

Crestron **C2N-TTVFM**  
TV & FM Radio Tuner  

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Operations Guide



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# Contents

<b>TV &amp; FM Radio Tuner: C2N-TTVFM</b>	<b>1</b>
Introduction .....	1
Features and Functions.....	1
Specifications .....	3
Physical Description.....	4
Industry Compliance .....	8
Setup.....	8
Network Wiring.....	8
Identity Code .....	9
Hardware Hookup .....	12
Programming Software.....	13
Earliest Version Software Requirements for the PC .....	13
Programming with SIMPL Windows.....	13
Uploading and Upgrading .....	31
Communication Settings .....	32
Uploading a SIMPL Windows Program .....	34
Firmware Upgrade – TV/FM Tuner .....	35
Firmware Upgrade – AMWX Tuner .....	36
Problem Solving .....	38
Troubleshooting .....	38
Further Inquiries.....	38
Future Updates .....	38
Return and Warranty Policies.....	39
Merchandise Returns / Repair Service .....	39
CRESTRON Limited Warranty .....	39



# TV & FM Radio Tuner: C2N-TTVFM

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## Introduction

### Features and Functions

The Crestron® C2N-TTVFM is a Crestron-controlled, cable-ready television tuner and FM radio tuner (TV/FM Tuner). Designed to provide superior performance and flexibility, the unit works stand-alone or with the companion AM/Weather band tuner, the C2N-TAMWX (AMWX Tuner). The TV/FM Tuner adds television and high-quality FM radio programming to your whole-house audio/video distribution system or boardroom AV system.

The TV/FM Tuner is designed to work in a Crestron 2-Series or X-Generation control system (Cresnet® system). You can use any Crestron multi-mode touchpanel to search through the stations and control tuner functions. User-programmable presets let you quickly select your favorite station. Audio output from the TV/FM Tuner can be routed to a CNX-PAD8A or local preamplifier or to a surround sound decoder such as the C2N-DAP8 or C2N-DAP8RC. Output can also be routed to a CNX-BIPAD8 for distribution to other rooms via CAT5 cabling.

### *Functional Summary*

- Headphone connector for local monitoring of audio output
- Up to 20 station presets (for TV and for FM) via local buttons—virtually unlimited number via software—enable fast program selection
- Five-pin mini terminal block for line-level FM stereo output
- RJ-45 connector provides proprietary noise-free link (up to 500 feet) to C2N-TAMWX AM/Weather band tuner
- Integrated configuration lets local TV/FM Tuner buttons control AM/WX Tuner
- On power up, returns to last station selected before power down
- Can switch tuner modes (Off-Air, Standard, IRC, and HRC) on the fly
- Scans channels for valid signals; builds next-channel table

### ***Mute and Mono Functions***

The TV/FM Tuner incorporates automatic as well as manual selection of mute and mono mode functions.

- The tuner can be put into mono/stereo mode or mute mode via the touchpanel.
- The tuner cannot be put into mono/stereo mode or mute mode via the tuner controls.
- After tuning to a station, the tuner will automatically switch to mono mode if the signal level is low and auto mono/mute is off.
- The tuner automatically mutes the output during rapid scan functions.
- After tuning to a station, the radio will automatically mute if the signal level is too low and the radio-forced mono mode is off.
- The auto mono/mute feature can be disabled via program or touchpanel program.

### ***SAP Feature***

The TV/FM Tuner supports the SAP (Secondary Audio Program) feature utilized by many television broadcast stations. This feature is commonly used in the U.S. to provide Spanish-language audio for English-language television programming.

### ***TV Modes***

The TV/FM Tuner will power-on to its last programmed reception mode. Off-Air mode is factory set; all other modes are accessed through the control system software. Channel reception is standard NTSC format for all modes:

Off-Air	Channels 2 to 69
Standard (CATV)	Channels 2 to 125
IRC	Channels 1 to 125
HRC	Channels 1 to 125

## Specifications

The following table summarizes the specifications for the C2N-TTVFM Tuner.

### *Specifications of the C2N-TTVFM*

SPECIFICATION	DETAILS
Power Requirements TV/FM Tuner only TV/FM Tuner plus AMWX Tuner	8.0 Watts (0.3 Amp @ 24 VDC) 16.0 Watts (0.66 Amp @ 24 VDC)
Default Net ID	47
Control System Update Files <sup>1, 2, 3</sup> 2-Series Control System CNMSX-AV/PRO CNRACKX-DP CEN/CN-TVAV	Version 2.004.CUZ or later Version 5.12.63X.UPZ or later Version 5.12.63W.UPZ or later Version 5.12.63V.UPZ or later
C2N-TTVFM Firmware	C2N-TTVFM.1.12.upg or later
TV Tuner Frequency Range Off-air TV channels CATV cable channels Stereo separation THD Sensitivity Video output level SAP	55 MHz to 802 MHz 2 to 69 2 to 125 35 dB 0.2% @ 1 kHz -20 dBmV to +20 dBmV 1 Vp-p @ 75 Ohms Secondary Audio Program
FM Tuner Frequency range Usable sensitivity S/N ratio IF rejection AM rejection Stereo separation	87.5 MHz to 108 MHz 11 dBf mono; 60 dBf stereo 64 dB @ 65 dBf mono; 56 dB @ 65 dBf stereo 100 dB 55 dB 27 dB
Audio Output Maximum output Output impedance Minimum load	1 V <sub>rms</sub> balanced 200 Ohms balanced, <100 Ohms single ended 600 Ohms balanced
Ports/Connectors NET AM RADIO AUDIO OUT VIDEO OUT FM ANT TV ANT	Four-pin mini-terminal block connector for Cresnet® interface (24, Y, Z, G) RJ-45 for link (up to 500 feet) to AM/Weather band tuner Five-pin mini-terminal block for balanced line-level stereo BNC Female for composite video F-Type coaxial connector for FM antenna input F-Type coaxial connector for TV antenna input
Environmental temperature	32° to 122°F (0° to 50°C)
Humidity	10% to 90% RH (non-condensing)
Dimensions	Height: 1.80 in (4.57 cm) Width: 7.07 in (17.96 cm) Depth: 6.85 in (17.40 cm)
Weight	1.86 lb (0.84 kg)

- 1 The latest versions can be obtained from the Downloads | Software Updates section of the Crestron website ([www.crestron.com](http://www.crestron.com)). Refer to following NOTE.
- 2 Crestron 2-Series control systems include the AV2 and PRO2. Consult the latest Crestron Product Catalog for a complete list of 2-Series control systems.
- 3 Filenames for CNX and ST-CP update files have a UPZ extension. Files on the website may be .zip or self-extracting .exe files containing the .cuz or .upz file. All can be obtained from the Downloads

section of the Crestron website. To avoid program problems, make sure you are using the update with the correct suffix letter (e.g., S, V, W, X).

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

## Physical Description

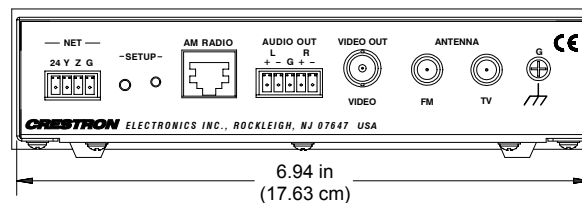
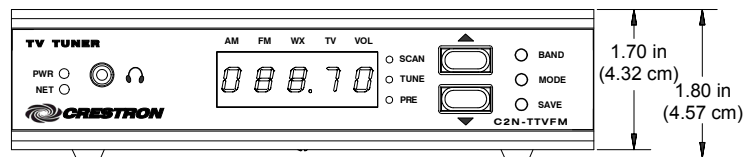
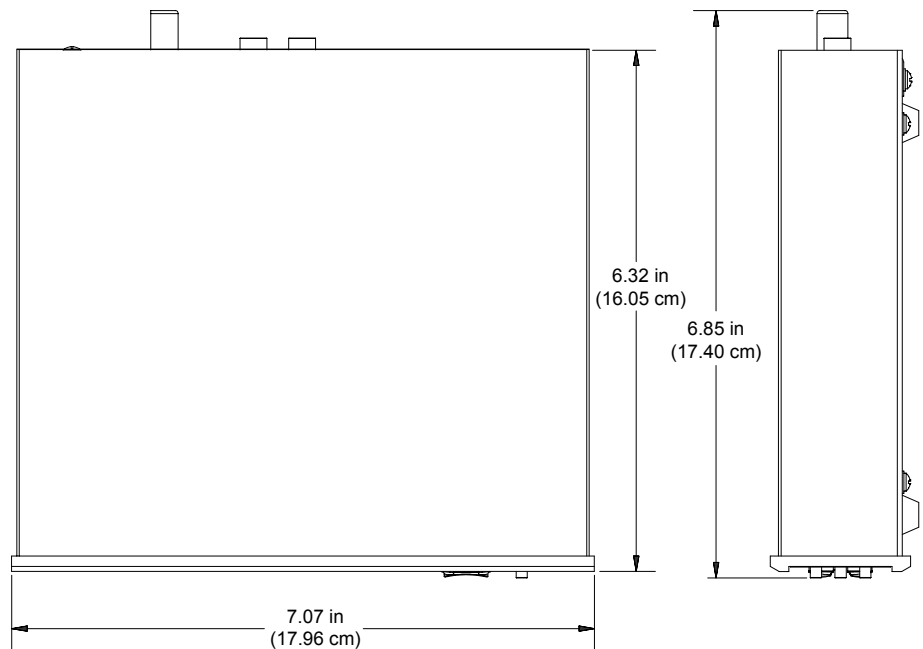
The C2N-TTVFM is housed in a black enclosure with labeling on the front and rear panels. The front of the unit includes ten LEDs that indicate the unit's status, and all local controls. All connections, except for headphones, are made on the back of the unit. Four rubber feet on the bottom of the unit provide stability and prevent slippage. Refer to the figures below and on the following page.

### *C2N-TTVFM Physical Views*





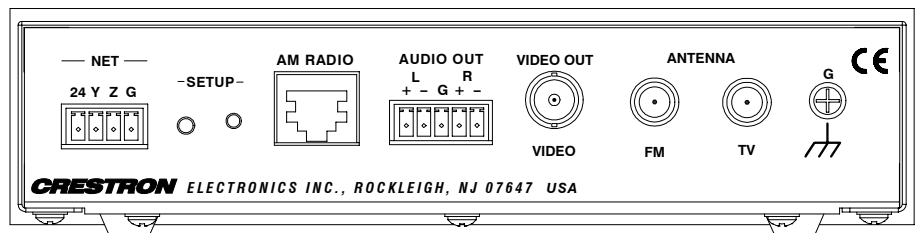
**C2N-TTVFM Overall Dimensions**



**C2N-TTVFM Ports**

All connections to the C2N-TTVFM, except headphones, are made through the ports on the rear panel. Refer to the illustrations and descriptions, which follow.

**C2N-TTVFM Ports**



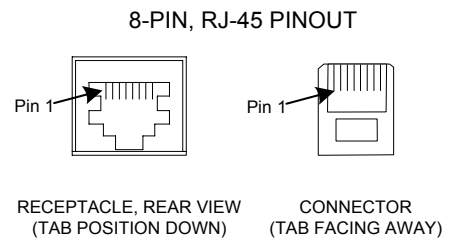
**NET**

This four-pin mini-terminal block connector is used to connect the C2N-TTVFM module to the Cresnet system. Data and power for the C2N-TTVFM are provided via the connection. Refer to “Network Wiring” on page 8. (Mating connector supplied.)

**AM RADIO (RJ-45)**

The RJ-45 **AM RADIO** port provides CAT5 interface (up to 500 feet of straight-thru cable) to the companion Crestron AMWX Tuner. Wiring for the connector is shown in the following diagrams.

PIN #	SIGNAL
1	+24V
2	+24V
3	COM+
4	Audio+
5	Audio-
6	COM-
7	Ground
8	Ground



**NOTE:** This connector is to be used only to provide interface to Crestron products specifically designed to work with this unit. It cannot be used for connections to Cresnet or Crestron audio distribution devices.

**AUDIO OUT L, R**

This five-pin mini-terminal block connector provides balanced line-level audio output for local preamp/processors. (Mating connector supplied.)

**VIDEO OUT**

This BNC female connector provides composite video output.

**FM ANT**

This Type F coaxial connector is for an FM antenna cable (not supplied).

**TV ANT**

This Type F coaxial connector is for a TV antenna cable (not supplied).

**G (Chassis Ground)**

Use this chassis screw to ground the unit to the amplifier and audio source common grounds.

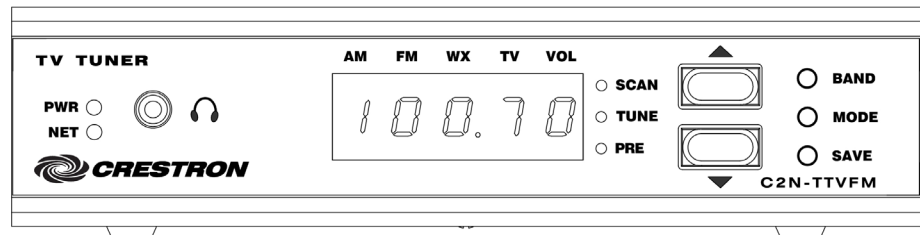
**🎧 (Headphone)**

The only connection on the front panel of the TV/FM Tuner is the mini-phone jack, which permits the use of headphones to monitor the audio signal (stereo). The volume mode, selected by the MODE switch, allows adjustment of the volume to the headphones only. Note that plugging in headphones does not interrupt the unit’s other audio output. The headphone output can also be adjusted via programming.

## ***Front Panel Controls and Indicators***

Ten LED indicators, a five-digit display, and three pushbutton switches are located on the front panel of the TV/FM Tuner. Refer to the illustration and descriptions that follow.

### ***C2N-TTVFM Front Panel Controls and Indicators***



### **PWR (Power)**

This green LED illuminates when power is supplied to the TV/FM Tuner.

### **NET**

This yellow LED illuminates when communication between the control system and the TV/FM Tuner is established (the unit is polled on the network). Illumination indicates that the program currently loaded has a network device defined at the same ID as the TV/FM Tuner. The LED flashes or remains on when communication with the processor occurs.

### **BAND Switch**

Use the **BAND** switch to select between the AM, FM, WX (weather), and TV bands. The corresponding red LEDs (**AM**, **FM**, **WX**, **TV**) illuminate as each band is selected, and the five-digit display shows the appropriate values. The AM and WX modes cannot be selected if the AMWX Tuner is excluded from your configuration.

### **MODE Switch, ▲▼ (Up/Down) Buttons, and Display**

Use the **MODE** switch to select between the volume, preset, tune, and scan modes. The corresponding red LEDs (**VOL**, **PRE**, **TUNE**, and **SCAN**) illuminate as each mode is selected. In each mode, the five-digit display shows the appropriate values.

In the volume mode, the up/down buttons select ten volume levels (0 through 9) for the signal supplied to the headphone jack.

In the preset mode, the up/down buttons let you sequence through the preset numbers (1-20) to select a station or to save a new station in a preset location.

In the tune mode, the up/down buttons let you sequence through the FM band frequencies in 100 kHz increments. (The frequency scan and step rate can be changed via the program from 100 kHz to 50 kHz, the rate needed in European radios.) For the TV band, the buttons let you sequence through all available channels.

In the scan mode for all bands, the up/down buttons initiate the scan and direction of the search for the next station with a signal strong enough for good reception. Pressing either button will halt the scan.

### SAVE Button

Use the **SAVE** button to save a station frequency in a preset location. To save a preset, select the desired station, use the **MODE** switch to select the preset mode, use the up/down buttons to select the preset location, and then press **SAVE**. The display will briefly show “SAVE” as the preset is saved.

### **SETUP LED and Pushbutton**

The TV/FM Tuner is Touch Settable ID (TSID) ready. The **SETUP** pushbutton and its associated LED are located on the rear panel and are used for setup of the unit’s network ID during the initial configuration of a Cresnet system or when the device is being added/replaced. Refer to “Method B (Touch Settable IDs)” on page 10 for detailed information.

## Industry Compliance

As of the date of manufacture, the TV/FM Tuner has been tested and found to comply with specifications for CE marking and standards per EMC and Radiocommunications Compliance Labelling.



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**NOTE:** This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) these devices may not cause harmful interference, and (2) these devices must accept any interference received, including interference that may cause undesired operation.

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## Setup

### Network Wiring

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**CAUTION:** In order to ensure optimum performance over the full range of your installation topology, Crestron Certified Wire, and only Crestron Certified Wire, should be used. Failure to do so, may incur additional charges if support is required to identify performance deficiencies as a result of using improper wire.

**CAUTION:** Use only Crestron power supplies for Crestron equipment. Failure to do so could cause equipment damage or void the Crestron warranty.

**CAUTION:** Provide sufficient power to the system. Insufficient power can lead to unpredictable results or damage to the equipment. Please use the Crestron Power Calculator to help calculate how much power is needed for the system.

[http://www.crestron.com/dealer-tech\\_resources/power\\_calculator.asp](http://www.crestron.com/dealer-tech_resources/power_calculator.asp)

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

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When calculating the wire gauge for a particular Cresnet run, the length of the run and the power factor of each network unit to be connected must be taken into

consideration. If Cresnet units are to be daisy-chained on the run, the power factor of each unit to be daisy-chained must be added together to determine the power factor of the entire chain. If the unit is a home-run from a Crestron system power supply network port, the power factor of that unit is the power factor of the entire run. The length of the run in feet and the power factor of the run should be used in the resistance equation below 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 following table.

**Wire Gauge Values**

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

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

**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.

**Identity Code**

Every equipment and user interface within the network requires a unique identity code (Net ID). These codes are two-digit hexadecimal numbers from 03 to FE. The Net ID of each unit must match an ID code specified in the SIMPL Windows program. Refer to “Setting the Net ID in Device Settings” on page 15 for details of the SIMPL Windows procedure.

*Refer to the note on page 32 for a definition of Viewport.*

The Net ID of the TV/FM Tuner has been factory set to **47**. The Net IDs of multiple TV/FM Tuners in the same system must be unique. Net IDs are changed from a personal computer (PC) via the Crestron Viewport.

**NOTE:** For detailed information on establishing communication between the PC and control system, refer to “Communication Settings” on page 32. If communication cannot be established, refer to the “Troubleshooting Communications” section in the respective Operations Guide for the control system.

There are two different methods—Method A or Method B—for setting the C2N-TTVFM Net IDs:

**Method A** (Cresnet address-settable ID), described below, applies to C2N-TTVFMs in a Cresnet system with a CNX control system or with a 2-Series control system upgrade file (CUZ) version prior to 3.008, but can be used with later versions of firmware and requires that a single unit be the only network device connected to the control system.

**Method B** (Touch Settable IDs), which begins on this page, applies to C2N-TTVFMs in a Cresnet system with 2-Series control system upgrade file (CUZ) version 3.029 or later. These upgrades enable Touch Settable ID (TSID) functionality, which makes it possible for the control system to recognize a network device via its serial number, which is stored in the device's memory. This method does not require that any devices be disconnected from the network; Net IDs may be set with the entire Cresnet system intact. This method requires the use of the Crestron Viewport version 3.35 or later.

Use the appropriate method to set the C2N-TTVFM Net ID.

### ***Method A (Cresnet address-settable ID)***

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

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

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10. Repeat this procedure for each TV/FM Tuner to be added to the system.

### ***Method B (Touch Settable IDs)***

Before using this method, you should have a list of all current network devices and their Net IDs, to avoid assigning duplicate IDs.

#### **Set Net ID by TSID**

These procedures are for TSID-enabled network devices during the initial configuration of a Cresnet system or when such devices are being added/replaced.

1. Ensure that all TV/FM Tuners are connected to the control system.
2. Open the Crestron Viewport version 3.35 or later.
3. From the Viewport menu, select **Functions | Assign Cresnet ID by Serial Number**. The “Set Net ID by TSID” window appears. The window is first displayed with the data fields empty. (Refer to the following figure.)

*“Set Net ID by TSID” Window*

The screenshot shows a dialog box titled "Set Net ID by TSID". At the top, there is a section labeled "Available Devices with Touch Settable ID's" which contains an empty rectangular list area. Below this list area is a button labeled "Search for Touch Settable Devices". Underneath the search button, the text reads "Please supply the Serial Number or TSID of the device:". This is followed by a "Serial Number:" label and an empty text input field. Below the input field is the text "-or-". This is followed by a "TSID:" label and another empty text input field. Below these fields, the text reads "Please supply the Cresnet ID it should be set to:" followed by a dropdown menu. At the bottom of the dialog box are two buttons: "Cancel" and "OK".

4. Click on the **Search for Touch Settable Devices** button. The system searches the network and lists all TSID-enabled devices found. The list is similar to the report produced by pressing **F4** (Report Network Devices); the first eight digits of each line constitute the TSID number (hexadecimal form of the serial number).
5. As you enter either the serial number or TSID number of the device that requires a change, the corresponding TSID or serial number automatically appears in its appropriate field, and the list scrolls to and highlights the device listing. The listing should show the device's current Cresnet ID.
6. Enter the Cresnet ID that the device should be set to and click **OK**. The number you enter should appear on the list.

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**CAUTION:** This function does not prevent you from setting duplicate IDs. Be sure to check current assignments before entering the desired Cresnet ID number.

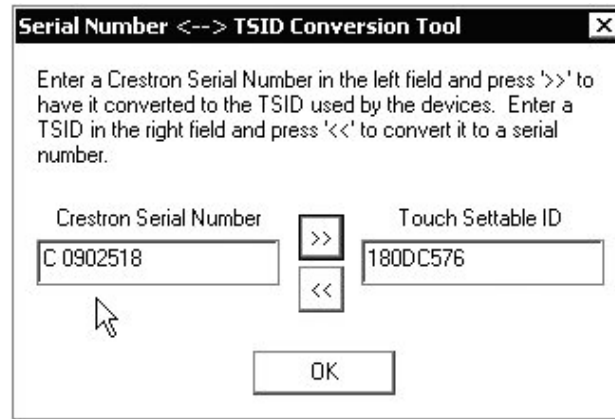
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### Serial Number to TSID Conversion

This utility is useful in a case where there are multiple devices of the same type on a network, you need to locate a particular one, you know the TSID but not the serial number, and your site installation list is based on device serial numbers. In this (or the reverse) situation, do the following.

1. Open the Crestron Viewport.
2. From the Viewport menu, select **Functions | Serial Number ↔ TSID Conversion Tool**. The “Serial Number ↔TSID Conversion Tool” window is displayed. (Refer to the following figure.)

**“Serial Number to TSID Conversion Tool” Window**



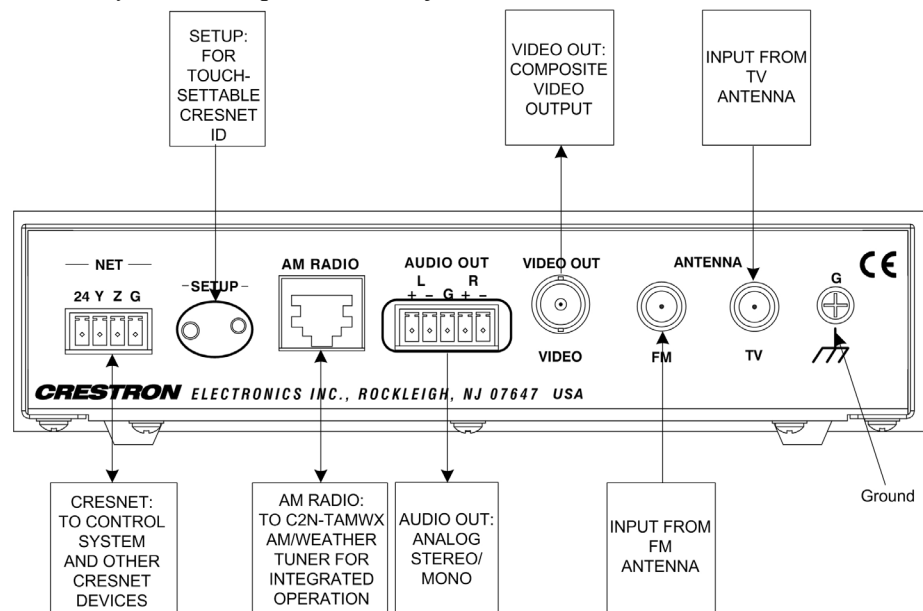
3. Enter the serial number or TSID number as instructed; press the appropriate button to obtain the corresponding number.

**NOTE:** Enter serial numbers, including spaces, exactly as they appear on the unit label. Alpha characters in serial numbers or TSID numbers may be entered in upper or lower case.

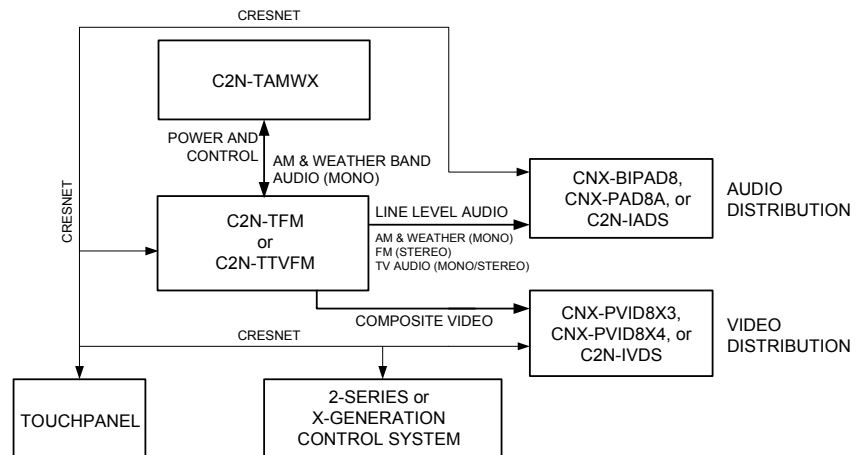
## Hardware Hookup

Refer to the following hookup diagram. Complete the connections in any order. The subsequent graphic is a typical configuration diagram for the TV/FM Tuner plus the AM/WX Tuner.

**Cresnet System Hookup Connections for C2N-TTVFM**





*Typical Configuration Diagram for C2N-TTVFM*

## Programming Software

### Have a question or comment about Crestron software?

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

### Earliest Version Software Requirements for the PC

**NOTE:** Crestron recommends that you use the latest software to take advantage of the most recently released features. The latest software is available from the Downloads | Software Updates section of the Crestron website ([www.crestron.com](http://www.crestron.com)).

The following are recommended software version requirements for the PC:

- SIMPL Windows version 2.05.16 or later.  
Requires SIMPL+ Cross Compiler version 1.1.
- Crestron Database version 16.1.0 or later. Required by SIMPL Windows.

### Programming with SIMPL Windows

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

.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+)  
.ush *projectname*.ush (compiled file for CNX generation with SIMPL+ header file)  
.usp *projectname*.usp (source code module for SIMPL+)

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.

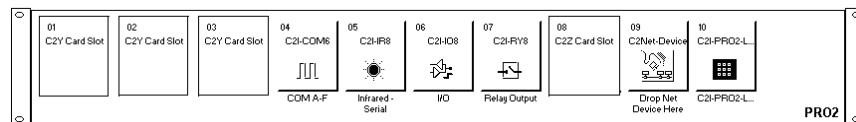
**NOTE:** The following descriptions assume that the reader has knowledge of SIMPL Windows. If not, refer to the extensive help information provided with the software.

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

This section describes a sample SIMPL Windows program that includes a TV/FM Tuner.

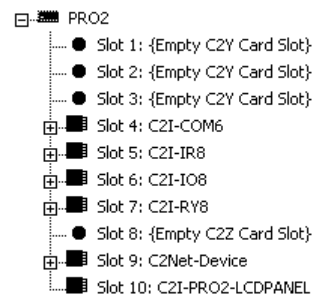
Configuration Manager is where programmers “build” a Crestron control system by selecting hardware from the *Device Library*. In Configuration Manager, drag the PRO2 from the Control Systems folder of the *Device Library* and drop it in the upper pane of the *System Views*. The PRO2 with its associated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

### PRO2 System View



The *System Views* lower pane displays the PRO2 system tree (refer to the following graphic). This tree can be expanded to display/configure the communications ports.

### Expanded PRO2 System Tree



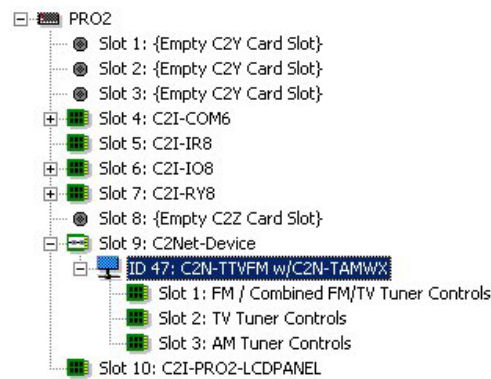
### C2Net Device Slot in Configuration Manager

To incorporate a TV/FM Tuner into the system, drag the C2N-TTVFM from the Cresnet Control Modules | Cresnet Audio Modules folder of the *Device Library* and drop it in *System Views*. The PRO2 system tree displays the C2N-TTVFM in Slot 9, with a default Net ID of 47 as shown in the following illustration.

**NOTE:** For convenience, the C2N-TTVFM symbol includes an AM Tuner Controls slot for integrated configurations. If your system does not include the AMWX Tuner, simply ignore the AM Tuner Controls inputs and outputs in your program.

**NOTE:** The first C2N-TTVFM in a system is preset with a Net ID of 47 when its symbol is dragged into the upper pane of *System Views*. Additional units are assigned different Net ID numbers as they are added.

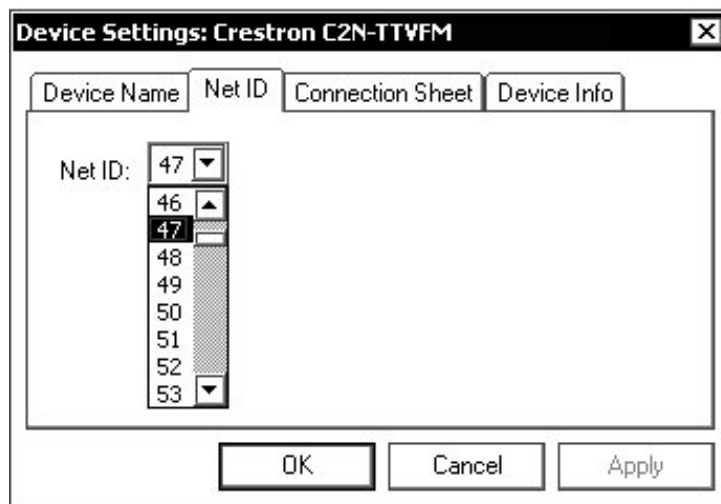
**C2Net Device, Slot 9**



**Setting the Net ID in Device Settings**

Double-click the C2N-TTVFM icon to open the “Device Settings” window. This window displays the C2N-TTVFM device information. If necessary, select the *Net ID* tab to change the C2N-TTVFM Net ID, as shown in the following figure.

**C2N-TTVFM “Device Settings” Window**



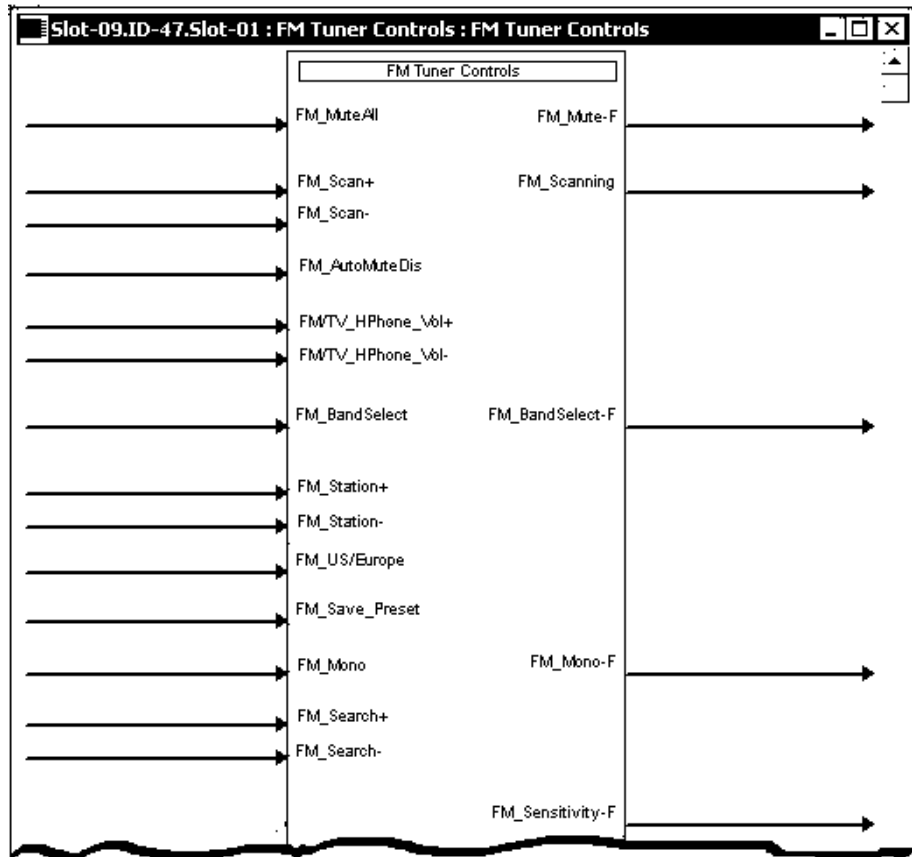
**NOTE:** SIMPL Windows automatically changes Net ID values of a device added to a program if a duplicate device or one with the same default Net ID already exists in the program. Always ensure that the hardware and software settings of the Net ID match. For Net ID hardware setting details, refer to “Identity Code” on page 9.

**C2N-TTVFM Symbol in Programming Manager**

Programming Manager is where programmers “program” a Crestron control system by assigning signals to symbols. Due to the extensive functionality of the unit, a single C2N-TTVFM symbol in SIMPL Windows would be too complex. Instead, the C2N-TTVFM functions are divided into three sub-slots: Slot 01 – FM Tuner Controls; Slot 02 – TV Tuner Controls; and Slot 03 – AM Tuner Controls. In Program Manager, expand the C2N-TTVFM to view the individual sub-slots; then drag the desired symbols to *Detail View*. The C2N-TTVFM sub-slots and corresponding symbols are described in the following paragraphs. Because the FM, TV, and AM Tuner controls symbols are also complex, each is illustrated and

described in two parts: digital inputs and outputs and analog inputs and outputs. Tables defining the input and output signals follow each section.

**C2N-TTVFM Sub-Slot 01: FM Tuner Controls Digital Input and Output Signals**



**C2N-TTVFM FM Tuner Controls Digital Input and Output Signal Descriptions**

SIGNAL TYPE AND NAME	DESCRIPTION
Input: <FM_MuteAll>	Mute toggle. Mutes all audio (AUDIO OUT and headphone), for as long as the input is high. Un-mutes the audio when the input goes low. High/1 = Mute all audio; Low/0 = Un-mute audio
Output: <FM_Mute-F>	Indicates the current mute state of the unit. The output will be high for as long as audio remains muted. FM audio will mute whenever: 1) the <FM_MuteAll> input is high; or 2) the radio or television signal strength is too weak to produce a clear signal, and the <FM_Mono> input is low. High/1 = Audio muted; Low/0 = Audio not muted

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*C2N-TTVFM FM Tuner Controls Digital Input and Output Signal Descriptions  
(continued)*

<b>SIGNAL TYPE AND NAME</b>	<b>DESCRIPTION</b>
Inputs: <FM_Scan+>, <FM_Scan->	Scans through FM stations on the rising edge of the input.  Users can scan for stations by pressing the local up (▲) and down (▼) buttons on the TV/FM Tuner when the unit is in SCAN mode; or from remote buttons defined on touchpanel or other interface.  The tuner will scan up (+) or down (-) to a station, pause for five seconds, then continue scanning to the next station. Pressing the local or remote scan button again will stop the scan operation.  The scan operation also stops when: 1) local BAND or MODE buttons are pressed; or 2) a remote band or search button is pressed; or 3) it wraps around to the original station, if that station is scannable; or 4) after a maximum number of repeats; or 5) a station is directly entered; or 6) a remote scan +/- or station +/- button defined on a touchpanel or other interface is pressed.  High/1 (rising edge) = Scan up or down; Low/0 = No effect
Output: <FM_Scanning>	Indicates that the tuner is busy scanning FM stations. The output will be high for as long as the tuner remains scanning/searching.  High/1 = Scanning; Low/0 = Not scanning
Input: <FM_AutoMuteDis>	Disables the auto-mute feature when the input is high. When low, the auto feature is enabled.  Auto mode automatically sets the tuner to mono as the signal strength weakens, and mutes the audio when the signal strength is weak.  High/1 = Disable auto-mute mode; Low/0 = Enable auto-mute mode
Inputs: <FM/TV_HPhone_Vol+>, <FM/TV_HPhone_Vol->	Increases (+) and decreases (-) the headphone volume on the rising edge of the signal.  Users can control the headphone volume by pressing the local up (▲) and down (▼) buttons on the TV/FM Tuner when the unit is in VOL mode, or from remote buttons defined on a touchpanel or other interface.  If the input is high for longer than 300 milliseconds, the volume will continue to increase or decrease until the input goes low (the local or remote volume button is released).  This input can be used in addition to or instead of the analog input <FM/TV_HPhone_Vol>.  High/1 = Raise/lower volume (volume button pressed); Low/0 = volume button released

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*C2N-TTVFM FM Tuner Controls Digital Input and Output Signal Descriptions  
(continued)*

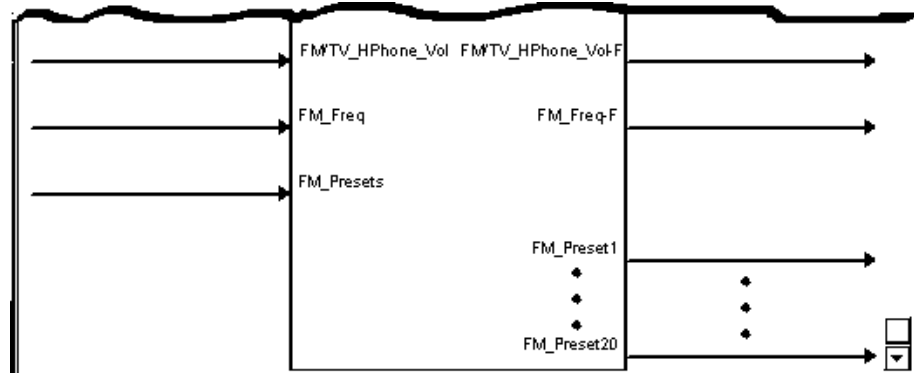
<b>SIGNAL TYPE AND NAME</b>	<b>DESCRIPTION</b>
Input: <FM_BandSelect>	<p>Selects the FM band on the rising edge of the signal.</p> <p>Users can select the band by pressing the local BAND button on the TV/FM Tuner; or from a remote button defined on a touchpanel or other interface.</p> <p>This signal is interlocked with the TV, AM and WX band selection inputs (on slots 2 and 3). That is, only one band can be selected at a time. The band will be set to whichever &lt;BandSelect&gt; input goes high last.</p> <p>High/1 = Select FM band; Low/0 = Exit FM band</p>
Output: <FM_BandSelect-F>	<p>Indicates that the FM band has been selected either via the local BAND button or from a remote button defined on a touchpanel or other interface.</p> <p>High/1 = FM band selected; Low/0 = FM band not selected</p>
Output: <FM_Mono-F>	<p>Indicates that the FM tuner is in the mono state. When low, indicates that the tuner is operating in stereo.</p> <p>The tuner will go into the mono state whenever the &lt;FM_Mono&gt; input is high.</p> <p>High/1 = In FM mono mode; Low/0 = In FM stereo</p>
Inputs: <FM_Station+>, <FM_Station->	<p>Tunes the FM station up (+) or down (-) on the rising edge of the signal when the FM band is selected.</p> <p>Users can tune to stations by pressing the local up (▲) and down (▼) buttons on the TV/FM Tuner when the unit is in TUNE mode; or from remote buttons defined on a touchpanel or other interface.</p> <p>If the input is high for longer than 300 milliseconds, the tuner will continue to tune from station to station until:</p> <ol style="list-style-type: none"> <li>1) the input goes low (the local or remote button is released); or</li> <li>2) it wraps around to the original station.</li> </ol> <p>The tuner will jump in 100 kHz steps if in US mode; or in 50 kHz steps if in European mode. The step rate is selected via the &lt;FM_US/Europe&gt; input.</p> <p>High/1 = Change station (tune button pressed); Low/0 = Stop station changing (tune button released)</p>
Input: <FM_US/Europe>	<p>Selects the FM frequency step rate.</p> <p>When low, the frequency is set to US steps (100 kHz). When high, the frequency is set to European steps (50 kHz).</p> <p>The tuner stores the last frequency selected in the EEPROM. On power-up, it restores this value.</p> <p>High/1 = European mode; Low/0 = US mode</p>

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*C2N-TTVFM FM Tuner Controls Digital Input and Output Signal Descriptions  
(continued)*

SIGNAL TYPE AND NAME	DESCRIPTION
Input: <FM_Save_Preset>	<p>Saves the current station to the preset given by the &lt;FM_Presets&gt; analog.</p> <p>Users can save a preset by setting this input high and selecting the desired FM preset number where the current station will be stored.</p> <p>High/1 (constant level) = Save preset; Low/0 = No effect</p>
Input: <FM_Mono>	<p>Sets the FM audio to mono when high. When low, the tuner operates in stereo.</p> <p>High/1 = Set FM to mono; Low/0 = Set FM to stereo</p>
Output: <FM_Mono-F>	<p>Indicates that the FM tuner is in the mono state. When low, indicates that the tuner is operating in stereo.</p> <p>The tuner will go into the mono state whenever the &lt;FM_Mono&gt; input is high.</p> <p>High/1 = In FM mono mode; Low/0 = In FM stereo</p>
Inputs: <FM_Search+>, <FM_Search->	<p>Searches in the up (+) or down (-) direction for FM stations, for as long as the signal is high.</p> <p>Users can search for stations by pressing remote search buttons defined on a touchpanel or other interface. (The TV/FM Tuner does not provide local search buttons.)</p> <p>The Search function will continue until:</p> <ol style="list-style-type: none"> <li>1) the remote search button is released; or</li> <li>2) it wraps around to the original station; or</li> <li>3) after maximum repeats; or</li> <li>4) a station is directly entered; or</li> <li>5) a remote scan +/- or station +/- button defined on a touchpanel or other interface is pressed.</li> </ol> <p>High/1 = Search up or down (search button pressed); Low/0 = Stop search (search button released)</p>
Output: <FM_Sensitivity-F>	<p>Indicates the FM sensitivity setting.</p> <p>The FM sensitivity will be set to High sensitivity whenever the FM signal level is too weak after tuning. (This will cause the tuner to switch to High sensitivity mode automatically.)</p> <p>High/1 = Sensitivity is set to High; Low/0 = Sensitivity is set to Normal</p>

*C2N-TTVFM FM Tuner Controls Analog Input and Output Signals*

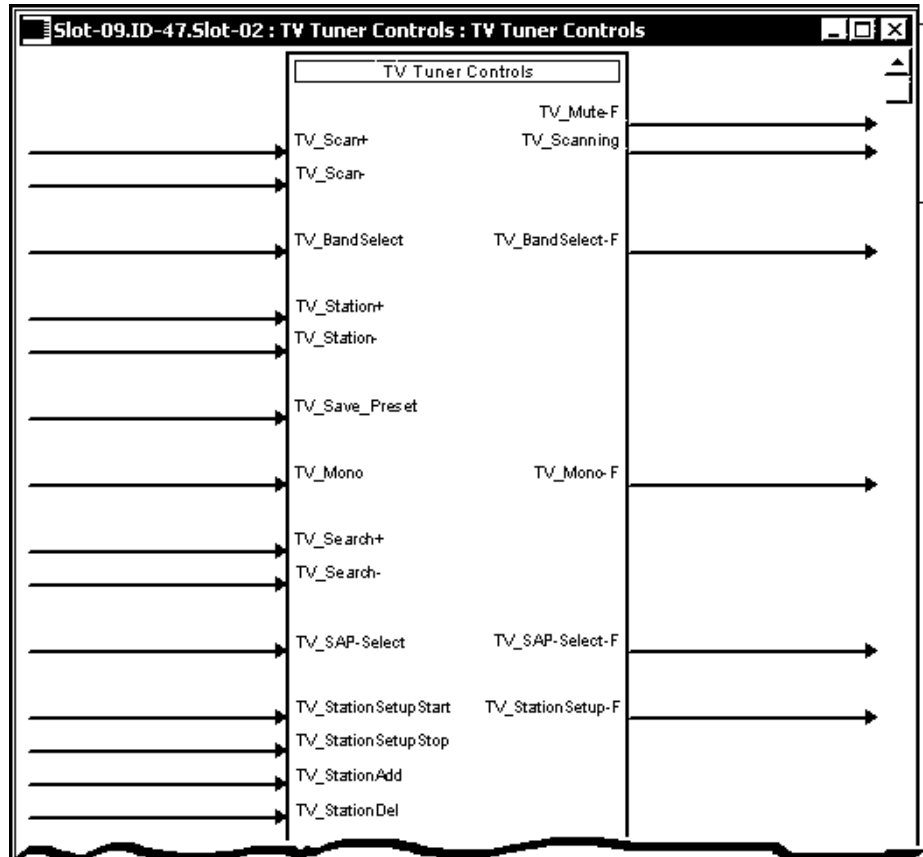


*C2N-TTVFM FM Tuner Controls Analog Input and Output Signal Descriptions*

SIGNAL TYPE AND NAME	DESCRIPTION
Input: <FM/TV_Hphone_Vol>	Sets the FM/TV headphone volume level from 0% to 100%. Note that this input can be used in addition to or instead of the digital inputs for volume.
Output: <FM/TV_Hphone_Vol-F>	Indicates the current headphone volume level.
Input: <FM_Freq>	Sets the tuner to the indicated FM frequency. In US mode, valid analog values range from 8800d (for 88.00MHz) to 10800d (for 108.00MHz). In European mode, valid analog values range from 8750d (for 87.50MHz) to 10800d (for 108.00MHz). Values above and below the maximum and minimum values will hold at the min/max frequencies.
Output: <FM_Freq-F>	Indicates the current FM station frequency.
Input: <FM_Presets>	Selects a station preset to Recall or Save. When the <FM_Save_Preset> input is high, the tuner saves the selected preset. When <FM_Save_Preset> is low, the tuner plays the selected preset. Valid analog values range from 0d (for Preset 1) to 19d (for Preset 20). No other values are valid.
Outputs: <FM_Preset1> through <FM_Preset20>	Indicates the frequency of the corresponding preset. For example, if Preset 4 is FM station 88.3, then <FM_Preset4> will equal 8830d. The analog values will differ depending on whether the tuner is set to US or European mode (refer to the <FM_Freq> input described earlier).



*C2N-TTVFM Slot 02, TV Tuner Controls Digital Input and Output Signals*



*C2N-TTVFM TV Tuner Controls Digital Input and Output Signal Descriptions*

<b>SIGNAL TYPE AND NAME</b>	<b>DESCRIPTION</b>
Inputs: <TV_Scan+>, <TV_Scan->	<p>Scans through TV stations on the rising edge of the input.</p> <p>Users can scan for stations by pressing the local Up and Down buttons on the TV/FM Tuner when the unit is in SCAN mode; or from remote buttons defined on a touchpanel or other interface.</p> <p>The tuner will scan up (+) or down (-) to a station, pause for five seconds, then continue scanning to the next station. Pressing the local or remote scan button again will stop the Scan operation.</p> <p>The Scan operation also stops when:</p> <ol style="list-style-type: none"> <li>1) a local BAND or MODE button is pressed; or</li> <li>2) a remote band or search button is pressed; or</li> <li>3) it wraps around to the original station; or</li> <li>4) after a maximum number of repeats; or</li> <li>5) a station is directly entered; or</li> <li>6) a remote scan +/- or station +/- button defined on a touchpanel or other interface is pressed.</li> </ol> <p>High/1 (rising edge) = Scan up or down; Low/0 = No effect</p>
Output: <TV_Mute-F>	<p>Indicates the current mute state of the unit. The output will be high for as long as audio is muted.</p> <p>TV audio will mute whenever:</p> <ol style="list-style-type: none"> <li>1) the &lt;FM_MuteAll&gt; input is high; or</li> <li>2) the television signal strength is too weak to produce a clear signal, and the &lt;TV_Mono&gt; input is low.</li> </ol> <p>High/1 = Audio muted; Low/0 = Audio not muted</p>
Output: <TV_Scanning>	<p>Indicates that the tuner is busy scanning TV stations. The output will be high for as long as the tuner remains scanning.</p> <p>High/1 = Scanning; Low/0 = Not scanning.</p>
Input: <TV_BandSelect>	<p>Selects TV band on the rising edge of the signal.</p> <p>Users can select the band by pressing the local BAND button on the TV/FM Tuner; or from a remote button defined on a handheld remote or other interface.</p> <p>This signal is interlocked with the FM, AM and WX band selection inputs (on slots 01 and 03). That is, only one band can be selected at a time. The band will be set to whichever &lt;BandSelect&gt; input goes high last.</p> <p>High/1 = Select TV band; Low/0 = Exit TV band</p>
Output: <TV_BandSelect-F>	<p>Indicates that the TV band has been selected either via the local BAND button or from a remote button defined on a touchpanel.</p> <p>High/1 = TV band selected; Low/0 = TV band not selected</p>

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*C2N-TTVFM TV Tuner Controls Digital Input and Output Signal Descriptions  
(continued)*

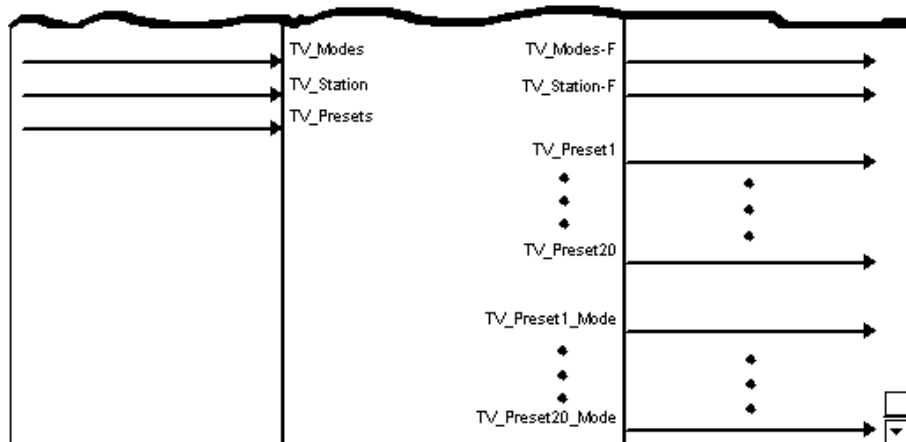
SIGNAL TYPE AND NAME	DESCRIPTION
Inputs: <TV_Station+>, <TV_Station->	<p>Tunes the TV station up (+) or down (-) on the rising edge of the signal.</p> <p>Users can tune to stations by pressing the local Up or Down buttons on the TV/FM Tuner when the unit is in TUNE mode; or from remote buttons defined on a touchpanel or other interface.</p> <p>If the input is high for longer than 300 milliseconds, the tuner will continue to tune from station to station until:</p> <ol style="list-style-type: none"> <li>1) the input goes low (the local or remote button is released); or</li> <li>2) it wraps around to the original station.</li> </ol> <p>High/1 = Change station (tune button pressed); Low/0 = Stop station changing (tune button released)</p>
Input: <TV_Save_Preset>	<p>Saves the current TV station to the preset given by the &lt;TV_Presets&gt; analog.</p> <p>Users can save a preset by setting this input high and selecting the desired FM preset number where the current station will be stored.</p> <p>High/1 (constant level) = Save preset; Low/0 = No effect</p>
Input: <TV_Mono>	<p>Sets the TV audio to mono when high. When low, the tuner operates in stereo.</p> <p>High/1 = Set to mono; Low/0 = Set to stereo</p>
Output: <TV_Mono-F>	<p>Indicates that the TV audio is in the mono state. When low, indicates that the tuner is operating in stereo.</p> <p>The tuner will go into the mono state whenever the &lt;TV_Mono&gt; input is high.</p> <p>High/1 = In mono mode; Low/0 = In stereo</p>
Inputs: <TV_Search+>, <TV_Search->	<p>Searches in the up (+) or down (-) direction for TV stations, for as long as the signal is high.</p> <p>Users can search for stations by pressing remote search buttons defined on a touchpanel or other interface. (The TV/FM Tuner does not provide local search buttons.)</p> <p>The Search function will continue until:</p> <ol style="list-style-type: none"> <li>1) the remote search button is released; or</li> <li>2) it wraps around to the original station; or</li> <li>3) after a maximum number of repeats; or</li> <li>4) a station is directly entered; or</li> <li>5) a remote scan +/- or station +/- button defined on a touchpanel or other interface is pressed.</li> </ol> <p>High/1 = Search up or down (search button pressed); Low/0 = Stop search (search button released)</p>

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*C2N-TTVFM TV Tuner Controls Digital Input and Output Signal Descriptions  
(continued)*

SIGNAL TYPE AND NAME	DESCRIPTION
Input: <TV_SAP_Select>	<p>Enables SAP (Second Audio Program) for as long as the input is high.</p> <p>If the currently tuned station does not support SAP, the audio will be muted if the input goes high.</p> <p>If the input goes high while &lt;TV_Mono&gt; is high, then if the station is transmitting SAP the right and left audio outputs will broadcast in two languages.</p> <p>High/1 = Turn on SAP; Low/0 = Turn off SAP</p>
Output: <TV_SAP-Select-F>	<p>This input goes high if the currently tuned TV station supports SAP (Second Audio Program) or the &lt;TV_SAP_Select&gt; input is high.</p> <p>High/1 = SAP supported and/or enabled ; Low/0 = SAP not supported</p>
Input: <TV_StationSetupStart>	<p>Runs the TV Station Setup function on the rising edge of the input.</p> <p>In this mode, the TV/FM Tuner scans for TV stations and stores the scannable stations in the memory for the selected mode (Off-air, Standard, IRC or HRC, set by the &lt;TV_Modes&gt; analog).</p> <p>After the TV station setup is complete, the tuner will tune only to the scannable stations, while skipping any un-scannable stations.</p> <p>High/1 = Start station setup start; Low/0 = No effect</p>
Output: <TV_StationSetup-F>	<p>Indicates that the tuner is busy running the TV station setup function.</p> <p>High/1 = Busy (TV station setup); Low/0 = Ready (Setup not running)</p>
Input: <TV_StationSetupStop>	<p>Cancels the TV station setup function.</p> <p>High/1 = Cancel station setup; Low/0 = No effect</p>
Input: <TV_StationAdd>	<p>Adds the currently tuned station to the station list for the selected mode, on the rising edge of the input.</p> <p>When a station is added to the station list it can be selected with the Station+/- function keys.</p> <p>High/1 = Add to station list; Low/0 = No effect</p>
Input: <TV_StationDel>	<p>Deletes the currently tuned station from the station list for the selected mode, on the rising edge of the input.</p> <p>After deletion, the station cannot be selected with the Station+/- function keys.</p> <p>High/1 = Delete the current tuned station from the list</p>

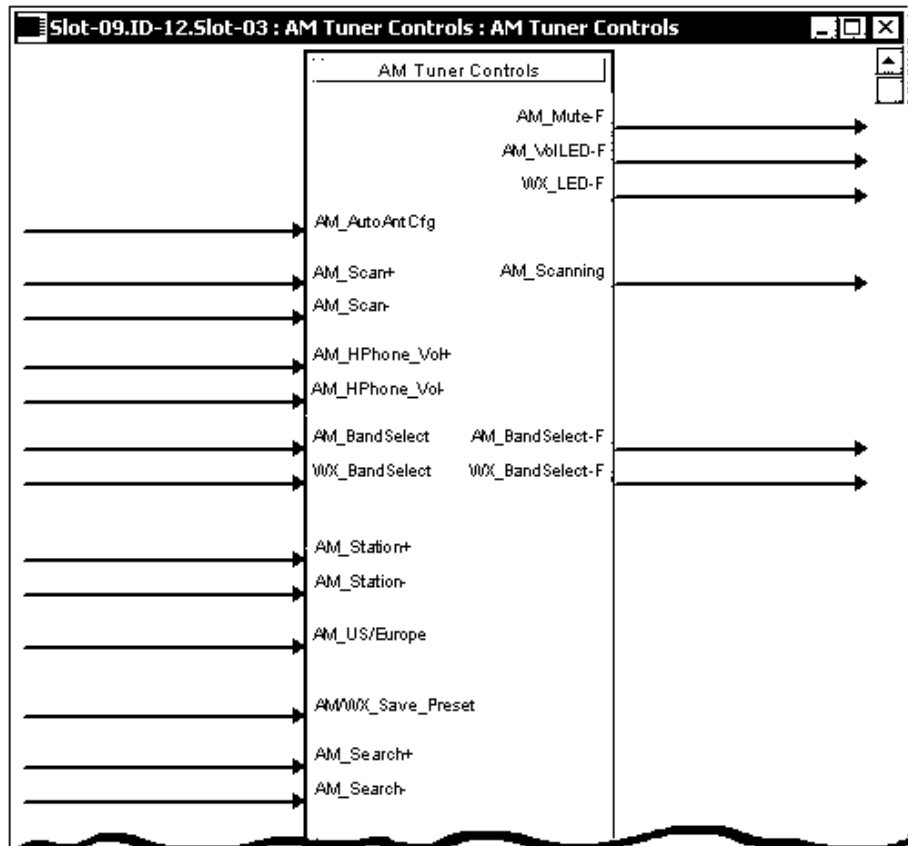
*C2N-TTVFM TV Tuner Controls Analog Input and Output Signals*



*C2N-TTVFM TV Tuner Controls Analog Input and Output Signal Descriptions*

SIGNAL TYPE AND NAME	DESCRIPTION
Input: <TV_Modes>	Sets the TV mode of operation. Valid analog values are as follows: 0 = Off-Air; 1 = STD; 2 = IRC; 3 = HRC.
Output: <TV_Modes-F>	Reports the current TV mode. Analog values will range from 0 to 3.
Input: <TV_Station>	Sets the TV tuner to the given station. The valid range of analog values depends on the mode (set by the <TV_Modes> analog): Off-air: 2d - 69d STD: 2d – 125d IRC: 1d – 125d HRC: 1d – 125d
Output: <TV_Station-F>	Reports the currently tuned TV station.
Input: <TV_Presets>	Selects a TV station preset to Recall or Save. When the <TV_Save_Preset> input is high, the tuner saves the selected preset. When <TV_Save_Preset> is low, the tuner plays the selected preset. Valid analog values range from 0d (for Preset 1) to 19d (for Preset 20).
Outputs: <TV_Preset1> through <TV_Preset20>	Reports the TV station for the indicated preset.
Outputs: <TV_Preset1_Mode> through <TV_Preset20_Mode>	Reports the mode for the indicated preset, as follows: 0 = Off-air; 1 = STD; 2 = IRC; 3 = HRC. The mode is set by the <TV_Modes> analog.

*C2N-TTVFM Slot 03, AM Tuner Controls Digital Input and Output Signals*



*C2N-TTVFM AM Tuner Controls Digital Input and Output Signal Descriptions*

SIGNAL TYPE AND NAME	DESCRIPTION
Output: <AM_Mute-F>	Indicates the current mute state of the unit. The output will be high for as long as audio is muted. AM audio will mute whenever the <FM_MuteAll> input is high. High/1 = Audio muted; Low/0 = Audio not muted
Output: <AM_VoILED-F>	Indicates the state of the VOL LED on the AMWX Tuner. This LED is active when the AMWX Tuner is in headphone volume mode. High/1 = Active (VOL LED on); Low/0 = Not active (VOL LED off).

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*C2N-TTVFM AM Tuner Controls Digital Input and Output Signal Descriptions  
(continued)*

<b>SIGNAL TYPE AND NAME</b>	<b>DESCRIPTION</b>
Output: <WX_LED-F>	<p>Indicates the state of the WX LED on the AMWX Tuner. This LED is active when the AM Tuner is set to the weather band.</p> <p>High/1 = Active (WX LED on); Low/0 = Not active (WX LED off)</p>
Input: <AM_AutoAntCfg>	<p>Sets the AMWX Tuner to auto-configure mode when the input is high.</p> <p>In this mode the AMWX Tuner will automatically select between the internal A and B loop antennas, depending on which signal is stronger.</p> <p>High/1 = Automatic antenna configuration; Low/0 = Manual antenna configuration</p>
Inputs: <AM_Scan+>, <AM_Scan->	<p>Scans through each AM station on the rising edge of the input. The scan function only applies to the AM band; it is not supported in the weather band.</p> <p>Users can scan for AM stations by pressing the up and down buttons on the TV/FM Tuner when the unit is in SCAN mode; or from remote buttons defined on a touchpanel or other interface. (The AMWX Tuner does not provide scan buttons.)</p> <p>The tuner will scan up (+) or down (-) to an AM station, pause for five seconds, and then continue scanning to the next station. Pressing the scan button again stops the Scan operation.</p> <p>The Scan operation also stops when:</p> <ol style="list-style-type: none"> <li>1) the local BAND or MODE buttons are pressed; or</li> <li>2) a remote band or search button is pressed; or</li> <li>3) it wraps around to the original station, if that station is scannable; or</li> <li>4) after a maximum number of repeats; or</li> <li>5) a station is directly entered; or</li> <li>6) a remote scan +/- or station +/- button defined on a touchpanel or other interface is pressed.</li> </ol> <p>High/1 (rising edge) = Scan up or down (AM only); Low/0 = No effect</p>
Output: <AM_Scanning>	<p>Indicates that the AMWX Tuner is busy scanning AM Stations. The output will be high for as long as the tuner remains scanning.</p> <p>High/1 = Scanning; Low/0 = Not scanning</p>

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*C2N-TTVFM AM Tuner Controls Digital Input and Output Signal Descriptions  
(continued)*

<b>SIGNAL TYPE AND NAME</b>	<b>DESCRIPTION</b>
Inputs: <AM_HPhone_Vol+>, <AM_HPhone_Vol->	Increases (+) and decreases (-) the headphone volume for as long as the input remains high.  Users control headphone volume by pressing the Up and Down buttons on the AMWX Tuner when the unit is in VOL mode; or from remote buttons defined on a touchpanel or other interface.  High/1 = Raise/lower volume (Volume button pressed); Low/0 = Volume button released
Input: <AM_BandSelect>	Sets the AMWX Tuner to the AM band for as long as the input is high.  Users can select the band by pressing the local BAND button on the AMWX Tuner or C2N-TFM/TTVFM; or from remote buttons defined on a touchpanel or other interface.  This input is interlocked with the FM and WX band selection inputs. That is, only one band can be selected at a time. The band will be set to whichever <BandSelect> input goes high last.  High/1 = Set to AM band; Low/0 = Exit AM band
Output: <AM_BandSelect-F>	Indicates that the AM band has been selected via the BAND button on the AMWX Tuner or C2N-TFM/TTVFM, or from a remote button defined on a touchpanel.  High/1 = AM band selected; Low/0 = AM band not selected
Input: <WX_BandSelect>	Sets the AMWX Tuner to the weather band for as long as the input is high.  Users can select the band by pressing the local BAND button on the AMWX Tuner or C2N-TFM/TTVFM; or from remote buttons defined on a touchpanel or other interface.  This input is interlocked with the TV, AM and FM band selection inputs. That is, only one band can be selected at a time. The band will be set to whichever <BandSelect> input goes high last.  High/1 = Set to WX band; Low/0 = Exit WX band
Output: <WX_BandSelect-F>	Indicates that the weather band has been selected via the BAND button on the AMWX Tuner or TV/FM Tuner, or from a remote button defined on a touchpanel.  High/1 = WX band selected; Low/0 = WX band not selected

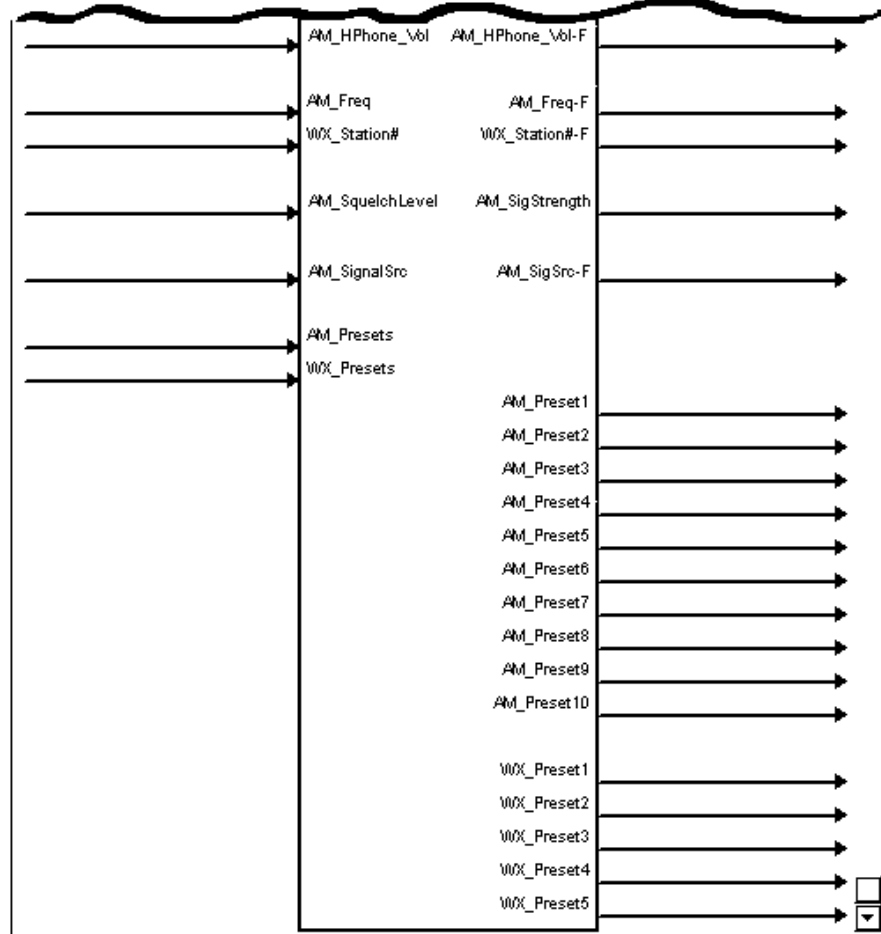
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*C2N-TTVFM AM Tuner Controls Digital Input and Output Signal Descriptions (continued)*

SIGNAL TYPE AND NAME	DESCRIPTION
Inputs: <AM_Station+>, <AM_Station->	<p>Tunes the AM or weather station up (+) or down (-), for as long as the input is high.</p> <p>Users can tune to stations by pressing the up (▲) or down (▼) buttons on the AMWX Tuner or the FM Tuner or TV/FM Tuner when the unit is in TUNE mode; or by using remote buttons defined on a touchpanel or other interface.</p> <p>The Station+/- function will continue until the input goes low (the local or remote tune button is released).</p> <p>The tuner will jump in 10 kHz steps if in US mode; or in 9 kHz steps if in European mode. The step rate is selected via the &lt;AM_US/Europe&gt; input.</p> <p>High/1 = Station up or down (tune button pressed); Low/0 = Stop station changing (tune button released)</p>
Input: <AM_US/Europe>	<p>Selects the AM frequency step rate. When low, the frequency is set to US steps (10 kHz). When high, the frequency is set to European steps (9 kHz).</p> <p>The tuner stores the frequency selection in the EEPROM. On power-up, it restores this value.</p> <p>High/1 = European mode; Low/0 = US mode</p>
Input: <AM/WX_Save_Preset>	<p>Saves the current station to the preset given by the &lt;AM_Presets&gt; or &lt;WX_Presets&gt; analogs.</p> <p>Users can save a preset by setting this input high and selecting the desired FM preset number where the current station will be stored.</p> <p>High/1 (constant level) = Save preset; Low/0 = No effect</p>
Inputs: <AM_Search+>, <AM_Search->	<p>Searches in the up (+) or down (-) direction for AM stations, for as long as the input remains high. The search function only applies to the AM band; it is not supported in the weather band.</p> <p>Users can search for AM stations by pressing remote buttons defined on a touchpanel or other interface. (Neither the AMWX Tuner nor the TV/FM Tuner provide AM search buttons.)</p> <p>The Search function will continue until</p> <ol style="list-style-type: none"> <li>1) the remote search button is released; or</li> <li>2) it wraps around to the original station; or</li> <li>1) a station is directly entered; or</li> <li>2) a remote scan +/- or station +/- button defined on a touchpanel or other interface is pressed.</li> </ol> <p>High/1 = Search up or down (remote search button pressed, AM band only); Low/0 = Stop search (remote search button released)</p>

*C2N-TTVFM Slot 03, AM Tuner Controls Analog Input and Output Signals*



*C2N-TTVFM AM Tuner Controls Analog Input and Output Signal Descriptions*

SIGNAL NAME	DESCRIPTION
Input: <AM_HPhone_Vol>	Sets headphone volume level from 0% to 100%.
Output: <AM_HPhone_Vol-F>	Indicates the current headphone volume.
Input: <AM_Freq>	Sets the tuner to the indicated AM frequency. In both US and European modes, valid analog values range from 5300d (for 530 kHz) to 17100d (for 1710 kHz). Values above and below the maximum and minimum values will hold at the min/max frequencies.
Output: <AM_Freq-F>	Indicates the current AM station frequency.
Input: <WX_Station#>	Sets the tuner to the indicated weather station number. Valid analog values range from 1 to 7. No other values are valid.
Output: <WX_Station#-F>	Indicates the current weather station number. The analog values will range from 1 to 7.

*(continued on next page)*

*C2N-TTVFM AM Tuner Controls Analog Input/Output Signal Descriptions  
(continued)*

SIGNAL NAME	DESCRIPTION
Input: <AM_SquelchLevel>	Sets the AMWX Tuner's squelch level, from 0% to 100%. The default squelch level is about 55%.
Output: <AM_SigStrength>	Indicates the AM signal strength. The analog values will range from 0 (for no signal) to 65535 (maximum signal strength).
Input: <AM_SignalSrc>	Sets the AMWX antenna signal source. Valid analog values are as follows: 0 = Internal Loop A 1 = Internal Loop B 2 = External Plus Loop A 3 = External Plus Loop B No other values are valid.
Output: <AM_SigSrc-F>	Indicates the current AMWX antenna signal source. The analog values will range from 0 to 3.
Input: <AM_Presets>	Selects an AM station preset to Recall or Save. When the <AM/WX_Save_Preset> input is high, the tuner saves the selected preset. When <AM/WX_Save_Preset> is low, the tuner plays the selected preset. Valid analog values range from 0d (for Preset 1) to 9d (for Preset 10). No other values are valid.
Input: <WX_Presets>	Selects a weather station preset to Recall or Save. When the <AM/WX_Save_Preset> input is high, the tuner saves the selected preset. When <AM/WX_Save_Preset> is low, the tuner plays the selected preset. Valid analog values range from 0d (for Preset 1) to 4d (for Preset 5). No other values are valid.
Outputs: <AM_Preset1> through <AM_Preset10>	Indicates the frequency of the corresponding preset. For example, if Preset 4 is AM station 820, then <AM_Preset4> will equal 820d.
Outputs: <WX_Preset1> through <WX_Preset5>	Indicates the weather station channel number of the corresponding preset. Analog values range from 1 to 7.

### Example Program

The example program for the TV/FM Tuner also demonstrates the various features of the AMWX Tuner. Download the example program from the Crestron FTP site, <ftp://ftp.crestron.com/Examples>, (search for C2N-TTVFM.Basic Example.zip).

## Uploading and Upgrading

Assuming a PC is properly connected to the entire system, Crestron programming software allows the programmer to upload programs and projects after their development to the system and network devices. 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.

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**NOTE:** The Crestron Viewport is available as a pull-down command from SIMPL Windows and VT Pro-e (**Tools | Viewport**) or as a standalone utility. 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.

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The following sections define how one would upload a SIMPL Windows program or upgrade the firmware of the C2N-TTVFM. However, before attempting to upload or upgrade, it is necessary to establish communications.

## Communication Settings

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**NOTE:** For laptops and other PCs without a built-in RS-232 port, Crestron recommends the use of PCMCIA cards, rather than USB-to-serial adapters. If a USB-to-serial adapter must be used, Crestron has tested the following devices:

Belkin (large model) F5U103  
I/O Gear GUC232A (discontinued)  
Keyspan USA-19QW (discontinued)

Results may vary, depending on the computer being used. Other models, even from the same manufacturer, may not yield the same results.

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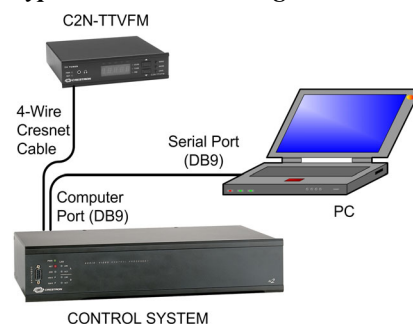
The procedure in this section provides details for RS-232 communication between the PC and the control system. If TCP/IP communication is preferred, consult the latest version of the Crestron e-Control Reference Guide (Doc. 6052) or the respective Operations Guide for the control system. These documents are available from the Downloads | Product Manuals section of the Crestron website ([www.crestron.com](http://www.crestron.com)). Refer to the following figure for a typical connection diagram when uploading files.

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**NOTE:** Use a standard DB9 male to female “straight-through” cable.

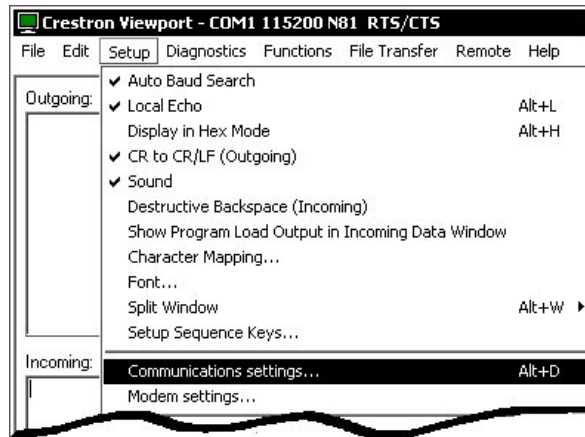
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### *Typical Connection Diagram when Uploading*



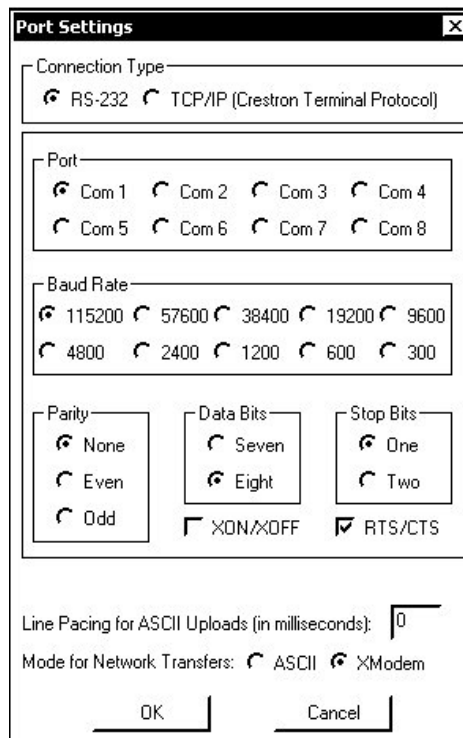
1. Open the Crestron Viewport.  
Either launch the stand-alone version of Viewport, or start SIMPL Windows or VT Pro-e, and from the menu bar, select **Tools | Viewport**.
2. Refer to the figure after this step. From the Viewport menu, select **Setup | Communications settings** (alternatively, press **Alt+D**) to open the “Port Settings” window.

**Setup | Communications Settings Command**



3. 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 in the following illustration. Click the **OK** button to save the settings and close the window.

**“Port Settings” Window**



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**NOTE:** The parameters shown in the previous illustration are the port settings for a 2-Series control system. Consult the Operations Guide for the control system being used for exact parameter selection.

---

- To verify communication, select **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 system using SIMPL Windows or via the Crestron Viewport.

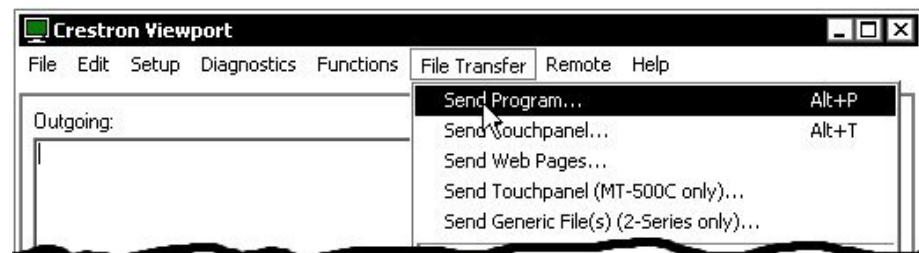
### Upload via SIMPL Windows

- Start SIMPL Windows.
- Select **File | Open** to view the “Open” window, navigate to the SIMPL Window file (.smw), and click **Open**.
- Select **Project | Transfer Program**.

### Upload via Crestron Viewport

- Verify that the procedure for “Communication Settings” that begins on page 32 has been performed.
- As shown after this step, select **File Transfer | Send Program** (alternatively, press **Alt+P**) from the Viewport menu.

#### File Transfer | Send Program Command



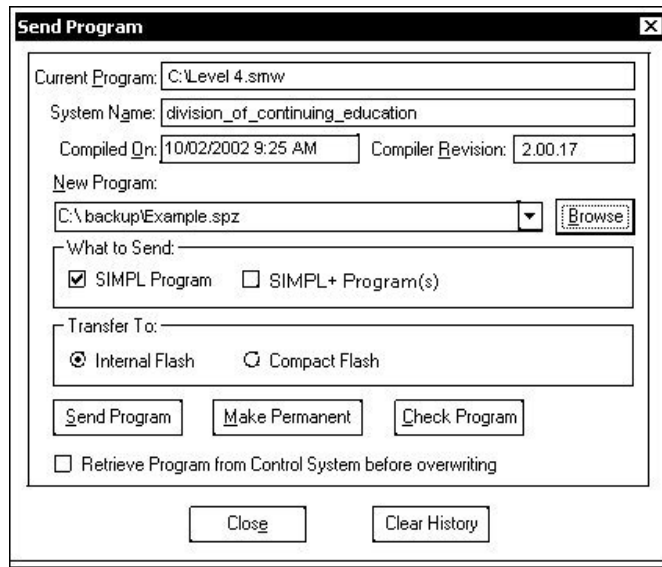
- The “Send Program” window appears, as shown after this step. Click **Browse**, locate the compiled file (.spz for PRO2), and click **Open**. This will display the program's header information and enable one or both of the *What to Send* check boxes. If the program does not contain any SIMPL+ modules, only the *SIMPL Program* check box will be enabled. If it does contain SIMPL+ modules, then the *SIMPL+ Program(s)* check box will also be enabled. Select one or both check boxes and then click **Send Program** to begin the transfer.

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**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**. This should display a window that provides details about the current program loaded into the control system.

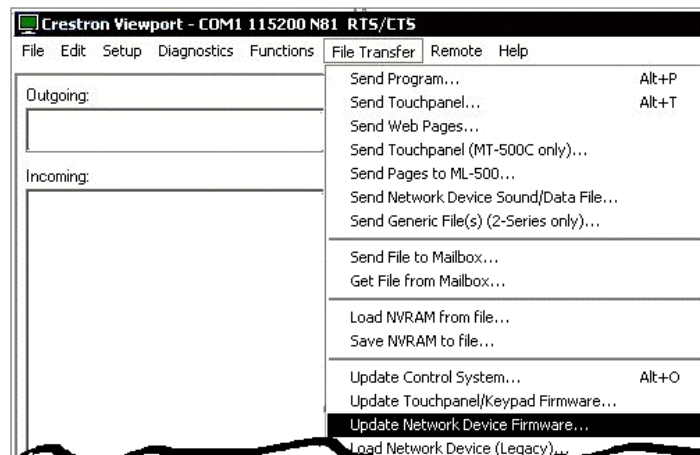
**Firmware Upgrade – TV/FM Tuner**

*A firmware upgrade file has the extension .upg.*

To take advantage of all the C2N-TTVFM 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](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.

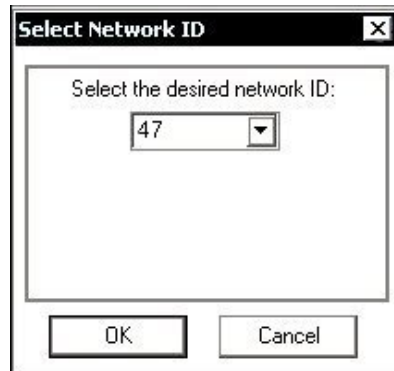
1. Make sure that “Communication Settings” that begins on page 32 has been performed.
2. As shown after this step, select **File Transfer | Update Network Device Firmware** from the Viewport menu.

**File Transfer | Load Network Device Command**



- As shown after this step, select the Net ID of the C2N-TTVFM and then click **OK**. The “Open” window appears (refer to the subsequent graphic).

**“Select Network ID” Window**

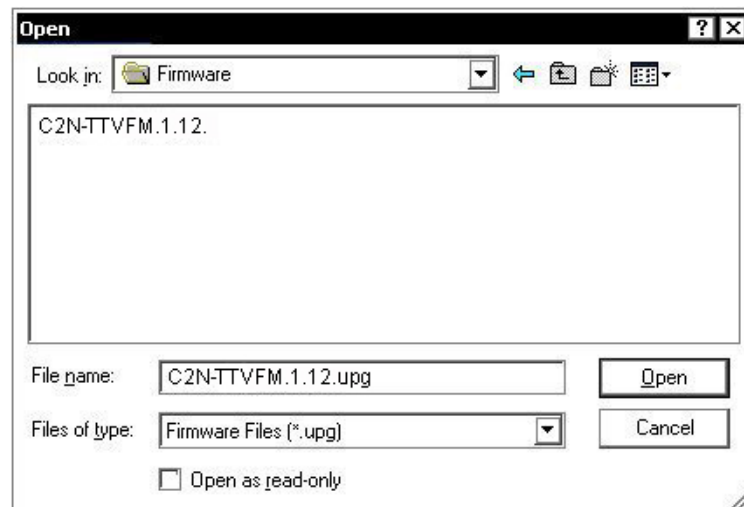



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**NOTE:** When transferring any Cresnet file (touchpanel project/firmware), lower the port speed baud rate to 38400 to match the Cresnet bus speed.

---

**“Open” Window**



- Browse to the desired .upg file and click **Open** to begin the transfer.

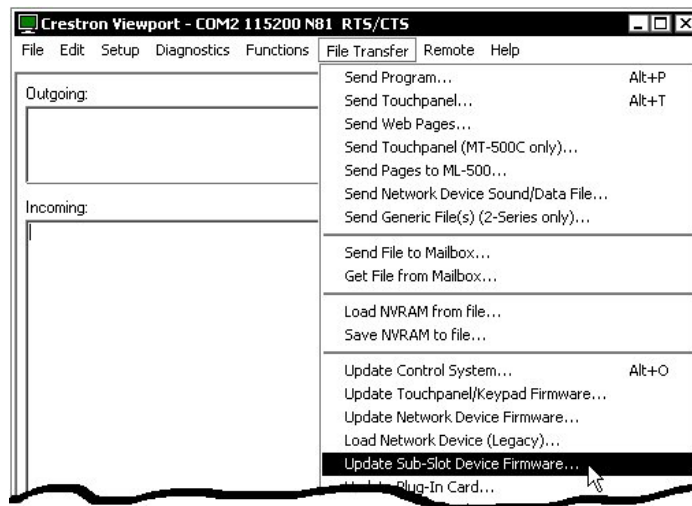
## Firmware Upgrade – AMWX Tuner

The procedures for upgrading the firmware for the AMWX Tuner are almost identical to those for the TV/FM Tuner. The difference is that the AMWX Tuner is not a standalone Cresnet device, but is a sub-slot device to the TV/FM Tuner. To upgrade the firmware, complete the following steps.

- Make sure that “Communication Settings” that begins on page 32 has been performed.
- As shown after this step, select **File Transfer | Update Sub-Slot Device Firmware** from the Viewport menu.

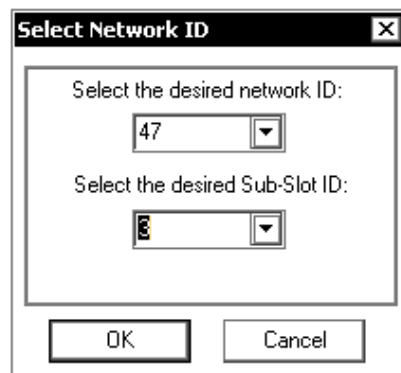


*File Transfer | Load Sub-Slot Device Command*



- As shown after this step, select the Net ID of the C2N-TTVFM, select the desired sub-slot ID of the AMWX Tuner (03), and then click **OK**. The “Open” window appears (refer to the subsequent graphic).

*“Select Network ID” Window*

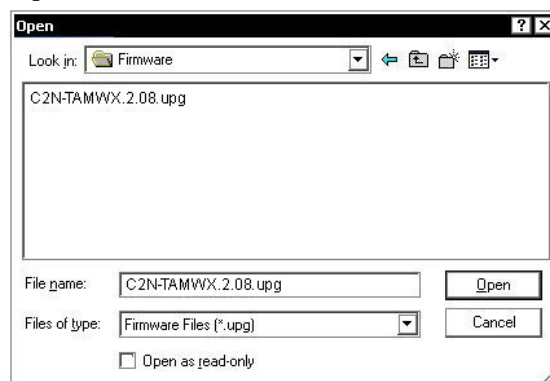



---

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

---

*“Open” Window*



- Browse to the desired .upg file and click **Open** to begin the transfer.

## Problem Solving

### Troubleshooting

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

#### *C2N-TTVFM Troubleshooting*

TROUBLE	PROBABLE CAUSE(S)	CORRECTIVE ACTION
Green PWR LED does not illuminate.	Wrong power supply.	Use a Crestron power supply.
	C2N-TTVFM is not receiving power.	Verify that cables plugged into NET port are secure.
Yellow NET LED does not illuminate.	Improper Net ID.	Verify that the C2N-TTVFM Net ID matches Net ID in the software program.
	Loose network connection.	Verify that cable plugged into NET port is secure.
Search functions do not work properly.	Station signal strength is too low.	Check antenna placement for good signal strength.

### Further Inquiries

If you cannot locate specific information or have questions after reviewing this guide, please take advantage of Crestron's award winning customer service team by calling the Crestron corporate headquarters at 1-888-CRESTRON [1-888-273-7876]. For assistance in your local time zone, refer to the Crestron website (<http://www.crestron.com>) for a listing of Crestron worldwide offices.

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

### Future Updates

As Crestron improves functions, adds new features, and extends the capabilities of the C2N-TTVFM, additional information and programming examples 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 periodically for manual update availability and its relevance. Updates are identified as an “Addendum” in the Download column.

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## Return and Warranty Policies

### Merchandise Returns / Repair Service

1. No merchandise may be returned for credit, exchange, or service without prior authorization from CRESTRON. To obtain warranty service for CRESTRON products, contact the factory and request an RMA (Return Merchandise Authorization) number. Enclose a note specifying the nature of the problem, name and phone number of contact person, RMA number, and return address.
2. Products may be returned for credit, exchange, or service with a CRESTRON Return Merchandise Authorization (RMA) number. Authorized returns must be shipped freight prepaid to CRESTRON, 6 Volvo Drive, Rockleigh, N.J., or its authorized subsidiaries, with RMA number clearly marked on the outside of all cartons. Shipments arriving freight collect or without an RMA number shall be subject to refusal. CRESTRON reserves the right in its sole and absolute discretion to charge a 15% restocking fee, plus shipping costs, on any products returned with an RMA.
3. Return freight charges following repair of items under warranty shall be paid by CRESTRON, shipping by standard ground carrier. In the event repairs are found to be non-warranty, return freight costs shall be paid by the purchaser.

### CRESTRON Limited Warranty

CRESTRON ELECTRONICS, Inc. warrants its products to be free from manufacturing defects in materials and workmanship under normal use for a period of three (3) years from the date of purchase from CRESTRON, with the following exceptions: disk drives and any other moving or rotating mechanical parts, pan/tilt heads and power supplies are covered for a period of one (1) year; touchscreen display and overlay components are covered for 90 days; batteries and incandescent lamps are not covered.

This warranty extends to products purchased directly from CRESTRON or an authorized CRESTRON dealer. Purchasers should inquire of the dealer regarding the nature and extent of the dealer's warranty, if any.

CRESTRON shall not be liable to honor the terms of this warranty if the product has been used in any application other than that for which it was intended, or if it has been subjected to misuse, accidental damage, modification, or improper installation procedures. Furthermore, this warranty does not cover any product that has had the serial number altered, defaced, or removed.

This warranty shall be the sole and exclusive remedy to the original purchaser. In no event shall CRESTRON be liable for incidental or consequential damages of any kind (property or economic damages inclusive) arising from the sale or use of this equipment. CRESTRON is not liable for any claim made by a third party or made by the purchaser for a third party.

CRESTRON shall, at its option, repair or replace any product found defective, without charge for parts or labor. Repaired or replaced equipment and parts supplied under this warranty shall be covered only by the unexpired portion of the warranty.

Except as expressly set forth in this warranty, CRESTRON makes no other warranties, expressed or implied, nor authorizes any other party to offer any warranty, including any implied warranties of merchantability or fitness for a particular purpose. Any implied warranties that may be imposed by law are limited to the terms of this limited warranty. This warranty statement supercedes all previous warranties.

#### Trademark Information

*All brand names, product names, and trademarks are the sole property of their respective owners. Windows is a registered trademark of Microsoft Corporation. Windows95/98/Me/XP and WindowsNT/2000 are trademarks of Microsoft Corporation.*



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**Operations Guide – DOC. 6266A**  
**08.04**

Specifications subject to  
change without notice.