Crestron Isys™ **TPS-3000L**
6.4 Inch Lectern/Wall Mounted Touchpanel
Operations Guide

CRESTRON

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Contents

6.4 Inch Lectern/Wall Mount Touchpanel: Crestron Isys™ TPS-3000L

Introduction

Features and Functions

The TPS-3000L series packs all the power and performance of an Isys panel in a stylish lectern or wall-mount model. Its compact stature makes the TPS-3000L series perfect for the home, especially in locations like home theaters, bedrooms and the home office.

These touchpanels are available in three colors: almond, black, and white. The suffix 'A', 'B', and 'W' respectively denotes color, i.e. TPS-3000LB is a black unit. For simplicity within this guide, color suffix is omitted.

Featuring a 6.4" active matrix display that provides the finest quality video and graphics available on a screen of its size, the TPS-3000L features the 65,536-color Isys engine which allows all graphics to be displayed with incredible brightness and depth. A light sensor automatically brightens or dims the display with room light for easy viewing.

TPS-3000L Functional Summary

- 6.4" (1.26cm) Active Matrix Color Display
- 640x480 Screen Resolution
- 16 Bit Non-Palette Graphics, over 64,000 Colors
- 8 Mb of Flash & 8 Mb of DRAM Memory
- Built-in Time-Based Correction for Stable Video & Graphics
- Balanced/Unbalanced Composite Video Input; Supports NTSC/PAL Formats
- Full Screen Video Capability

(continued on next page)

TPS-3000L Functional Summary (Continued)

- Up to 4,000 Digital and Analog Signal Joins; Up to 999 Serial Signal Joins
- Built-in Microphone & 2 Speakers (Half Duplex Intercom Capable)
- Stores WAV Sound Files
- Automatic Light Sensor
- Capable of Inverting Image for optimum viewing whether mounting in a lectern or wall.
- Pop-up sub panels to reduce memory requirements, providing optimal speed and performance
- Up to 4,000 functions and unlimited screens
- Multiple button, slider control, and icon configurations, including multi-mode objects
- Fast graphics performance: imported photographs, drawings, and icons
- Support for downloadable fonts – proportional and non-proportional
- Foreign language text
- Five Pushbuttons that can be programmed for quick access to regularly used functions*

* Custom engraved keys can be ordered separately by using the Crestron Engraver Software. Version 2.0.0.9 or later is available from the Downloads | Software Updates section of the Crestron website (www.crestron.com).

Multiple graphics can be displayed on the TPS-3000L without any shift in color depth or quality. The newest Isys panel also supports real-time video as standard and can accommodate balanced or unbalanced video, S-Video or composite.

The TPS-3000L's audio capabilities include stereo audio speakers that offer built-in volume control, a built-in microphone and built-in WAV sound file capability.

This touchpanel also features five engraveable pushbuttons that are backlit for easy viewing. These buttons can be programmed to access regularly used functions. Each button also features LED feedback with adjustable brightness to indicate operation.

The purpose of the TPS-3000L touchpanel is to replace large, complicated hard-wired panels in either a Cresnet system or an RS-232 system with a series of simpler screens each specific to the control problem at hand. Thus, a very large number of functions can be made available to the user without the confusion associated with hardware panels of that complexity. Icons, graphics, and text can dramatically increase any user's comprehension of the control environment. Devices, functions, and control zones are quickly organized and more easily accessed.

The TPS-3000L has a "Dynamic range" compression feature. When enabled, the audio amplifier gain is reduced dynamically for loud signal levels, thus eliminating most distortion at the speakers. For quiet audio signals, the gain is not reduced. When "Dynamic range" compression is turned off (default), the audio amplifier gain remains fixed for all signal levels at the given volume setting. Refer to the "Audio Menu" section of "Configuring the Touchpanel" on page 13 for instructions on selecting this feature.

The TPS-3000L has the ability to transmit touch coordinates when "RS-232 Port for Touch Output" is selected. Currently Telestrator devices are supported on the TPS-3000L. Refer to the "RS-232 Menu" section of "Configuring the Touchpanel" on page 17 for instructions on selecting this feature.

Specifications

The table below and on the next page provides a summary of specifications for the TPS-3000L touchpanel.

Specifications for the TPS-3000L Touchpanel

SPECIFICATION	DETAILS
Power Requirements	20 Watts (0.83 Amp @ 24 VDC)
Default NET ID	03
Timeout	Adjustable from 0 to 120 minutes (Default = 10 min.)
Signal Join Maximums	4000 Digital and Analog, 999 Serial
Control System Update Files[1,2,3]	
2-Series Control System	Version C2-2004.CUZ or later
CEN/CN-TVAV	Version 5.13.12V.UPZ or later
CNMSX-AV/PRO	Version 5.12.63X.UPZ or later
CNRACKX/-DP	Version 5.07.06W.UPZ or later
ST-CP	Version 4.02.04S.UPZ or later
Acceptable File Extensions[4]	
SIMPL Windows	
.smw	*projectname*.smw (source file)
.spz	*projectname*.spz (compiled file for 2-Series)
.bin	*projectname*.bin (compiled file for CNX generation)
.csz	*projectname*.csz (compiled file for CNX generation with SIMPL+)
VT Pro-e	
.vtp	*projectname*.vtp (source file)
.vtz	*projectname*.vtz (compiled file)
Firmware	
.csf	TPS-3000xxxxxx.csf (panel firmware)
Audio	• Balanced (20 kΩ) & unbalanced (10 kΩ) line level stereo input through 6-position mini-phoenix. • Maximum input level 2Vrms single ended, 4Vrms differential with internal volume control and two speakers. • Balanced line level microphone with AGC output via 3-position mini-phoenix. • Maximum output level 1Vrms single ended, 2Vrms differential • Built-in WAV file (8bit 8kHz mono PCM type) & key click capability • Speaker amplification: 2 Watts per channel

(continued on next page)

Specifications for the TPS-3000L Touchpanel (Continued)

SPECIFICATION	DETAILS
Video	• Composite/S-Video input through 6-position mini-phoenix (Balanced 100 Ω: cable run not to exceed 500 feet (152.4 meters)), or BNC (Unbalanced 75 Ω: cable run not to exceed 100 feet (30.5 meters)). • Built-in time base correction for stable video and graphics • Video can be displayed full screen or in a window • NTSC and PAL supported • De-interlaced (still) and line doubled (motion) modes are supported • Adjustments for brightness, contrast, hue and saturation available
Memory	8MB internal flash memory (7MB for user display lists), 8MB of DRAM
Screen Dimensions	6.4"/16.3 cm diagonal
Screen Viewing Angles:	Y Dir. (X=0°): +40° (from top), -55° (from bottom) X Dir. (Y=0°): +60° (from right), -60° (from left)
Screen Resolution	640 x 480 pixels
Color	16 Bit non-palette graphics with color key video window capability, 65,536 colors
Display Type	Touch-sensitive active matrix color LCD
Enclosure	Black metal enclosure with injection-molded plastic faceplate in black, white, or almond.
CPU	63MIPs Coldfire processor running Isys generation firmware
Cresnet	Via 4-position mini-phoenix connector
RS-232	RJ11 connector for console, telestrator, etc. Default settings: 115200, 8 bit, parity none, stop bit 1.
Operating Temperature and Humidity	50º to 113º F (10º to 45º C), 10 to 90% Relative Humidity (non-condensing)
Dimensions and Weight (with faceplate)	Height: 7.65 in (19.43 cm) Width: 9.36 in (23.77 cm) Depth: 2.74 in (6.95 cm) Weight: 2.8 lbs (1.3 kg)
Programmable Pushbuttons	5 with fixed join numbers. Join numbers are 1 to 5 (top to bottom) regardless of screen orientation. Custom engraved buttons can be ordered separately from Crestron.

1. The latest versions can be obtained from the Downloads | Software Updates section of the Crestron website (www.crestron.com). Refer to NOTE after last footnote.
2. Crestron 2-Series control systems include the AV2, CP2, CP2E, MP2, MP2E, PAC2, PRO2, and RACK2.
3. CNX update files are required for either CNMSX-AV/Pro or CNRACKX/-DP. Filenames for CNX update files have a UPZ extension and ST-CP files are in one EXE or zipped UPZ file. To avoid program problems, make certain you are using the update file with the correct suffix letter (e.g., S, V, W, X).

4. Extension requires a prefix specific to the touchpanel type. In DETAILS, *projectname* represents the assigned project name, and xxxxxx represents a version number.

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 site (including the FTP site).

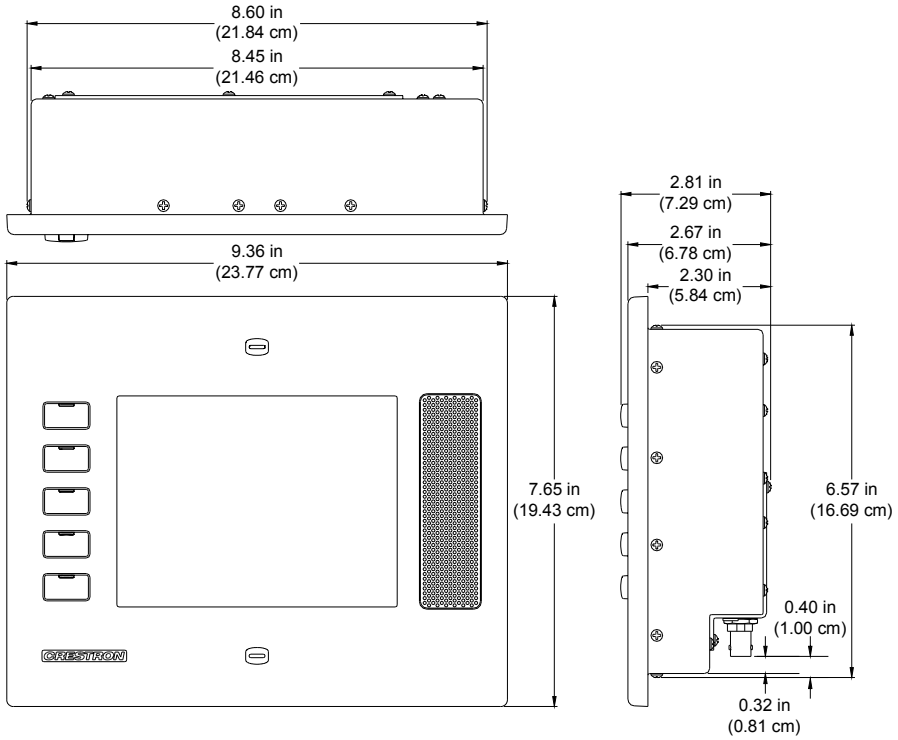
Physical Description

The 6.4 inch (16.26 cm) touch sensitive viewing screen is located on the front of the TPS-3000L touchpanel with five engraveable pushbuttons on the side. A faceplate conceals two speakers, a photosensor and a microphone. The electronic hardware is housed in a metal enclosure, with a colored faceplate as shown after this paragraph. All audio, video, RS-232, network, and power connections are made at the rear of the unit.

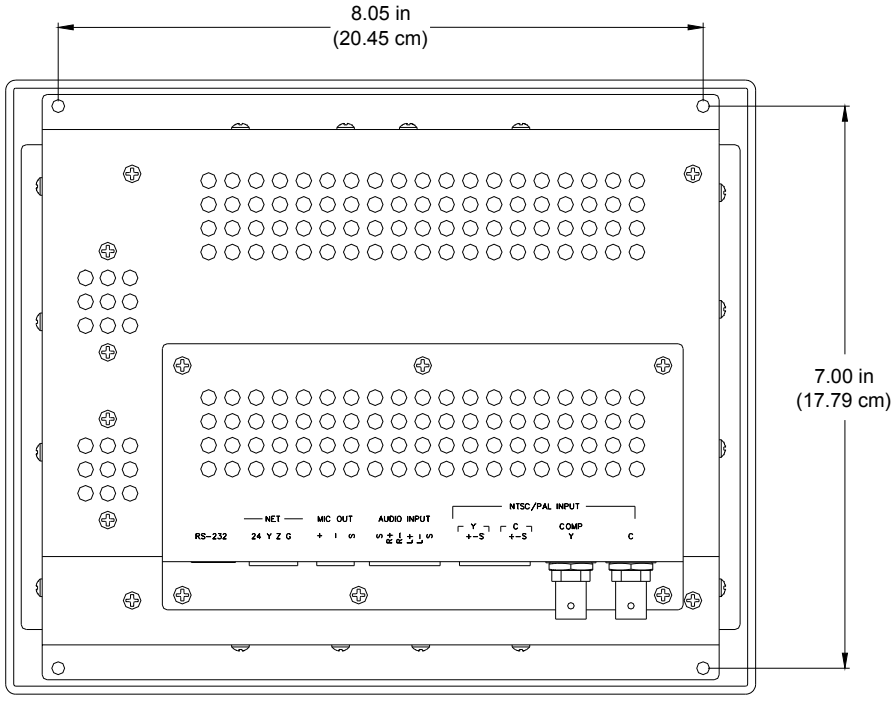
This touchpanel is designed for placement in a wall or on a lectern/podium. When placing in a wall, the touchpanel should be installed with the pushbuttons on the left side of the screen for optimum viewing. If the touchpanel is to be mounted in a lectern or podium, the touchpanel should be installed with the pushbuttons located on the right side of the screen for optimum viewing. Refer to "Screen Orientation" on page 8 for more information.

TPS-3000L Shown with Optional Engraved Buttons (Unit Ships with Colored Blanks)

Physical Views of the TPS-3000L Touchpanel (Top, Front, and Side)



Physical View of the TPS-3000L Touchpanel (Back)



Industry Compliance

As of the date of manufacture, the touchpanel 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

Network Wiring

NOTE: When installing network wiring, refer to the latest revision of the wiring diagram(s) appropriate to your specific system configuration, available from the Downloads | Product Manuals | Wiring Diagrams section of the Crestron website (www.crestron.com).

When calculating the wire gauge for a particular Cresnet run, the length of the run and the power factor of each Cresnet 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 network unit to be daisy-chained must be added together to determine the power factor of the entire chain. 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

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

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

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 table after this paragraph.

Wire Gauge Values

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

NOTE: All network wiring must consist of two twisted pairs. One twisted pair is the +24V conductor and the GND conductor. The other twisted pair is the Y and Z conductors.

NOTE: When daisy-chaining Cresnet units, strip the ends of the wires carefully to avoid nicking the conductors. Twist together the ends of the wires that share a pin on the network connector, and tin the twisted connection. Apply solder only to the ends of the twisted wires. Avoid tinning too far up the wires or the end becomes brittle. Insert the tinned connection into the Cresnet connector and tighten the retaining screw. Repeat the procedure for the other three conductors.

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

Identity Code

Every equipment and user interface within the network requires a unique Cresnet identity code (NET ID). These codes are recognized by a two-digit hexadecimal number ranging from 03 to FE. Refer to “Interface Menu” on page 13 for instructions on setting the unit's NET ID. The NET ID of the unit must match the NET ID specified in the SIMPL Windows program. Refer to “Setting the Net ID in Device Settings” on page 26 for information about changing the ID in a SIMPL Windows program.

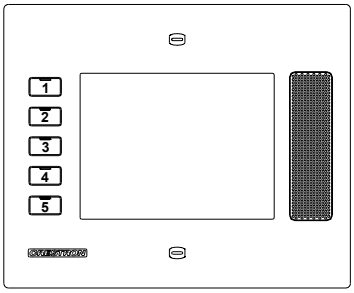
Screen Orientation

When installing the TPS-3000L into a wall or lectern, the screen must be properly oriented for optimum viewing. Incorrect orientation of the screen will not allow the screen to be viewed at its brightest during operation.

Wall Mounting

The TPS-3000L ships in the default “Upright” configuration for mounting in a wall. The “Upright” configuration provides optimum viewing when installed into a wall. In this setting, the pushbuttons are located on the left side of the screen, and the screen orientation is set to “Upright” (refer to the “Orientation” section of “Screen Settings” which begins on page 15 for instructions) with the connectors located on the bottom of the touchpanel. Refer to the following diagram.

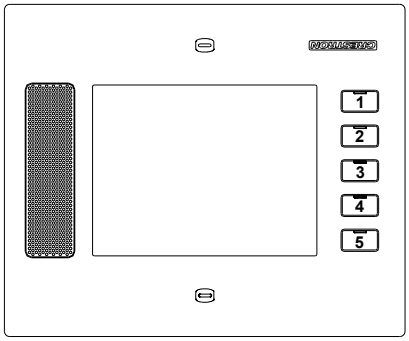
Pushbutton Layout and Join Number Assignment Wall Mount



Lectern Mounting

If the touchpanel is to be installed into a lectern, the touchpanel must be set to the "Inverted" configuration. The "Inverted" configuration provides optimum viewing when installed into a lectern. This configuration requires the pushbuttons to be placed on the right side of the screen the screen orientation set to "Inverted" operation (refer to "Screen Settings" on page 15 for instructions), and the connectors to be located at the top of the touchpanel. Refer to the following diagram. Before installing the touchpanel in the "Inverted" configuration, the pushbuttons must be reoriented to match the position of the touchpanel. Follow the instructions below to reorient the pushbuttons.

Pushbutton Layout and Join Number Assignment-Lectern Mount



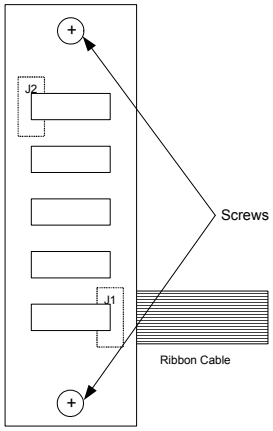
NOTE: This Procedure should be done before installing the touchpanel.

Required Tools

- ❑ #1 Phillips tip screwdriver

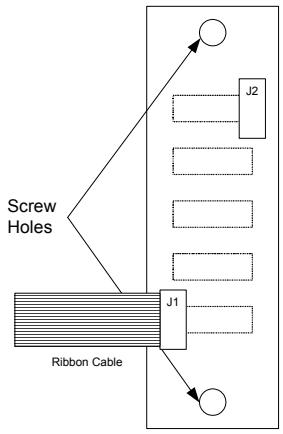
1. Place the touchpanel on a flat surface.
2. Remove the faceplate (if installed) and the pushbuttons from the touchpanel. Number the pushbuttons 1 through 5 (with 1 being the button in the top position) as they are removed.
3. Use a #1 Phillips screwdriver to remove the two screws that hold down the pushbutton circuit board. Refer to the following diagram for screw locations.

Pushbutton Circuit Board (Top View)



4. Lift and turn over the pushbutton circuit board to view the cable connecting the circuit board to the touchpanel. Refer to the following diagram.

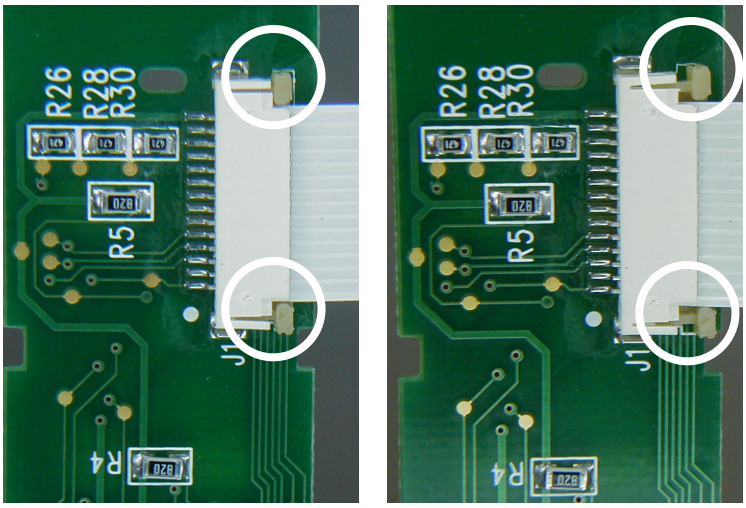
Pushbutton Circuit Board (Bottom View)



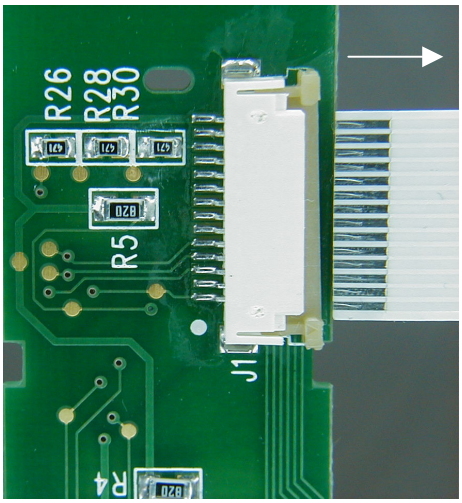
5. Release the tension clip on the ZIF connector (labeled J1) by gently sliding the clip approximately 1/16” toward the pushbutton circuit board edge and remove the ribbon cable from the connector. Refer to the pictures after this step for a detailed view.

NOTE: Do not pull the cable before releasing the tension clip.

Release the Tension Connector: Connector Locked (left) & Unlocked (right)



Remove the Ribbon Cable



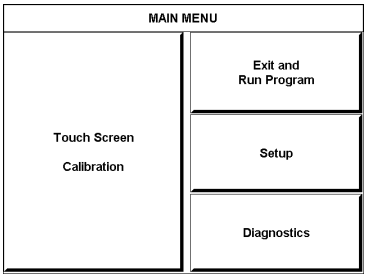
6. Rotate the pushbutton circuit board 180º and slide the ribbon cable into the open connector (labeled J2). Insert the cable with the leads facing away from the pushbutton circuit board.
7. Secure the ribbon cable by gently sliding the tension clip toward the connector body.
8. Turn over the circuit board in its new orientation and install the two pushbutton circuit board screws to **finger-tight.** Using a #1 Phillips screwdriver, tighten each screw an additional **1/8-turn**.
9. While holding a finger gently on the touchscreen, connect the power cable to the NET connector on the touchpanel. This will place the touchpanel in the setup mode.
10. Set the screen to inverted operation. Refer to "Screen Settings" on page 15 for instructions.
11. Rotate the touchpanel so the pushbuttons are located on the right side of the touchpanel. If custom engraved button caps exist, install them to match programming.
12. With the faceplate buttons on the right, place the supplied Crestron label on the faceplate over the molded Crestron logo (which is now upside down).
13. The touchpanel is now ready for installation in a lectern. Refer to "Touchpanel Mounting" on page 21 for mounting instructions.

NOTE: The sequence of digital join numbers is (top to bottom) 1 through 5 whether the touchpanel is mounted with the buttons on the left side or right side.

Configuring the Touchpanel

NOTE: The only connection required to configure the touchpanel is power. Refer to "Hardware Hookup" on page 17 for details.

MAIN MENU



This menu can also be obtained via digital reserved join number, 17242.

To configure the unit, it may be necessary to access a series of setup screens prior to viewing run-time screens that are loaded into the touchpanel for normal operation. The MAIN MENU for configuring the touchpanel appears when a finger is held to the touchscreen as power is applied. Remove your finger when the message "SETUP MODE" appears on the touchscreen.

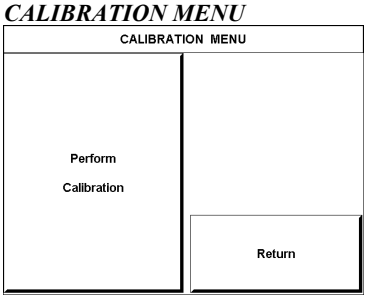
NOTE: The SETUP MODE can also be accessed through the Viewport Utility if the touchpanel is connected directly to a PC.

Upon entering SETUP MODE, the MAIN MENU, shown to the left, displays four buttons: **Touch Screen Calibration**, **Exit and Run Program**, **Setup**, and **Diagnostics**.

The **Exit and Run Program** button verifies that all of the setup information has been saved to EEPROM and displays the main page that has been programmed into your system. The remaining buttons on the MAIN MENU open other menus, which are discussed in subsequent paragraphs.

Calibration Menu

CALIBRATION MENU



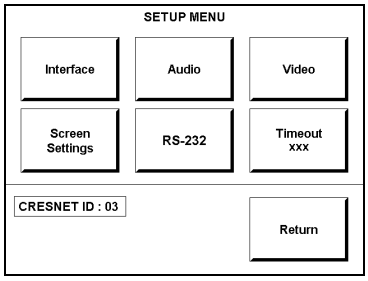
Calibration of the touchscreen is required if the active touch area of a button does not coincide with the button's image. Select the **Touch Screen Calibration** button to display the CALIBRATION MENU, shown to the left. The CALIBRATION MENU offers the choice to initiate calibration with the **Perform Calibration** button or return to the previous screen with the **Return** button. Choose an option by touching the correct button.

If you proceed to calibrate the touchpanel, the screen displays the message "Touch Upper Left" centered on the panel with a cross hair in the corner. Touch the cross hair in the corner of the screen to initiate calibration. Another message, "Touch Upper Right", appears with a cross hair in the correct corner. Touch the corner of the screen. A final message, "Touch Lower Right", appears with a cross hair in the correct corner. Touch the corner of the screen to conclude calibration and return to the MAIN MENU.

NOTE: When touching the screen during calibration, be as accurate as possible. Use the tip of a capped pen or the eraser end of a pencil. To cancel calibration and return to the CALIBRATION MENU without saving calibration data, create a calibration error by touching the screen in an area that is opposite from the instructed area.

Setup Menu

SETUP MENU



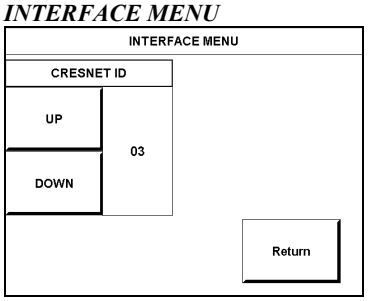
To obtain the SETUP MENU, shown to the left, press the **Setup** button from the MAIN MENU. The SETUP MENU offers a series of buttons, which opens additional menus and displays, which are detailed in subsequent paragraphs. After setup parameters have been set, select the **Return** button to return to the MAIN MENU.

NOTE: For convenience, the current CRESNET ID setting is displayed in the lower left corner.

NOTE: All touchpanel settings are automatically saved in non-volatile memory.

Interface Menu

INTERFACE MENU



The touchpanel communicates with a control system to activate commands or to display feedback from components within the system. The communication interface must be correctly specified or communication will not occur. To set communication parameters select the **Interface** button located on the SETUP MENU and display the INTERFACE MENU, shown to the left.

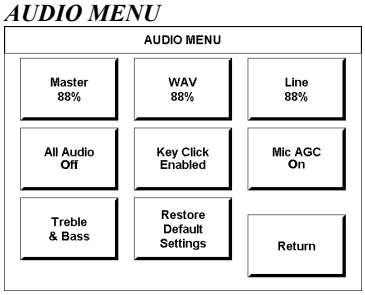
The Cresnet network identity number (CRESNET ID) is displayed on the INTERFACE MENU. CRESNET ID is the two-digit hexadecimal number. The hexadecimal number can range from 03 to FE and must correspond to the NET ID set in the SIMPL Windows program of the Cresnet system. Matching IDs between touchpanel and SIMPL Windows program is required if data is to be successfully transferred. NET ID for the TPS-3000L is factory set to 03, and no two devices in the same system can have the same ID.

Two buttons adjacent to the hexadecimal display, **UP** and **DOWN**, increase and decrease the CRESNET ID by one, respectively.

Select the **Return** button located on the INTERFACE MENU to accept the changes and return to the SETUP MENU.

Audio Menu

AUDIO MENU



Audio is a useful feedback tool and it can be used to enhance a custom interface. To obtain the AUDIO MENU, shown to the left, press the **Audio** button from the SETUP MENU. The AUDIO MENU offers a series of buttons, which opens additional screens and each is detailed in a table after this paragraph. Two of the buttons on the AUDIO MENU perform a function directly. The **Restore Default Settings** button returns all audio parameters to their default factory settings when the button is selected. After audio parameters have been set, select the **Return** button to accept the changes and return to the SETUP MENU.

The button text shown demonstrates the default audio setting for the given button. The items in parenthesis are also default values, but are seen in subsequent screens.

Audio Setup Details

AUDIO MENU BUTTON	AUDIO SETUP SCREEN	DESCRIPTION*
Master 88%	Master Volume	The volume of all audio types (WAV, line, and key click) is affected by the Master Volume control. If the Master Volume control is set to 100%, the volume for any type of audio is at maximum. If the Master Volume is set to 0%, the value of all audio types is overridden and the touchpanel is silent. If Master Volume is a percentage (say 50%), then all audio types can only achieve half their value.
WAV 88% (On)	WAV	Enable WAV files with the **WAV On** button. **WAV Off** disables this feature. Adjust the volume with the **UP** and **DOWN** buttons. Select the **Play WAV File** to sample and adjust the volume as a pre-loaded WAV file plays.

(continued on next page)

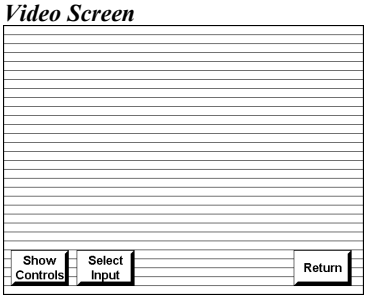
Audio Setup Details (continued)

AUDIO MENU BUTTON	AUDIO SETUP SCREEN	DESCRIPTION*
Line 88% (On)	Line	Enable line level audio with the **Line On** button. **Line Off** disables this feature. Adjust the volume with the **UP** and **DOWN** buttons.
All Audio (On)	All Audio Control	All types of audio may be disabled with a single button press. **All Audio Off** activates global muting. **All Audio On** enables all audio.
Key Click Enabled (Vol. 29%)	Key Click	**Click On** enables the key click sound, **Click Off** disables the key click. Adjust the volume with the **UP** and **DOWN** buttons.
Mic AGC On	AGC	The built-in microphone AGC (Automatic Gain Control) is enabled by the **Mic Audio AGC On** button and disabled with the **Mic Audio AGC Off** button.
Treble & Bass (49%)	Treble & Bass	Two **UP** and **DOWN** buttons allow independent treble and bass adjustment.

*Each screen has its own Return button to revert to the AUDIO MENU. Selected buttons are shown in red on the touchpanel.

Video Menu

Video Screen



The TPS-3000L can display balanced and unbalanced composite video and S-Video input supporting both NTSC/PAL formats. Select the **Video** button from the SETUP MENU to display the video screen, shown to the left. The video source type can be specified by selecting **Select Input**. The touchpanel can be configured to auto-detect BNC and Twisted-Pair (TP) connections (S-Video or Composite) or can be set to a specific connection type (BNC S-Video, BNC Composite, TP S-Video, TP Composite). Select the appropriate input mode.

The **Show Controls** button on the video screen offers another screen with a series of buttons, each is detailed in a table after this paragraph. After video parameters have been set, select the **Return** button to return to the SETUP MENU.

NOTE: A solid blue screen is displayed in the video window if the video signal is not detected or is very weak. Verify that the video source is functioning and properly connected. Balanced video cable runs should not exceed 500 feet (152.4 meters) and unbalanced video cable runs should not exceed 100 feet (30.5 meters). Cable runs in excess of these lengths will weaken the video signal.

Video Setup Details

VIDEO SCREEN BUTTONS[1]	DESCRIPTION[2]
Brightness	**UP** button increases video image brightness, **DOWN** button decreases video image brightness.
Contrast	**UP** button increases video image contrast, **DOWN** button decreases video image contrast.

(continued on next page)

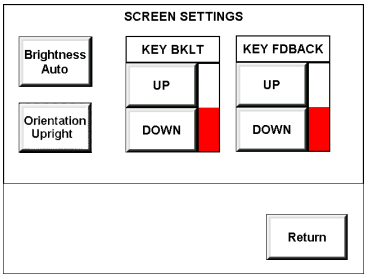
Video Setup Details (continued)

VIDEO SCREEN BUTTONS[1]	DESCRIPTION[2]
Saturation	**UP** button increases video image saturation, **DOWN** button decreases video image saturation.
Hue	**UP** button increases video image hue, **DOWN** button decreases video image hue.
Still/Motion (toggle)	The **Motion** setting eliminates motion artifacts caused by the difference between the first and second halves of a video field and softens the image. The **Still** setting yields a much sharper image, however, motion artifacts may occur if fast moving objects are displayed.
Hide Controls	This button returns the display to the video screen.
Default	Returns you to the default settings. You are prompted with "Are you sure?" Answering **YES** to the prompt returns you to default settings. Answering **NO** to the prompt returns you to the previous screen.
Return	Saves the settings and returns to the SETUP MENU

1. Video default is 50% for each of the video parameters (brightness, contrast, saturation, and hue).
2. Each screen has its own **Return** button to revert to the SETUP MENU**.**

Screen Settings

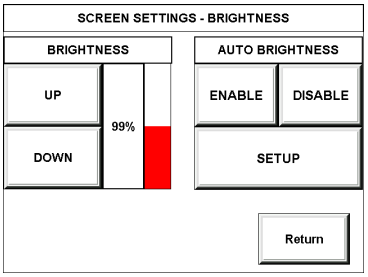
SCREEN SETTINGS



Screen brightness, orientation, and pushbutton settings may need to be adjusted because of ambient light conditions or personal preference. These screen attributes may be automatically set via programming or be altered manually by selects made from the SCREEN SETTINGS display, shown to the left. Press the **Screen Settings** button from the SETUP MENU to access this screen. To return to the SETUP MENU and save screen settings, select the **Return** button on the SCREEN SETTINGS display. Screen settings are factory set to **Brightness Auto**, **Orientation Upright**, 50% **KEY BKLT** (Key Backlighting), and 50% **KEY FDBACK** (Key Feedback Lighting). Alterations to brightness and orientation are performed on subsequent screens after selecting the appropriate button.

The key backlighting level as well as the key feedback lighting (the key lighting when a key is engaged) level can be adjusted by pressing **UP** or **DOWN**. Setting either value to zero will disable the lighting.

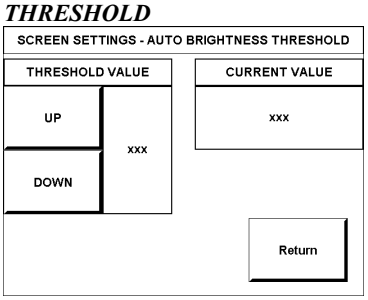
SCREEN SETTINGS - BRIGHTNESS



BRIGHTNESS

Press the Brightness button to open the SCREEN SETTINGS – BRIGHTNESS display. Manual controls are located on the left side and automatic controls are located on the right side. Two buttons, **ENABLE** and **DISABLE**, are used to determine whether the touchpanel brightness is controlled manually or automatically via thresholds. Select the **ENABLE** button for automatic settings. Notice that a 'net' covers the manual controls on the left. The **DISABLE** button removes the 'net' to permit manual advancements (use the **UP** button) and reductions (use the **DOWN** button) to the screen brightness.

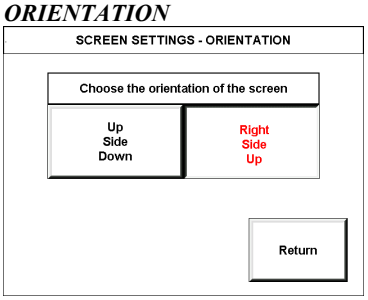
SCREEN SETTINGS – AUTO BRIGHTNESS THRESHOLD



Choose the **SETUP** button on the SCREEN SETTINGS – BRIGHTNESS display to open the SCREEN SETTINGS – AUTO BRIGHTNESS THRESHOLD display, shown to the left. A photosensor on the front panel permits this exclusive light-sensing touchpanel to automatically determine if the amount of light sensed exceeds a set threshold value. This threshold value allows the touchpanel to switch between daytime super bright (high brightness) and evening soft glow (low brightness) automatically. The right side of this display shows the CURRENT VALUE as detected by the photosensor. This value, represented by xxx in the illustration, can range from 0% (dark) to 100% (very bright). The THRESHOLD VALUE located on the left side of the display needs to be set to automatically adjust brightness. The numerical value, represented by xxx in the illustration, can range from 0% (dark) to 100% (very bright). Use the **UP** and **DOWN** buttons to increase and decrease the THRESHOLD VALUE, respectively.

If the CURRENT VALUE has exceeded the THRESHOLD VALUE, the screen switches to high brightness. When the CURRENT VALUE is less than the THRESHOLD VALUE, the screen switches to low brightness.

SCREEN SETTINGS - ORIENTATION



ORIENTATION

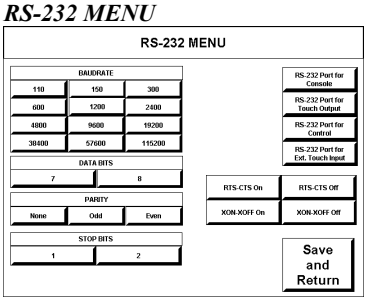
There is no 'top' or 'bottom' when installing the TPS-3000L. Press the **Orientation** button to open the SCREEN SETTINGS – ORIENTATION display, shown to the left. This setup feature allows the orientation of the display to be rotated 180° with the press of a button. This allows for optimum viewing whether installing the touchpanel into a wall or a lectern. When installing the touchpanel into a wall, the screen should be set to "Right Side Up" (pushbuttons on the left side). When installing the touchpanel into a lectern, the screen orientation should be set to "Up Side Down" (pushbuttons on the right side).

Two buttons, **Up Side Down** and **Right Side Up**, are used to set the orientation of the screen. The selected button appears in red text. By definition, the **Right Side Up** button displays the screen with connectors at the bottom of the touchpanel and as a result, the term **Orientation Upright** appears on the SCREEN SETTINGS display's center button. The **Up Side Down** button displays the screen with connectors at the top of the touchpanel and the term **Orientation Inverted** appears on the SCREEN SETTINGS display's center button. Use the **Return** button to get back to the SCREEN SETTINGS display.

NOTE: Whether the touchpanel screen orientation is set to **Upright** or **Inverted,** the sequence of digital join numbers remains the same (1 through 5 for both modes). Refer to "Screen Orientation" on page 8 for more information about lectern or wall installation.

RS-232 Menu

RS-232 MENU



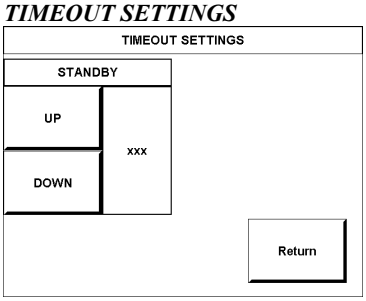
The touchpanel allows for four RS-232 communication methods:

- Console (i.e. loading programs)
- Control (i.e. non-Crestron device)
- Touch output (communication of touch coordinates to an external device)
- External touch screen input.

Touch the communication option to select communication parameters and then select **Save and Return** to save the RS-232 settings and return to the SETUP MENU.

Timeout Settings

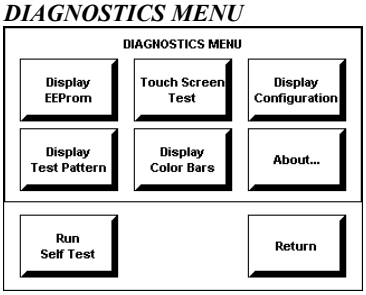
TIMEOUT SETTINGS



The touchpanel display can be turned off (standby mode) when not in active use. Select the **Timeout** button on the SETUP MENU to reveal the TIMEOUT SETTINGS display, shown to the left. This setting turns the display off when the touchpanel is inactive for a specified time. Touch the screen to awaken the touchpanel and the last screen to be displayed reappears. The time value, represented by xxx in the illustration, can range from 0 (disables the timeout) to 120 (minutes). Two buttons, **UP** and **DOWN**, increase and decrease the timeout, respectively. Select the **Return** button to save the timeout setting and return to the SETUP MENU.

Diagnostics Menu

DIAGNOSTICS MENU



The **Diagnostics** button from the MAIN MENU should only be used under supervision from a Crestron customer service representative during telephone support. The options available from the DIAGNOSTICS MENU, shown to the left, are numeric in nature and their interpretation is beyond the scope of this manual.

NOTE: The "About…" button will display a screen indicating the current version of firmware residing on the touchpanel.

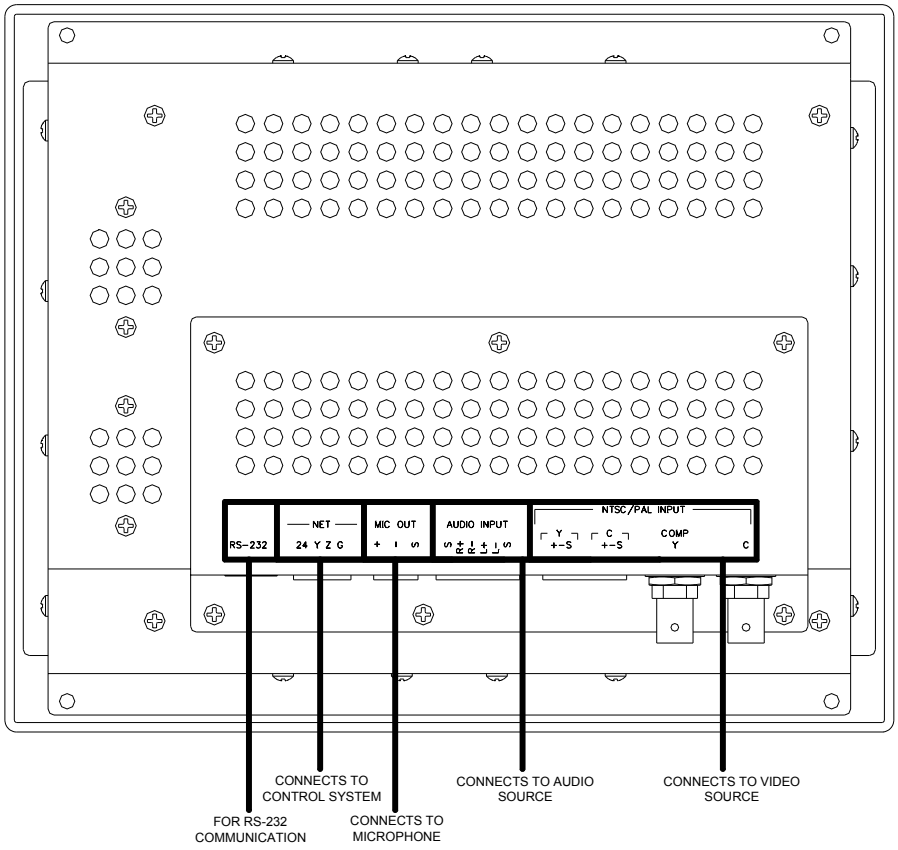
Hardware Hookup

The TPS-3000L can be mounted in a wall or inside a lectern. Make the necessary connections as called out in the illustration that follows this paragraph. Refer to "Network Wiring" on page 7 before attaching the 4-pin connector. Apply power after all connections have been made.

CAUTION: Do not remove the tape that covers the photosensor. Doing so can short the board and damage the touchpanel.

CAUTION: Do not apply excessive pressure to the touchscreen display during handling (mounting/installation). Doing so can crack the screen and damage the touchpanel.

Hardware Connections for the TPS-3000L (Back of the Unit is Shown)

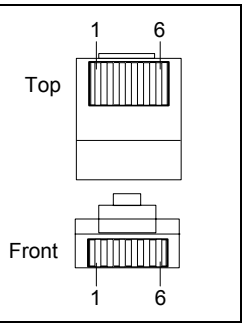


RS-232

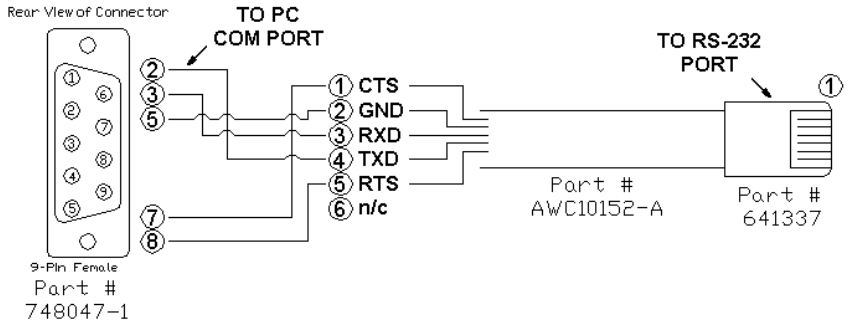
This 6-position RJ11 connector mates with a serial port of a PC. The connecting cable is not supplied. Prior to installation, use this port for direct connection between the touchpanel and a PC to load files to a touchpanel without a network connection. In the event that modular cables or an RJ11 to DB9F adapter is not available, the table below and diagram on the next page provide information so that the cable can be fabricated on site. Refer to "Appendix: RS-232 Protocol" on page 46 for protocol details.

RS-232 Pinouts

PIN #	DESCRIPTION
1	CTS
2	GND
3	RXD
4	TXD
5	RTS
6	N/C (Not connected)



PC to TPS-3000L Cable Specifications (Crestron Cable Number STCP-502PC)



NET

This 4-position mini-phoenix connector provides Cresnet network connection from the touchpanel as well as power to the touchpanel. A description of the pinouts is shown in the table after this paragraph.

NET Pinouts

PIN #	DESIGNATION	DESCRIPTION
1	24	Power
2	Y	Data
3	Z	Data
4	G	Ground

MIC OUT

This 3-position mini-phoenix connector provides balanced line level microphone output with AGC. A description of the pinouts is shown in the table after this paragraph.

MIC Pinouts

PIN #	DESIGNATION	DESCRIPTION
1	+	Mic Output (Positive)
2	-	Mic Output (Negative)
3	S	Shield

AUDIO INPUT

This 6-position, mini-phoenix connector provides line level, balanced and unbalanced audio input. The pinouts are shown in the tables after this paragraph.

AUDIO Pinouts-Balanced

PIN #	DESIGNATION	DESCRIPTION
1	S	Shield
2	R+	Right Input (Positive)
3	R-	Right Input (Negative)
4	L+	Left Input (Positive)
5	L-	Left Input (Negative)
6	S	Shield

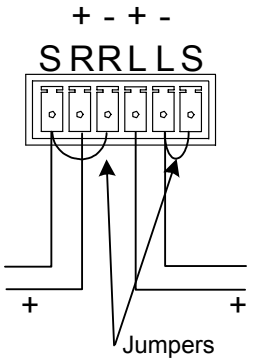
NOTE: When sending balanced audio from a CNX-BIPAD8 or CNX-PVID device, only the Positive (+) and Negative (-) wires are to be connected to the touchpanel. Do not connect the Shield (S) wires.

AUDIO Pinouts-Unbalanced

PIN #	DESIGNATION	DESCRIPTION
1	S	Ground
2	R+	Right Input (Positive)
3	R-	Right Ground
4	L+	Left Input (Positive)
5	L-	Left Input Ground
6	S	Ground

NOTE: Using two jumpers, connect R Shield to R - and L Shield to L - respectively at the TPS3000 Audio Input connector. Refer to the following diagram.

Wiring for Unbalanced Audio



NTSC/PAL INPUT

This port provides unbalanced composite and S-video input (using BNC connectors) or balanced video input (using 6-position mini-phoenix) for video signals. Both sets of inputs support both NTSC and PAL formats. Balanced video format is typically used when distributing video via CAT 5 (i.e., from a Crestron CNX-PVID8x3 or 8x4). Unbalanced video is typically used when distributing video via coaxial cable.

NOTE: Cable runs for balanced video should not exceed 500 feet (152.4 meters) and cable runs for unbalanced video should not exceed 100 feet (30.5 meters). For distances greater than these specified lengths use a distribution amplifier.

NTSC/PAL Balanced Video Input Pinouts

PIN #	DESIGNATION	DESCRIPTION
1	Y(+)	Luminance (Positive)
2	Y(-)	Luminance (Negative)
3	Y(S)	Luminance (Shield)

(continued on next page)

NTSC/PAL Balanced Video Input Pinouts (continued)

PIN #	DESIGNATION	DESCRIPTION
4	C(+)	Chrominance (Positive)
5	C(-)	Chrominance (Negative)
6	C(S)	Chrominance (Shield)

NOTE: When sending balanced video from a CNX-BIPAD8 or CNX-PVID device, only the Positive (+) and Negative (-) wires are to be connected to the touchpanel. Do not connect the Shield (S) wires.

Mounting Options

The TPS-3000L touchpanel installs simply and cleanly into existing or newly constructed walls, with an assortment of pre- and post-construction mounting options. All mounting options are provided separately from the actual touchpanel. Refer to the table after this paragraph for a complete list of mounting options and respective Installation Guides for the TPS-3000L.

Mounting Options for the TPS-3000L

PRE-CONSTRUCTION* OPTION	POST-CONSTRUCTION** OPTION	MODEL NUMBER	DOCUMENT NUMBER
Back Box Kit	-	BB-3000L	6022
Pre-Construction Mount Kit	-	PMK-3000L	6024
Mud Mount Kit (accessory)	-	MMK-3000L	6021
Trim Mount Kit (accessory)	-	TMK-3000L	6020
-	Wall Mount Kit – Mud	WMKM-3000L	6021
-	Wall Mount Kit – Trim	WMKT-3000L	6020

* Pre-construction refers to framed walls prior to hanging drywall.

** Post-construction refers to framed walls with drywall hung.

NOTE: There is also a rack mount kit for the TPS-3000L (known as RMK-TPS3000L). Refer to the latest version of the Installation Guide (Doc. 6023) which is available from the Crestron website (www.crestron.com).

If the BB-3000L or PMK-3000L are to be used and a touchpanel is not available, the installer can either leave the hole in the mounting surface open (if permitted by local building codes) or attach the cover plate supplied with the mounting kit.

Touchpanel Mounting

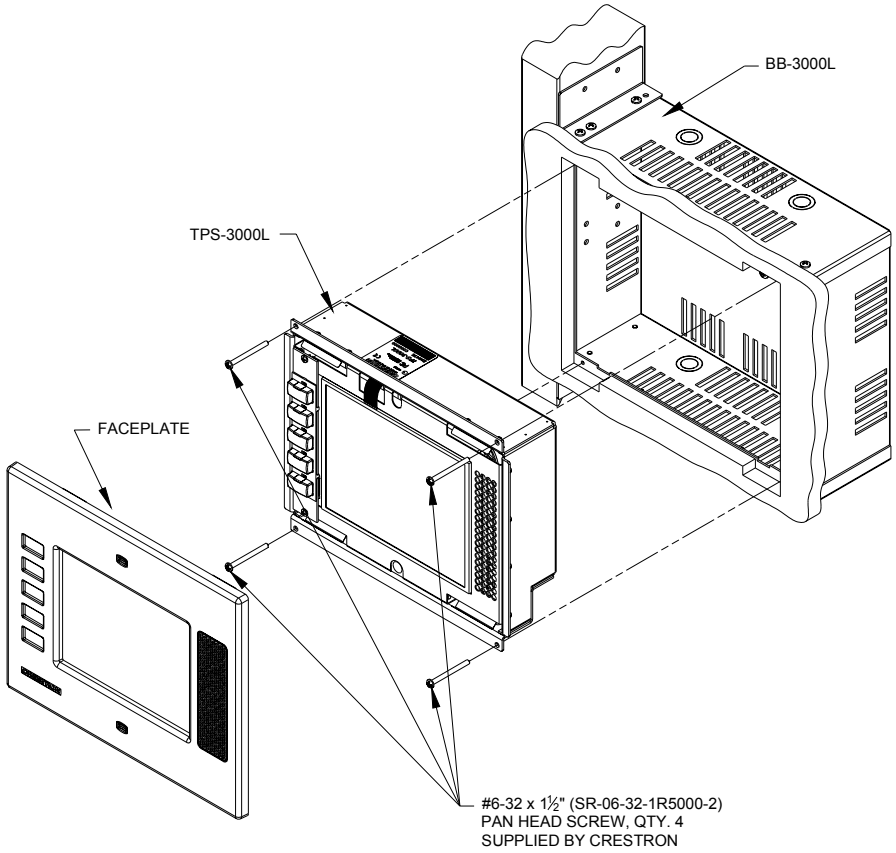
Required Tools

- ❑ #1 Phillips tip screwdriver

1. If the cover plate is attached, use a #1 Phillips screwdriver to loosen and remove the four screws and plate.
2. Connect all required cables to the touchpanel.

3. Insert the touchpanel (without its faceplate) into the mounting option and align the four screw holes.
4. Insert and tighten the four supplied screws (finger tight and then using a #1 Phillips screwdriver, tighten an additional 1/8-turn).
5. Insert the five buttons. If the buttons are engraved, verify that the placement of the each button matches the programming.
6. Cover the mounted unit with the faceplate. Refer to the illustration after this paragraph for guidance.

Exploded View for Mounting the TPS-3000L in the Optional BB-3000L Back Box



Optional custom engraved keys can be ordered separately by using the Crestron Engraver Software. Version 2.0.0.9 or later is available from the Downloads | Software Updates section of the Crestron website (www.crestron.com).

NOTE: If it is necessary to remove the touchpanel, secure and label the attached cables before disconnecting them from the back of the touchpanel.

Touchpanel Removal

If it is necessary to remove the touchpanel after it has been installed into a mounting surface, complete the following steps in the order provided to remove the touchpanel. The only tool required is a #1 Phillips tip screwdriver.

1. Lift the plastic cover off the touchpanel. Do not apply excessive pressure to the touchscreen.
2. Remove the plastic buttons from the touchpanel. If the buttons are engraved, be sure to record the button engraving with the button location so that the buttons can be properly returned.
3. Loosen and remove the four screws that secure touchpanel to the mounting option in use.
4. Using equal pressure, carefully remove the touchpanel from the opening.
5. If necessary, secure and label the attached cables before disconnecting them from the back of the touchpanel.

Recommended Cleaning

Keep the surface of the touchscreen free of dirt, dust, or other materials that could degrade optical properties. Long-term contact with abrasive materials can scratch the surface, which may detrimentally affect image quality.

For best cleaning results, use a clean, damp, non-abrasive cloth with any commercially available non-ammonia glass cleaner. The faceplate may not provide a complete watertight seal. Therefore, apply cleaning solution to the cloth rather than the surface of the touchscreen. Wipe touchscreen clean and avoid ingress of moisture beneath panels.

Programming Software

Have a comment about Crestron software?

Direct software related suggestions and/or complaints to Crestron via email (software@crestron.com). Do not forward any queries to this address. Instead refer to "Further Inquiries" on page 45 for assistance.

Setup is easy thanks to Crestron's Windows®-based programming software. Crestron Application Builder™ (AppBuilder) creates a complete project, with no special programming required. Crestron AppBuilder completes all necessary programming for a base system including all touchpanel screens and the control system program. Once Crestron AppBuilder creates the project, the system interfaces and program logic can be customized. It can easily be modified with Crestron development tools (i.e., SIMPL™ Windows® and VisionTools™ Pro-e (VT Pro-e) software packages).

The program output of Crestron AppBuilder is a SIMPL Windows program with much of the functionality encapsulated in macros. Therefore, extending the capabilities of the system is very easy. Crestron AppBuilder and SIMPL Windows are intended for users with different levels of programming knowledge. Crestron AppBuilder is easier to use for the beginning programmer, and much faster for all programmers. However, it does not allow the degree of control and flexibility that SIMPL Windows does. Of course, one can initiate programming using the easiest method (Crestron AppBuilder) and use advanced techniques that are available from SIMPL Windows to customize the job.

Crestron AppBuilder comes with templates for all supported interfaces. If a user wishes to create a touchpanel project using templates with a different look-and-feel this can be accomplished by making a custom template. This custom template can then be used by Crestron AppBuilder to create the final project files to be loaded into the panels. Alternatively, VT Pro-e can be used to tweak projects created with Crestron AppBuilder or develop original touchpanel screen designs.

The following are recommended software version requirements for the PC:

- Application Builder version 1.1.6 or later with Application Builder Templates version 2.12 or later. Requires SIMPL Windows.

- SIMPL Windows version 2.02.11 or later with library update file. Requires SIMPL+ Cross Compiler version 1.1.
- Crestron Database version 15.8.6 or later. Required by SIMPL Windows.
- VisionTools Pro-e version 2.4.1.6 or later. Used for graphical touchscreen design.
- Crestron Engraver 2.0.0.9 or later.

NOTE: The TPS-3000L touchpanel is supplied with five blank pushbuttons. Optional custom engraved keys can be ordered separately by using the Crestron Engraver Software. Version 2.0.0.9 or later is available from the Downloads | Software Updates section of the Crestron website (www.crestron.com).

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 logic functions (although they can perform page flips).

Programming with the Crestron AppBuilder

The easiest method of programming, but does not offer as much flexibility as SIMPL Windows.

Crestron AppBuilder offers automatic programming for such residential and commercial applications as audio distribution, home theater, video conferencing, and lighting. The interface of this tool guides you through a few basic steps for designating rooms and specifying the control system, touchpanels, devices, and functionality. Crestron AppBuilder then programs the system, including touchpanel projects and control system logic.

Crestron AppBuilder is fully integrated with Crestron's suite of software development tools, including SIMPL Windows, VT Pro-e, and the Crestron Database. Crestron AppBuilder accesses these tools behind the scenes, enabling you to easily create robust systems.

Programming with SIMPL Windows®

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

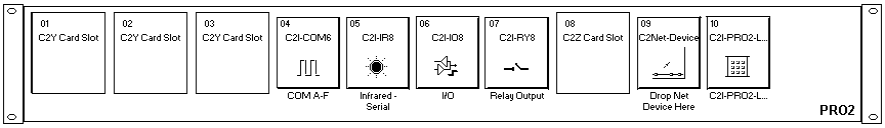
NOTE: In the following description, the PRO2 control system is used.

SIMPL Windows is Crestron's 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.

This section describes a sample SIMPL Windows program that includes a TPS-3000L touchpanel.

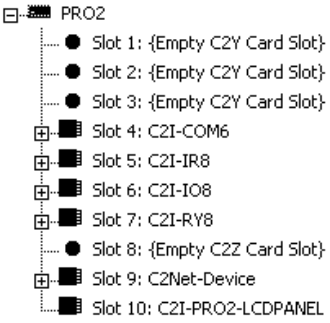
Configuration Manager is where programmers "build" a Crestron control system by selecting hardware from the *Device Library*. In Configuration Manager, drag the PRO2 from the Control Systems folder of the *Device Library* and drop it in the upper pane of the *System Views*. The PRO2 with its associated communication ports is displayed in the *System Views* upper pane.

PRO2 System View



The *System Views* lower pane displays the PRO2 system tree. This tree can be expanded to display and configure the communications ports.

Expanded PRO2 System Tree

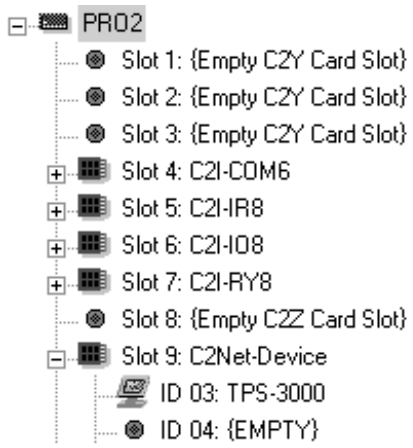


C2Net-Device Slot in Configuration Manager

To incorporate the TPS-3000L touchpanel into the system, drag the TPS-3000 from the Touchpanels | Touchpanels (Cresnet) folder of the *Device Library* and drop it in the *System Views.* The PRO2 system tree displays the touchpanel in slot 9 with a default NET ID of 03 as shown in the following illustration.

NOTE: The first touchpanel in a system is preset with a NET ID of 03, when its symbol is dragged into the upper pane of *System Views*. Additional touchpanels are assigned different NET ID numbers as they are added.

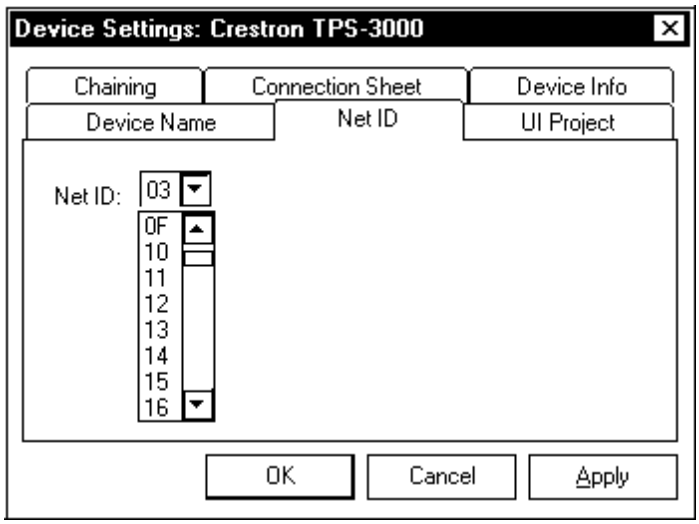
C2Net Device, Slot 9



Setting the Net ID in Device Settings

Double-click the TPS-3000 icon to open the "Device Settings" window. This window displays the TPS-3000 device information. If necessary, select the *Net ID* tab to change the Net ID, as shown in the following figure.

"Device Settings" Window for the TPS-3000L

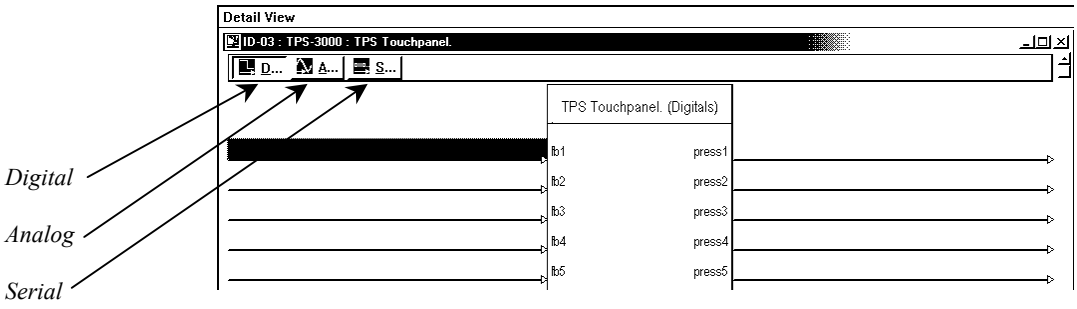


NOTE: SIMPL Windows automatically changes NET ID values of a device added to a program if a duplicate device or a device with the same default NET ID already exists in the program. Always ensure that the hardware and software settings of the NET ID match. For NET ID hardware settings details, refer to "Interface Menu" on page 13.

TPS-3000 Symbol in Programming Manager

Programming Manager is where programmers "program" a Creston control system by assigning signals to symbols. The following diagram shows the TPS-3000 symbol in the SIMPL Windows' Programming Manager.

Detail View of the TPS-3000 in SIMPL Windows' Programming Manager



NOTE: Join numbers are expandable to 4000 digital & analog, 999 serial.

Signal Types

Signals interconnect the various devices and logic symbols that comprise a SIMPL 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 on/off or high/low, 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 much like analog signals, in that they, too, contain 16 bits of information. However, whereas the value of an analog signal is used directly-to control volume or temperature, for instance–the value of the serial signal is used as a pointer to a location in memory that contains a string of characters. When a serial signal is routed to a symbol, that symbol can identify the signal as serial rather than analog and it will automatically look at the data it points to.

Thus 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.

TPS-3000L Input/Output Signals

The TPS-3000L symbol provides up to 4000 digital input and output joins, 4000 analog input and output joins, and up to 999 serial input joins. The programmer

selects the signal types by clicking on the appropriate button at the top of the S*ymbol Detail* view when programming the panel.

The following tables list and give functional descriptions for the touchpanel outputs and inputs.

Digital Output Signal Descriptions

OUTPUT	DESCRIPTION
press 1 through press 4000	Notifies control system of button press (1 - 4000). High/1 = Button being pressed Low/0 = Button not being pressed

Digital Input Signal Descriptions

INPUT	DESCRIPTION
fb 1 through fb 4000	Notifies panel of button press (1 - 4000). This can represent that the button was pressed, or can be an actual device feedback, e.g., that power was turned on.

Analog Output Signal Descriptions

OUTPUT	DESCRIPTION
an_act 1 through an_act 4000	Notifies control system of an action (1 - 4000). Any value from 0 through 65535

Analog Input Signal Descriptions

INPUT	DESCRIPTION
an_fb 1 through an_fb 4000	Notifies panel of analog action (1 - 4000).

Serial Input Signal Descriptions

INPUT	DESCRIPTION
text-01 through text-999	Notifies panel of text string (1 - 999). Also called indirect text.

Device Extenders

Device extenders provide additional logic and functionality to a device. The Poll Manager and Sleep/Wake Manager symbols are device extenders for touchpanels. Poll Manager takes the touchpanel on and off line during polling by the control system. Sleep/Wake Manager suspends and restores operation of the touchpanel. For additional information about Device Extenders, refer to the latest version of the Crestron SIMPL Windows Symbol Guide (Doc. 6120), or the on-line help included with SIMPL Windows.

Example Program

An example program for the TPS-3000L is available from the Crestron FTP site (ftp://ftp.crestron.com/Examples). Search for the file TPS3000L.ZIP that contains the example program, associated files and a README.TXT file that describes the program.

Programming with VisionTools™ Pro-e

VT Pro-e, a design and programming Windows®-based software, permits the creation of unlimited control screen variations incorporating two and three-dimensional graphics and text as well as video and sounds (recorded as WAV files). A set of pages, which make up a project, can be designed for each TPS-3000L touchpanel application. Each page contains objects such as custom control graphics,

two and three-dimensional buttons, sliders, and digital readouts which allow the user to interface with the control system via join numbers. Unjoined objects are not interfaced with the system and thus cannot initiate any functions. The completed and compiled project is uploaded to the touchpanel and programmed into the flash PROM via the **File | Upload Project** command. The touchpanel uses the programmed project until another project is uploaded from the PC. Programs cannot be extracted from the touchpanel. The PC may be disconnected from the control system or panel except during reprogramming. VT Pro-e also allows users the option to generate projects destined for web browsers rather than for physical touchpanels.

For additional software information, refer to the help file provided with the software. The latest version of VT Pro-e can be obtained from the Downloads | Software Updates section of the Crestron website (www.crestron.com).

Multi-Mode Objects

Multi-mode objects offer high-performance programming!

The single most-advanced VT Pro-e high-performance programming technique involving the TPS-3000L is the concept of multi-mode objects. A multi-mode object (i.e., button, legend, etc.) is an object drawn on a VT Pro-e page that can have one or more active and inactive visible settings (*modes*).

For examples, refer to the MULTI-MODE_OBJECT_EXAMPLES_OF_VTPRO-E_PROJECTS_USE_WITH_ISYS_TOUCHPANELS.ZIP file. It is available from the Crestron FTP site (ftp://ftp.crestron.com/Examples). This file contains the VT Pro-e touchpanel files and SIMPL Windows files that illustrate the high-performance capabilities of multi-mode objects.

WAV File Audio Messages

The TPS-3000L is capable of playing audio messages as system prompts and responses. These files are recorded as WAV files on a PC using an audio utility such as Sound Recorder that is packaged with Microsoft Windows 95/98/Me/XP/NT/2000™. Files from other sources may also be converted to an acceptable format by using this or a similar utility. Many other audio utilities are available commercially or as shareware. The TPS-3000L touchpanel only accepts the following WAV file format: **PCM, 8KHz, mono, 8 bit**. For more information about how to use Sound Recorder, refer to its User's Guide and extensive help information provided with the software.

Pre-recorded WAV files for voice prompts and responses are available from Crestron. These files can be stored into and programmed for use in the touchpanel directly or may be edited with the Sound Recorder. For example, the individual files can be combined to create custom messages.

NOTE: WAV files (for the TPS-3000L touchpanel) can be obtained from the Wave LC Library of the Crestron FTP site (ftp://ftp.crestron.com/Wave LC/).

Since the CT/LC-1000 touchpanel accepts the same WAV file formats, only use those WAV files designated for the CT/LC-1000, TPS-2000L, or TPS-3000 touchpanels. These WAV files are different than those made available for the CNXTA, Crestron CNX Telephone Audio Interface Card.

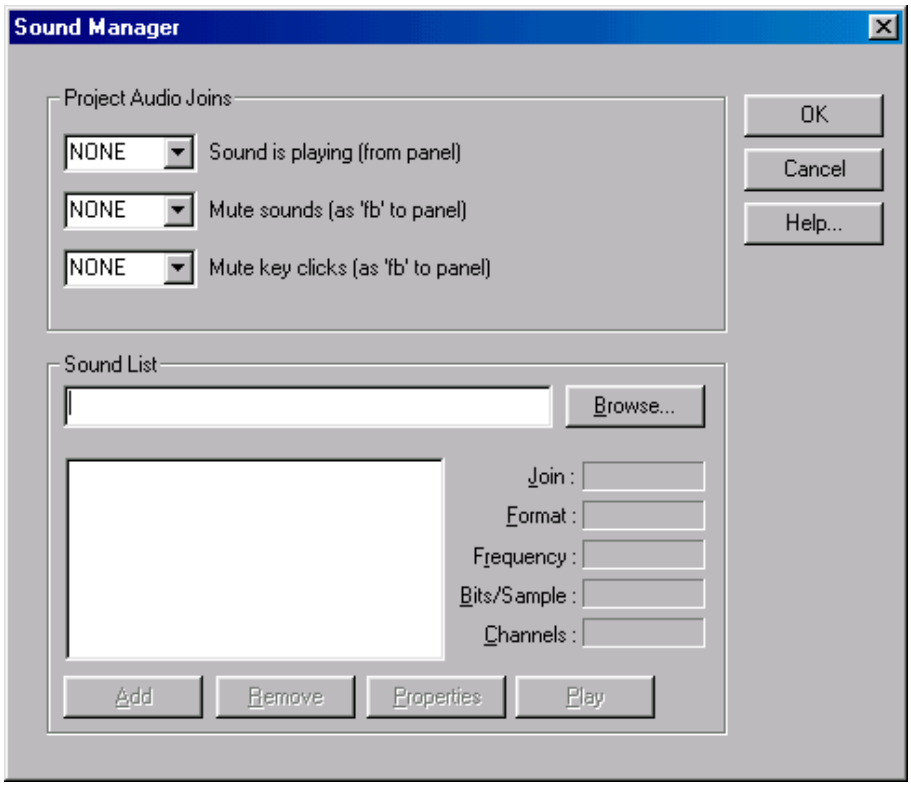
Sound Manager

NOTE: If keyclick is enabled on a touchpanel, each press of the touchpanel results in an audible click. It may be desirable to conceal the keyclick sound for certain buttons (e.g., if the button triggers playing of a WAV file). Using VT Pro-e, the

panel designer has the option to suppress the keyclick on a button-by-button basis from the "Button Properties" window.

Crestron VT Pro-e (version 2.1.0 and later) contains an audio tool, Sound Manager, which permits the panel designer to attach WAV files to a touchpanel project. Sound Manager is available from the Tools pull-down menu and opens the "Sound Manager" window, shown after this paragraph.

"Sound Manager" Window



Sound Manager Guidelines

There are three things to keep in mind when using Sound Manager.

1. Each WAV file must be assigned a unique digital join number. The join number options include none, keyclick, or a number (1 through 4000). The default is none. If the keyclick option is selected, this WAV file becomes the default keyclick sound for all buttons. The other WAV files can be played by having the SIMPL Windows program assert the assigned join number.
2. Each WAV file must have the correct audio format and attributes for the TPS-3000L target type selected in VT Pro-e.
   The correct audio format is PCM, 8 or 16 KHz, 8 bit, mono.
3. There are three system-wide join numbers that the designer can define. The first, sound playing from panel, differs from the other two in that it is triggered from the panel.
   a. Sound Playing from Panel – The signal for this join number goes high when the WAV file plays.

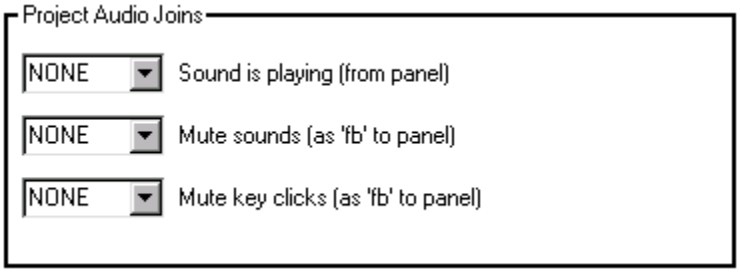
b. Mute Sounds – All WAV files (except the keyclick) in the project are muted when this join number goes high.

c. Mute Key Click – The keyclick sound is muted when this join number goes high.

Using Sound Manager

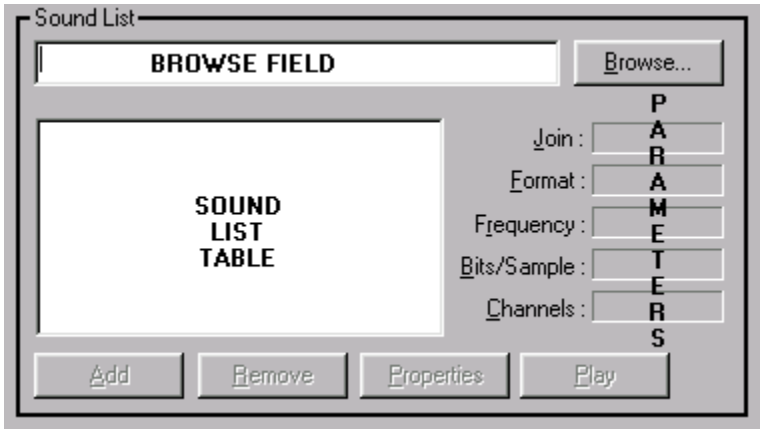
Sound Manager is broken into two distinct components. The *Project Audio Joins* component, shown below, permits the designer to assign the three system-wide join numbers described in the previous section. The three system joins can be assigned automatically with the **Auto** button or by scrolling down to the desired number.

Project Audio Joins Component



The *Sound List* component, shown below, permits the designer to attach WAV files to the touchpanel project. Complete the following steps to attach (add) a WAV file.

Sound List Component



1. Use the **Browse** button to locate the desired WAV files. It should appear in the field adjacent to the **Browse** button.
2. If necessary, select the **Play** button to verify that the file in the browse field is the desired file.
3. Select the **Add** button to transfer the WAV file to the *Sound List* table located below the browse field. The audio parameters of the file also appear to the right of the table.
4. Repeat steps 1 through 3 for each desired WAV file.

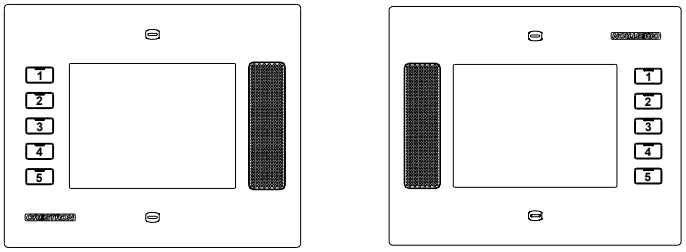
NOTE: To remove a WAV file from the *Sound List* table, highlight the file and click on the **Remove** button.

The **Properties** button opens the "Sound Properties" window for a highlighted WAV file in the *Sound List* table. The designer can assign a join number either automatically with the **Auto** button or by scrolling down to the desired number. Select **Description** to enter comments about the WAV file.

"Quick" Pushbuttons

The touchpanel includes five "quick" pushbuttons, located on the side of the LCD screen. These buttons are programmable to access any frequently used command. Each button has a permanently fixed digital join number. The sequence of digital join numbers is (top to bottom) 1 through 5 whether the touchpanel is mounted with the buttons on the left side or right side. The default feedback definition for these joins is "momentary." Refer to the following diagrams that illustrate the button position for upright and inverted operation.

Pushbutton Layout and Join Number Assignment
Pictured left to right: Upright/Factory Default and Inverted



NOTE: A VT Pro-e sample project, TPS-3000L.VTP, is available from the VT Pro-e section of the Crestron FTP site (ftp://ftp.crestron.com/VTPro-E/). This project provides guides for panel designers so that they can line up objects with the five "quick" pushbuttons that flank the LCD display. New users are required to register in order to obtain access to the FTP site.

Reserved Join Numbers

A reserved join number is a feature of the software that enables a designer to create a button that completes a predetermined function. The tables on the next few pages provide lists of reserved join numbers available within the software.

NOTE: Many touchpanel configuration "shortcuts" are available via the software. A button can be created on a page that either calls up the Preferences Menu, adjusts brightness, etc., via reserved join numbers.

NOTE: Reserved join numbers can also be automatically activated by a control system when using join number remapping. Contact Crestron Customer Service for more information.

Video Digital Reserved Join Numbers for TPS-3000L Touchpanels

JOIN #	FUNCTION	VALUE	IN/OUT
17101	Video	Video Composite	INPUT
17102	Video	S-Video	INPUT
17103	Video	Auto Detect	INPUT
17107	Video	Still	INPUT
17108	Video	Motion	INPUT
17111	Video Brightness	Increase	INPUT
17112	Video Brightness	Decrease	INPUT
17113	Video Contrast	Increase	INPUT
17114	Video Contrast	Decrease	INPUT
17115	Video Saturation	Increase	INPUT
17116	Video Saturation	Decrease	INPUT
17117	Video Hue	Increase	INPUT
17118	Video Hue	Decrease	INPUT
17122	Video	Defaults*	INPUT

*Video default is 50% for each of the video parameters (brightness, contrast, saturation, and hue).

Video Analog Reserved Join Numbers for the TPS-3000L Touchpanels

JOIN #	FUNCTION	VALUE	IN/OUT
17100	Video	Brightness	INPUT/OUTPUT
17101	Video	Contrast	INPUT/OUTPUT
17102	Video	Saturation	INPUT/OUTPUT
17103	Video	Hue	INPUT/OUTPUT

System Digital Reserved Join Numbers for TPS-3000L Touchpanels

JOIN #	FUNCTION	VALUE	IN/OUT
17214	Cresnet ID	Down	INPUT
17215	Cresnet ID	Up	INPUT
17216	System LCD Brightness	Increase	INPUT
17217	System LCD Brightness	Decrease	INPUT
17218	System LCD Brightness	High	INPUT/OUTPUT
17219	System LCD Brightness	Medium	INPUT/OUTPUT
17220	System LCD Brightness	Low	INPUT/OUTPUT
17221	System LCD Brightness	Auto	INPUT/OUTPUT
17231	System Standby Time Out	Increase	INPUT

(continued on next page)

System Digital Reserved Join Numbers for TPS-3000L Touchpanels (continued)

JOIN #	FUNCTION	VALUE	IN/OUT
17232	System Standby Time Out	Decrease	INPUT
17242	System Run	Setup	INPUT
17295	System LCD Brightness	Auto Off	INPUT/OUTPUT
17296	System LCD Brightness	Auto Threshold Increase	INPUT
17297	System LCD Brightness	Auto Threshold Decrease	INPUT

System Analog Reserved Join Numbers for the TPS-3000L Touchpanels

JOIN #	FUNCTION	VALUE	IN/OUT
17200	System Cresnet ID	ID	INPUT/OUTPUT
17201	System LCD	Brightness	INPUT/OUTPUT
17203	System Standby	Time Out	INPUT/OUTPUT
17218	System LCD Brightness	Auto Threshold	OUTPUT
17219	System Light Sensor	Light Sensor Value	OUTPUT

Audio Digital Reserved Join Numbers for TPS-3000L Touchpanels

JOIN #	FUNCTION	VALUE	IN/OUT
17300	Audio	On	INPUT/OUTPUT
17301	Audio	Off	INPUT/OUTPUT
17302	Audio Beep	On	INPUT/OUTPUT
17303	Audio Beep	Off	INPUT/OUTPUT
17304	Audio Beep Volume	Increase	INPUT
17305	Audio Beep Volume	Decrease	INPUT
17306	Audio Line	On	INPUT/OUTPUT
17307	Audio Line	Off	INPUT/OUTPUT
17308	Audio Line Volume	Increase	INPUT
17309	Audio Line Volume	Decrease	INPUT
17312	Audio Wave	On	INPUT/OUTPUT
17313	Audio Wave	Off	INPUT/OUTPUT
17314	Audio Wave Volume	Increase	INPUT
17315	Audio Wave Volume	Decrease	INPUT
17318	Audio Mic AGC	On	INPUT/OUTPUT
17319	Audio Mic AGC	Off	INPUT/OUTPUT

(continued on next page)

Audio Digital Reserved Join Numbers for TPS-3000L Touchpanels (continued)

JOIN #	FUNCTION	VALUE	IN/OUT
17321	Audio	Defaults*	INPUT
17325	Audio Bass	Increase	INPUT
17326	Audio Bass	Decrease	INPUT
17327	Audio Treble	Increase	INPUT
17328	Audio Treble	Decrease	INPUT
17329	Audio Master Volume	Increase	INPUT
17330	Audio Master Volume	Decrease	INPUT
17331	Audio Source	On	INPUT/OUTPUT
17332	Audio Source	Off	INPUT/OUTPUT

* Audio Defaults: Master 88%, Wav 88%, Line 88%, Key Click 29%, Treble & Bass 49%, All Audio On, Mic AGC On.

Audio Analog Reserved Join Numbers for the TPS-3000L Touchpanels

JOIN #	FUNCTION	VALUE	IN/OUT
17300	Audio Beep	Volume	INPUT/OUTPUT
17301	Audio Line	Volume	INPUT/OUTPUT
17302	Audio Wave	Volume	INPUT/OUTPUT
17305	Audio	Bass	INPUT/OUTPUT
17306	Audio	Treble	INPUT/OUTPUT
17307	Audio	Master Volume	INPUT/OUTPUT

Key Feedback Digital Reserved Join Numbers for TPS-3000L Touchpanels

JOIN #	FUNCTION	VALUE	IN/OUT
17904	Key Backlight Brightness	Increase	INPUT/OUTPUT
17905	Key Backlight Brightness	Decrease	INPUT/OUTPUT
17906	Key Feedback Brightness	Increase	INPUT/OUTPUT
17907	Key Feedback Brightness	Decrease	INPUT/OUTPUT

Key Feedback Analog Reserved Join Numbers for TPS-3000L Touchpanels

JOIN #	FUNCTION	VALUE	IN/OUT
17900	Key Backlight	Brightness	INPUT/OUTPUT
17901	Key Feedback	Brightness	INPUT/OUTPUT

MultiByte International Characters

Most languages use a single byte of 8 bits to represent a character, e.g. English, French, German, Hebrew, Russian, Thai, etc.

Multibyte character fonts require more than the usual 8 bits to specify a character. This occurs when a language has more than 256 characters (2^8) in a font. For example, Chinese fonts contain several thousand characters. Other multibyte languages include Japanese and Korean.

There are two separate issues with multibyte characters - static text on buttons and indirect text on buttons. No Isys touchpanel firmware changes are required in either case.

Static text on a button, entered in the standard way in VTPro-e, always works under Windows 98. Under Windows XP, you must use VTPro-e 3.0 or later.

Indirect text on a button is entered in VTPro-e and the actual string to be displayed is entered in SIMPL Windows. You must use VTPro-e 3.0 or later to guarantee that the full set of characters in the font is stored on the touchpanel. You must use SIMPL Windows 2.03.11 or later to enter Chinese characters directly. As of this publication date, only completely single byte or completely multibyte strings may be entered or they will not be compiled correctly in SIMPL Windows. In other words, you cannot enter Chinese character interspersed with numbers. You can enter Chinese characters or numbers in separate strings. Crestron is scheduling time to fix this in the near future and the release notes for SIMPL Windows will mention it.

Of course, you can always use the workaround of showing a graphic that displays the string, but it is not dynamic.

Uploading and Upgrading

Assuming a PC is properly connected to the entire system, Crestron programming software allows the programmer to upload programs and projects to the system and touchpanel after their development. However, there are times when the files for the program and projects are compiled and not uploaded. Instead, compiled files may be distributed from programmers to installers, from Crestron to dealers, etc. Even firmware upgrades are available from the Crestron website as new features are developed after product releases. In those instances, one has the option to upload via the programming software or to upload and upgrade via the Crestron Viewport.

NOTE: Currently, the Crestron Viewport is only available as a pull-down command from SIMPL Windows and VT Pro-e (**Tools | Viewport**). The Viewport utility accomplishes 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.

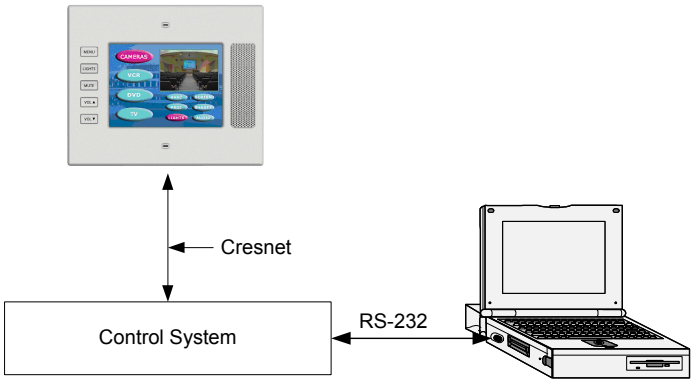
The following sections define how one would upload a SIMPL Windows program, VT Pro-e project or upgrade the firmware of the TPS-3000L touchpanel. However, before attempting to upload or upgrade, it is necessary to establish communications.

Communication Settings

Connection of a PC to the TPS-3000L touchpanel can be direct via the RS-232 port on the touchpanel or through a control system (Cresnet). Both methods of connection provide setup for RS-232 communication.

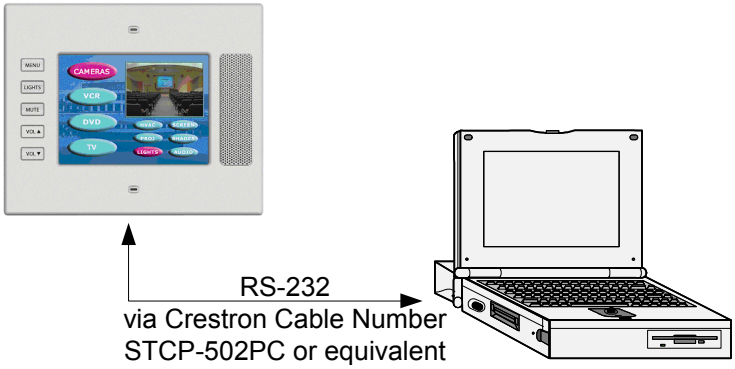
To prepare the TPS-3000L for uploading or upgrading, refer to the following figure for a typical connection diagram.

Typical Connection Diagram when Uploading a Project



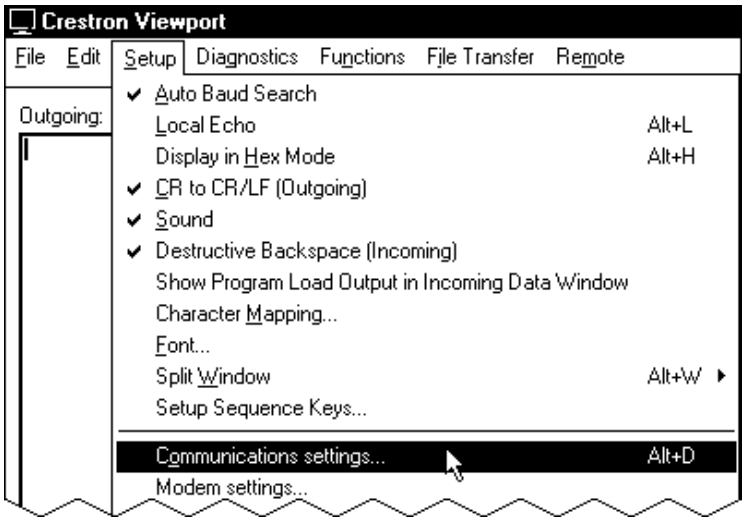
To prepare the TPS-3000L for uploading or upgrading directly from a PC, refer to the following figure. Connect the RS-232 port of the computer directly to the RS-232 port of the touchpanel. Refer to page 18 for RS-232 cable information.

Typical Connection Diagram when Uploading a Project Directly to the Touchpanel



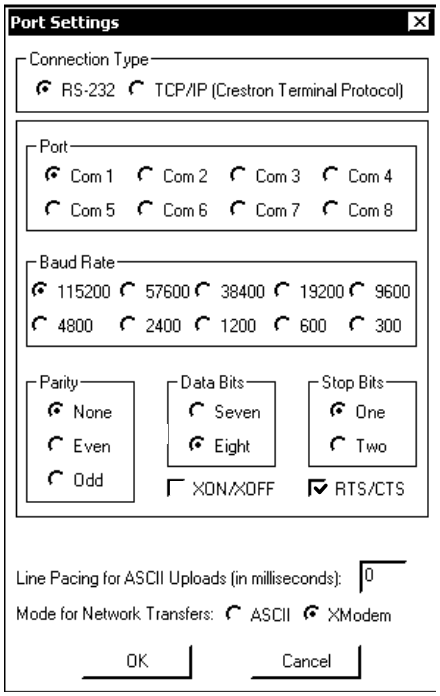
1. Start SIMPL Windows or VT Pro-e.
2. From the menu bar, select **Tools | Viewport** to open the Crestron Viewport. (If communication settings are correct, the prompt should be TPS for direct communications).
3. Refer to the following figure. From the Viewport menu, select **Setup | Communications settings** (alternatively, depress **Alt+D**) to open the "Port Settings" window.

Setup | Communications Settings Command



4. Select **RS-232** as the connection type. Verify that an available COM port (COM 1 is shown after this step) is selected, and that all communication parameters and necessary options from the "Port Settings" window are selected as shown after this step. Click the **OK** button to save the settings and close the window.

"Port Settings" Window



NOTE: Different control systems may require different communication settings. Refer to each control system's Operations Guide for proper communication settings.

NOTE: If connecting to the touchpanel through a control system, the baud rate may need to be set to 38400 baud (Cresnet speed) for a successful transfer.

NOTE: If connecting to a touchpanel through a control system, control system communications can be verified by selecting Diagnostics | Establish Communications (Find Rack). This should display a window that gives the COM port and baud rate. If communication cannot be established, refer to the "Troubleshooting Communications" section in the respective Operations Guide for the control system.

Uploading a SIMPL Windows Program

A control system source file has the extension .smw. A compiled SIMPL Windows file has the extension .spz for a 2-Series control system, .bin for CNX generation, and .csz for CNX generation with SIMPL+.

The SIMPL Windows file can be uploaded to the control using SIMPL Windows or via the Crestron Viewport.

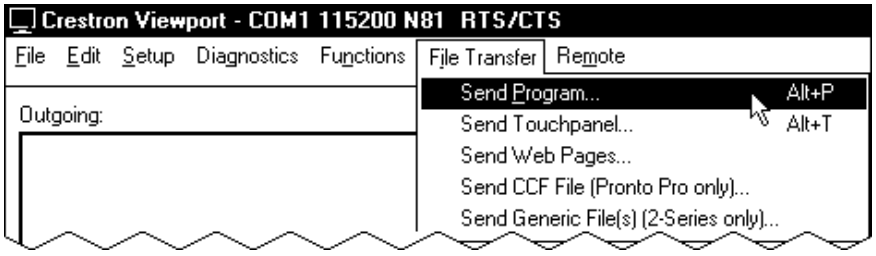
Upload via SIMPL Windows

1. Start SIMPL Windows.
2. Select **File | Open** to view the "Open" window, navigate to the SIMPL Window file (.smw), and click **Open**.
3. Select **Project | Transfer** Program.

Upload via Crestron Viewport

1. Verify that the procedure for "Communication Settings" that begins on page 37 has been performed.
2. As shown after this step, select **File Transfer | Send Program** (alternatively, press **Alt+P**) from the Viewport menu.

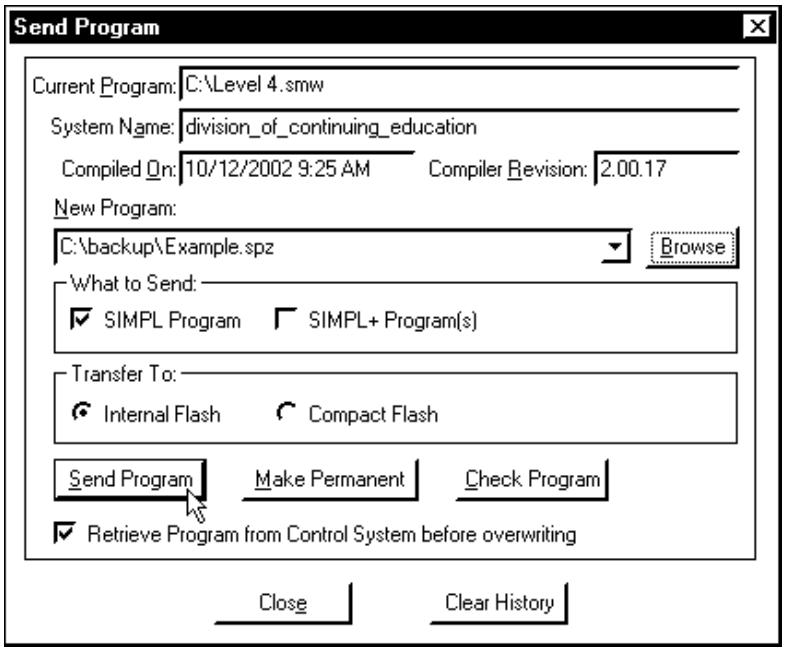
File Transfer | Send Program Command



3. The "Send Program" window appears, as shown after this step. Click **Browse**, locate the compiled file (.spz) and click **Open**. This will display the program's header information and enable one or both of the What to Send check boxes. If the program does not contain any SIMPL+ modules, only the **SIMPL Program** check box will be enabled. If it does contain SIMPL+ modules, then the SIMPL+ check box will also be enabled. Select one or both check boxes and then click **Send Program** to begin the transfer.

NOTE: Refer to the respective Operations Guide for the control system for details about the other fields shown on the "Send Program" window.

"Send Program" Window



4. To verify that the program has been transferred successfully, select **Diagnostics | Report Program Information** or press **F7**. This should display a window that provides details about the current program loaded into the control system.

Uploading a VT Pro-e Project

The TPS-3000L touchpanel source file has the extension .vtp. A compiled VT Pro-e file has the extension .vtz.

The VT Pro-e file can be uploaded to the touchpanel using VT Pro-e or via the Crestron Viewport.

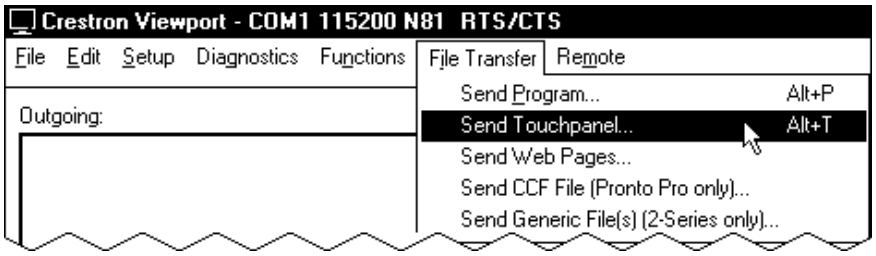
Upload via VT Pro-e

1. Start VT Pro-e.
2. Select **File | Open | Project** to view the "Open" window, navigate to the VT Pro-e file (.vtp), and click **Open**.
3. Select **File | Upload Project**.

Upload via Crestron Viewport

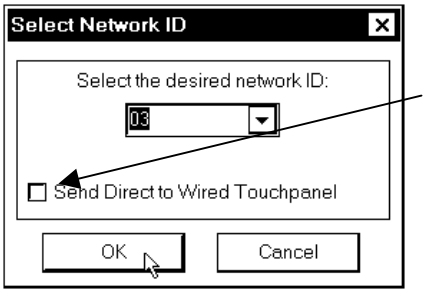
1. Verify that the procedure for "Communication Settings" that begins on page 37 has been performed.
2. As shown after this step, select **File Transfer | Send Touchpanel** (alternatively, press **Alt+T**) from the Viewport menu.

File Transfer | Send Touchpanel Command



3. As shown after this step, select the NET ID of the TPS-3000L touchpanel and then click **OK**. The "Touch Panel Transfer" window appears (refer to the subsequent graphic).

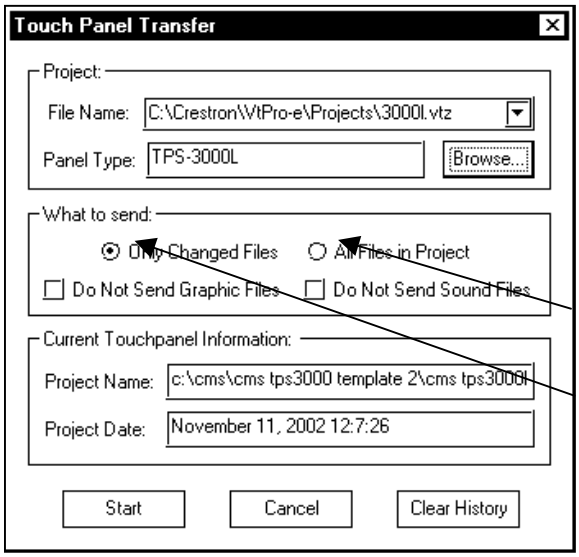
"Select Network ID" Window



Check *Send Direct to Wired Touchpanel* if connected via RS-232 directly to touchpanel.

NOTE: When transferring any Cresnet file (touchpanel project/firmware), lower the port speed baud rate to 38400 to match the Cresnet bus speed when transferring through a control system.

"Touch Panel Transfer" Window



Each time a project is selected using the **Browse** command, that project is added to the **File Name** drop-down list. This makes it convenient to recall projects without need to browse to a directory. To delete the list click **Clear History**.

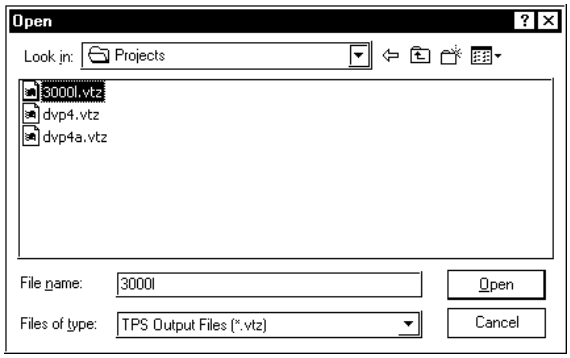
All Files in Project: sends the entire project.

Only Changed Files: sends only the files that are different from those that are currently stored in the panel. 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 take a long time to load.

4. Click **Browse**. The "Open" window appears as shown in the following illustration.

"Open" Window



5. Select the VT Pro-e (vtz) file and click **Open**. The transfer will complete automatically.

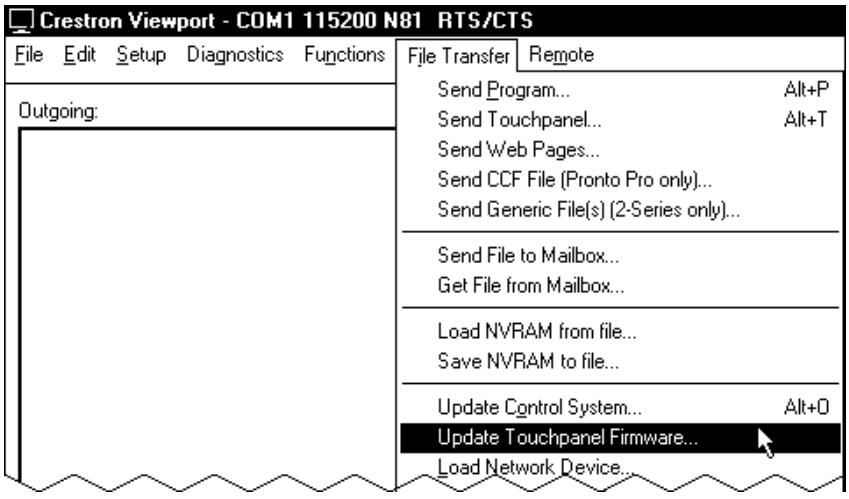
Firmware Upgrade

A firmware upgrade file has the extension .csf.

To take advantage of all the TPS-3000L 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. To upgrade the firmware, complete the following steps.

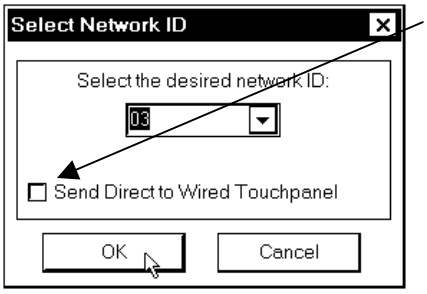
1. Make sure that "Communication Settings" that begins on page 37 has been performed.
2. As shown after this step, select **File Transfer | Update Touchpanel Firmware** from the Viewport menu.

File Transfer | Update Touchpanel Firmware Command



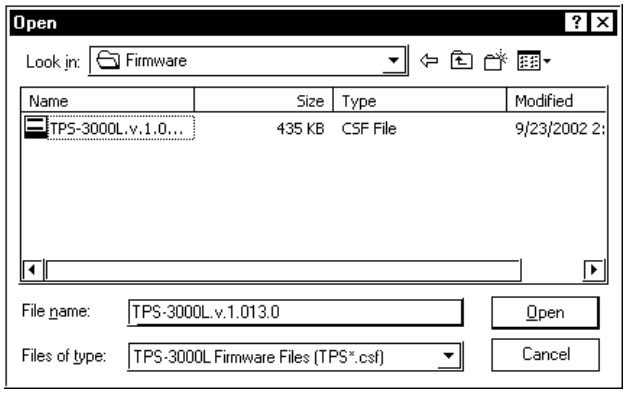
3. As shown after this step, select the NET ID of the TPS-3000L touchpanel and then click OK. The "Open" window appears (refer to the subsequent graphic).

"Select Network ID" Window



Check *Send Direct to Wired Touchpanel* if connected via RS-232 directly to touchpanel.

Select CSF File



4. Browse to the .csf file and click **Open** to begin the transfer.

Problem Solving

Troubleshooting

The table after this paragraph provides corrective action for possible trouble situations. If further assistance is required, please contact a Crestron customer service representative.

TPS-3000L Touchpanel Troubleshooting

TROUBLE	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Touchpanel does not function.	Touchpanel is not communicating with the network.	Use Performance Viewport (via SIMPL Windows or VT Pro-e) to poll the network. Verify network connection to the touchpanel.
	Touchpanel is not receiving network power.	Confirm that power is supplied to the network.
	Touchpanel is incorrectly calibrated.	Enter “SETUP MODE” and recalibrate.
Touchpanel is not responding.	Incorrect network wiring.	Touch the screen to remove the message and verify correct wiring to all connectors.
	Touchpanel Cresnet ID is not set to match the Net ID in the SIMPL program.	Touch the screen to remove the message and enter Performance Viewport (via SIMPL Windows or VT Pro-e) to poll the network. Verify that the Cresnet ID for the touchpanel is properly set to match the Net ID in the SIMPL program.
	Touchpanel Cresnet ID is not unique, two or more units share the same ID	Enter Performance Viewport (via SIMPL Windows or VT Pro-e) to poll the network and verify that each ID is used only once.
Touchpanel display is dark.	Standby timeout has elapsed.	Touch the screen to reactivate.
	Screen brightness is improperly set.	Enter “SETUP MODE” and alter screen brightness from the setup menu.
Unexpected response from the touchpanel.	Touchpanel is incorrectly calibrated.	Enter “SETUP MODE” and recalibrate.
Blue Screen displayed in a video window.	Nonexistent or weak video signal.	Verify that video source is functioning and connected properly. Balanced video cable length should not exceed 500 feet (152.4 meters). Unbalanced video cable length should not exceed 100 feet (30.5 meters).

Further Inquiries

If after reviewing this Operations 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 the Crestron corporate headquarters at 1-888-CRESTRON [1-888-273-7876].
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Future Updates

As Crestron improves functions, adds new features, and extends the capabilities of the TPS-3000, 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 subjective value. Updates are available from the Downloads | Product Manuals section and are identified as an "Addendum" in the Download column.

Appendix: RS-232 Protocol

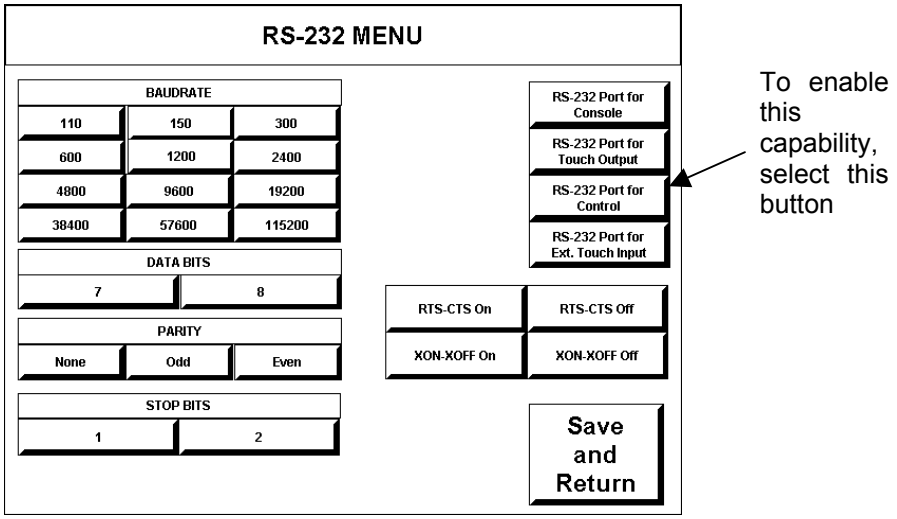
TPS-3000L touchpanels support panel operation via a host computer through the RS-232 port. Crestron recommends that the following serial data format is set.

Suggested Serial Data Format

Baud Rate: 38400	Data Bits: 8	Parity: None	Stop Bits: 1

These settings may be altered via the RS-232 Menu when configuring the touchpanel, however, doing so may prevent Crestron supplied software from operating with the touchpanel. Low baud rates will cause the panel to appear unresponsive. For example, at 300 baud, a single button press (and release) generates 12 characters and requires more than 0.333 of a second to send. Delays as short as 0.1 of a second are generally considered perceptible and somewhat annoying.

RS-232 Menu Button Selection



Command Format - Command format for all items sent to or from the touchpanel is very simple. All items are ASCII strings terminated by a <cr>. Line feed characters are ignored, thus <cr><lf> or <lf><cr> are also acceptable line terminators. When the touchpanel sends a line, it is always terminated with <cr><lf>.

For all strings, the first character determines command type. Numeric arguments, if present, are in decimal and separated by commas. No control characters are embedded in the strings to ease processing the strings with high-level languages. Be careful when using commas in BASIC, because BASIC uses commas for field separators when reading strings from a file using the INPUT # statement. Since we are dealing with complete lines, use the LINE INPUT # statement to cure this problem.

P<#> and R<#> Commands - When in RUN mode, pressing a button (assuming that it has been joined) generates a six-character code in the format P###<cr><lf>, where ### is a three-character decimal number in the range of 1 through 4000, providing for up to 4000 functions. When the button is released, a similar code is generated, with an 'R' in place of the 'P'. Given that only one button may be pressed at a time, an 'R' code always follows a 'P' code. A fixed three-digit format is used to simplify software on the host.

Codes may be sent to the touchpanel in the same form as they are received. The 'P' form turns on a function and the 'R' form turns off a function; sending back

information received from the touchpanel (i.e., jumping pins 2 and 3 on the RS-232 port) makes the buttons momentary. Notice that the touchpanel responds to P and R commands even when configured for other interface modes. Selecting an RS-232 interface mode merely enables P and R commands to be issued. In addition, the fixed format is not required for commands sent to the touchpanel; P1, P01, and P001 are all perfectly valid commands.

Compared to running on Cresnet, an RS-232 interface to a personal computer is slower, provides less features (such as tracking, among others), is less noise immune (Cresnet uses balanced transmission for high common mode rejection, RS-232 does not), and requires the user to supply the control logic program in the PC.

V<chan>,<level> Command - Levels in gauge and slider objects may be set through the RS-232 port. The command contains both the object channel number (1-255) and level (0-65535) in decimal separated by a comma. For example, V6,32768 would set channel 6 to level 128, or half way up.

One quick note on baud rate and smooth ramping. Ramping is accomplished by sending successive levels to the object. To do this in 64 levels over three seconds, for example, requires about 576 bytes worth of commands to be sent, and could not be accomplished at any rate less than 2400 baud. Obviously, ramping several objects at once requires a baud rate several times as high.

Indirect Text – TPS-3000L touchpanels support a feature that permits the text field in any user-defined button to be altered on the fly in RUN mode. This is accomplished by substituting a text pointer for the text in the button. The text pointer informs the panel to use the contents of a variable that may be dynamically redefined as the text field for the button. This presents a considerable advantage over other methods in that changing screens does not destroy information and that information may be placed in buttons not currently displayed.

The text pointer is a number in the range of '1' through '127' preceded by the "pound" symbol (#). If [text…] is omitted, the text field is cleared. If [text…] exists, it is added to the text field. For example, consider the following string:

```
#3,Now is the time<cr>
#3,for all good men<cr>
#3,to come to the<cr>
#3,aid of the party<cr>
```

Assuming that a button with an #3 text pointer was being displayed, the contents of the button would be changed to:

```
Now is the time
for all good men
to come to the
aid of the party
```

NOTE: To clear the text field for this example, type in "#3<cr>".

As each line is entered, the display is updated. Since the text may be placed in several different buttons, no boundary checking is done to see if the text fits in the button. If the text overflows the button/boundaries, it remains centered in the button/boundary.

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