Programmer's Guide

Crestron e-Schedule

Crestron Electronics, Inc.

Contents

System Overview **1**

Product Description....1
General Information and Terminology....1
System Components and CNX Gateway Licensing....3
Minimum System Requirements....5
System Connections....6
Data Flow....7

Configuring the e-Schedule Database **8**

Database Categories....8
Database Configuration....9
Scheduling Software Computer(s)....9
Areas....10
Head End and Source Devices....12
Destination Devices....17
Signals....19
Signal Macros....21
Signal Macros....22
Privileges....23
Join Number Pass-Throughs....24
Real-Time Engine (Scheduler.exe)....25
Diagnostic Utilities....29
Watch Signals....29
Configuration....30

e-Schedule Interface to Control Systems **32**

SIMPL Windows Programming....32
ActiveCNX Interface Definitions....37
Destination (Classroom) ActiveCNX Interface....37
Source ActiveCNX Interface....45

Software License Agreement....**49**
Return and Warranty Policies....**51**
Merchandise Returns / Repair Service....51
CRESTRON Limited Warranty....51

System Overview

Product Description

Crestron e-Schedule™ is a Web-based software package for event scheduling and real-time control of media resources across multiple rooms. It replaces Crestron SchoolNet with a much more flexible and robust system, and includes the following features:

- Event scheduling and conflict checking of media resources, rooms and source devices.
- Real-time signal routing and control of scheduled events.
- Copying and re-scheduling of one or all of a day's events.
- Scheduling of automatic transport functions such as Source Select, Play and Rewind.
- Support for broadband and/or baseband switching (as long as there is full crosspoint capability).
- Multiple-room scheduling and grouping and multiple head ends.
- Global signals.
- Join number pass-throughs for direct communication between a Web browser and a room.
- Customizable television channel lists.

General Information and Terminology

An e-Schedule system usually consists of at least one *head end*, one or more *destinations*, and the scheduling software computer(s), all networked through Ethernet. The head end is a central area that contains all the system's A/V source devices, such as VCRs, laser discs and television tuners. These sources must be controlled by a Crestron control system that supports Ethernet communication, such as the CNMSX or CNRACKX. The devices can be modulated onto broadband video network or switched baseband with any switcher controllable by Crestron.

The largest destination defined by e-Schedule is a *location* (i.e., Law School or Business School), a broad area that usually denotes an entire building or a large section of a building. A location is divided into *sublocations*, which are simply rooms. Various rooms from the same or different locations can be organized into *groups*. Rooms can also be assigned to one or more groups, (i.e., *All First Year Classes* or *All 8:00 a.m.Classes*).

As with the head end, a room must be controlled by a Crestron control system that supports Ethernet communication such as the CNMSX, or more typically the CEN-TVAV. Crestron supports room processing for the CN-TVAV as well, using an Ethernet-enabled control system as a "bridge" (see section titled *e-Schedule Interface to Control Systems*). Room controllers are referred to as *set-top boxes.*

Most systems include local room control of head end sources via Crestron touchpanels and/or real-time Web browser pages. End users usually control television settings such as volume, changing channels and turning power on and off, although e-Schedule supports automatic control of these settings as well. The Crestron CNIRHT-MM (445 KHz) transmitter can also be used for real-time control of sources and TV.

Events

The e-Schedule interface consists of various Web pages that the user navigates in order to schedule *events*, which are divided into two types: *media events* and *global events*.

To schedule a media event, the user requests up to six media titles, as well as start and end times and room destinations. In addition, actions called *signals* that occur automatically can be scheduled at the beginning and/or end of an event. For example, start signals might include dimming the lights and lowering a video screen, while end signals might rewind a VCR tape and raise the blinds.

After the scheduling software validates the request, it reserves the sources and media titles for use during the scheduled time. The user who schedules an event can then control it locally or from a Web browser while the event is in progress. They can also edit or delete the event using the Web-based interface.

When scheduling a media event for a group, the first room that the user selects will be designated as the "controlling room" that sends transport commands to the head end sources. Only the controlling room can communicate with the head end, and any action that is initiated in the controlling room will also take place in the other "eavesdropping" rooms that make up the group.

Global events differ from media events in that they *don't* involve any source devices, user-specified locations, or end times. Some common examples of global events are turning lights on or off in a location, activating an alarm system, or adjusting the setting on a thermostat. Global events can be scheduled to coincide with media events or they can occur independently.

NOTE: Crestron runs a demonstration e-Schedule program at http://www.escheduler.crestron-econtrol.com. To gain access, type "guest" as both the User ID and password.

Tiered Switching

e-Schedule does not currently support tiered switching, i.e., any environment that does not offer full crosspoint capability. For the e-Schedule system to function properly it must be able to switch any source to any destination without interfering with the routes of other sources or destinations or requiring allocation of a limited number of intermediate channels.

System Components and CNX Gateway Licensing

The e-Schedule software package consists of the following:

- **Active Server Pages**—Web server application for scheduling and conflict checking.
- **Real-Time Engine**—application for controlling media resources and signal routing between control systems, source devices and destination devices.
- **e-Schedule Database Directory**—divided into four categories: 1) Configuration 2) Web Browser 3) Resource and 4) System.
- **Documents/Examples Directory**—various SIMPL Windows and VT Pro-e programs that define an extensive sample system. Together with the completed configuration databases (also included), the programs can be used as models for most projects.

In addition, the system requires a CNX Gateway (the software gateway, not the CNXENET+ card gateway) to enable Ethernet communication with Crestron equipment. The number of connection licenses depends on the configuration of the system.

Crestron recommends two possible software configurations. The first is to have all the software and the CNX Gateway on a single computer. In this case, the number of connection licenses will be equal to the total number of IP addresses (meaning all browsers and any hardware with unique IP addresses), *plus two*. The two extra licenses enable communication between the Web Server and Real-Time Engine applications. For example, in the following system:

- One CNMSX-Pro controlling various sources
- Five CEN-TVAVs
- Five Web browsers

A total of thirteen licenses would be required.

The second possible configuration is to have two computers, one for the Web Server and the other for the Real-Time Engine, each with its own CNX Gateway. (The Database Directory should be installed on the Web Server for efficiency.) The Web Server computer would then require licenses for all

browser connections, *plus two*, and the Real-Time Engine would require licenses for all hardware devices with unique IP addresses, *plus two*. Thus in the example just described, the Web Server would require seven licenses and the Real-Time Engine computer would require eight licenses.

The CNX Gateway runs as a service, not an application, meaning that it starts when the computer boots up, and stops when the computer shuts down. After installation, the Crestron swirl icon will appear in the system tray of the Windows status bar. Right-click the system tray icon to check the current version, add licensing, or simply see the connections that the CNX Gateway is servicing.

NOTE: Crestron recommends that all e-Schedule components reside on a separate segment or subnet of the Ethernet network, in order to help ensure that packets will be routed efficiently and quickly.

Leading Specifications	
Maximum number of sources that can be scheduled to one event at one time	6
Maximum number of browsers that can be running simultaneously	90
Maximum number of IP IDs (Crestron control systems, source devices, switcher (if any) and browsers)	250
Maximum number of Cresnet (Crestron Network) devices—i.e., LC-1000, CN-TVAV, CT-1550—per CNMSX control system	30, if using only CN-TVAVs with no touchpanels or 50, with no more than 25 CN-TVAVs if touchpanels are used
Control system UPZ file	5.12.04x (CNMSX) or later 5.12.04w (CN-RACKX) or later 5.12.05v (CEN-TVAV) or later
SIMPL Windows version	1.40 (1.50.06 if using CN-TVAV)

Minimum System Requirements

NOTE: If both the Web Server and Real-Time Engine are to be located on one computer, the memory requirements are the same as those listed below for the Web Server PC (no additional memory is required for a one-computer configuration).

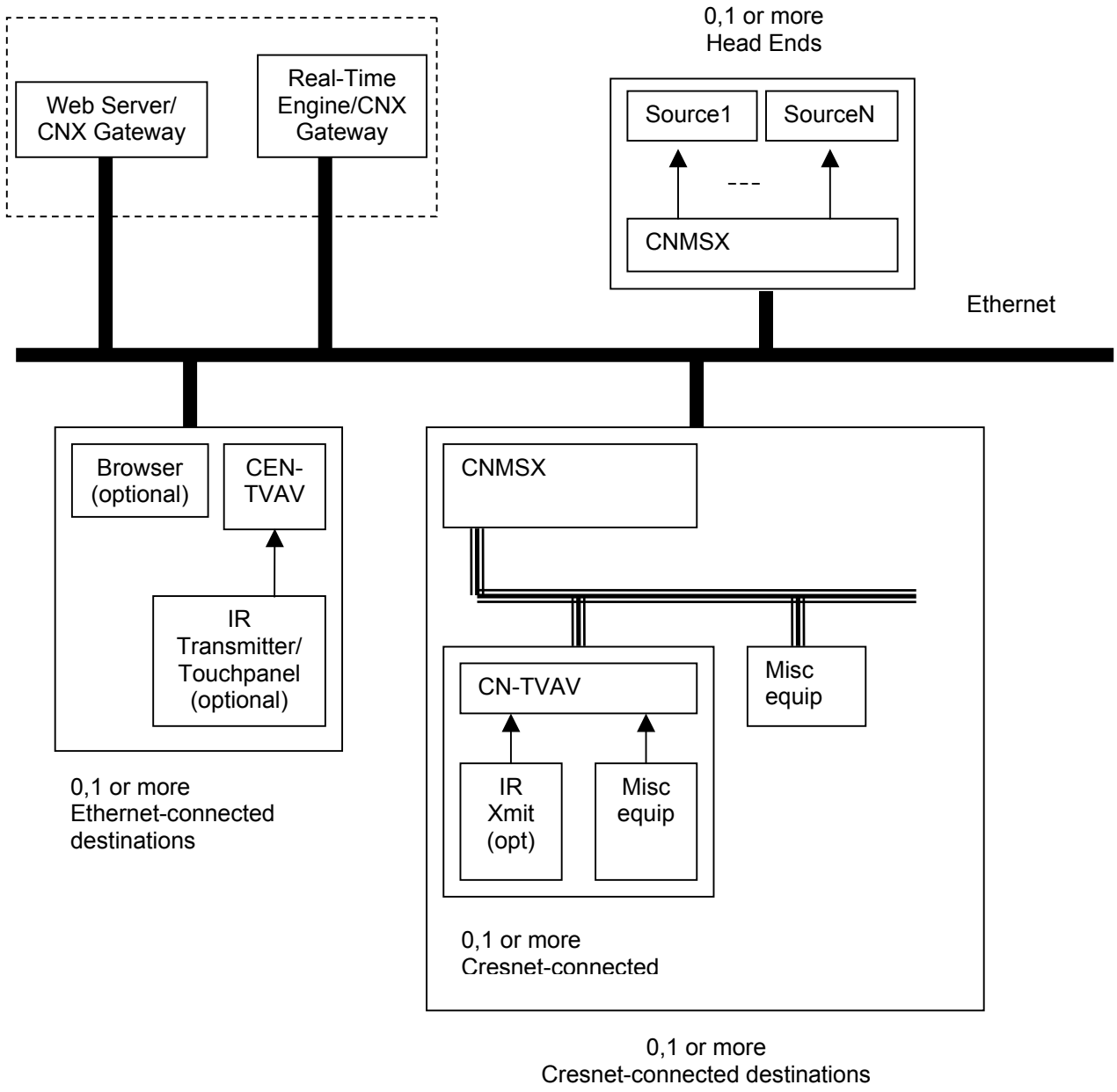
Web Server PC	
Hardware	600 MHz Pentium II Processor 512 MB RAM Network Card TCP/IP
Operating System/ Software	Windows NT Server 4.0 with Service Pack 4 or later Windows NT 4.0 Option Pack (Internet Information Server 4.0 included) Internet Explorer 5 Microsoft Access 2000 Firewall (optional, but recommended)
Crestron Software/Files	Crestron e-Control CNX Gateway 2.8.6.0 or later Active Server Pages Database Directory

Real-Time Engine PC	
Hardware	600 MHz Pentium II Processor 128 MB RAM Network Card TCP/IP and UDP/IP
Operating System	Windows 95, 98, or NT
Crestron Software	Crestron e-Control CNX Gateway 2.8.6.0 or later Real-Time Engine (Scheduler.exe)

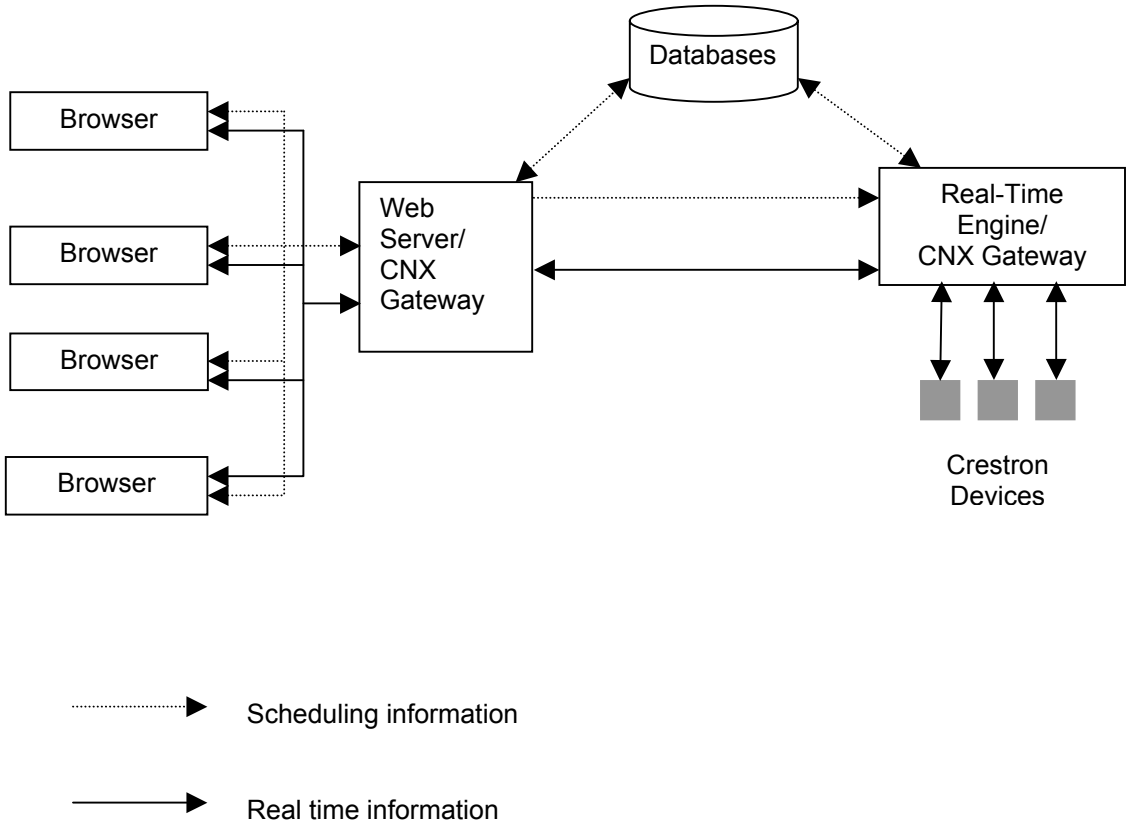
Browser Computers	
Hardware	166 MHz Pentium Processor
Microsoft Software	Windows 95, 98, or NT Internet Explorer 5*

**Although any Web browser should work with e-Schedule since Crestron conforms to Java specifications, Netscape Navigator on a PC platform may improperly display objects on top of other objects, and Netscape Navigator on a MacIntosh platform may not display Java objects in the correct position.*

System Connections



Data Flow


Databases
Browser
Browser
Browser
Browser
Web Server/ CNX Gateway
Real-Time Engine/ CNX Gateway
Crestron Devices
Scheduling information
Real time information

Configuring the e-Schedule Database

Database Categories

The e-Schedule Database Directory is divided into four categories: 1) Configuration 2) Web Browser 3) Resource and 4) System. The Microsoft Access databases in Scheduler_Configuration.mdb must be completed for each installation.

Configuration Databases

Scheduler_Configuration.mdb—defines the hardware, group and room setup, and user information. The programmer must configure the tables in this database.

Scheduler_Events.mdb—automatically stores event information by system, as well as real-time status of sources and destinations.

Resource Databases

Scheduler_Media.mdb—media database containing all media resources and media attributes.

Web Browser Database (DO NOT MODIFY! This database will be overwritten with each new installation and/or upgrade.)

Scheduler_WebGUI.mdb—read-only database for the client-side Web browser.

System Database (DO NOT MODIFY! This database will be overwritten with each new installation and/or upgrade.)

Scheduler_RealTimeControl.mdb—read-only database for the scheduling software.

NOTE: After opening any table in Microsoft Access, select **Design View** from the **View** menu for detailed information about each field in the table, including data types and descriptions.

Database Configuration

Except where noted, all of the tables detailed in this section are located in the Microsoft Access database, **Scheduler_Configuration.mdb**. The examples appearing in this section correlate with the Sample System on page 31.

Scheduling Software Computer(s)

The following two tables define the Web Server and Real-Time Engine computer(s).

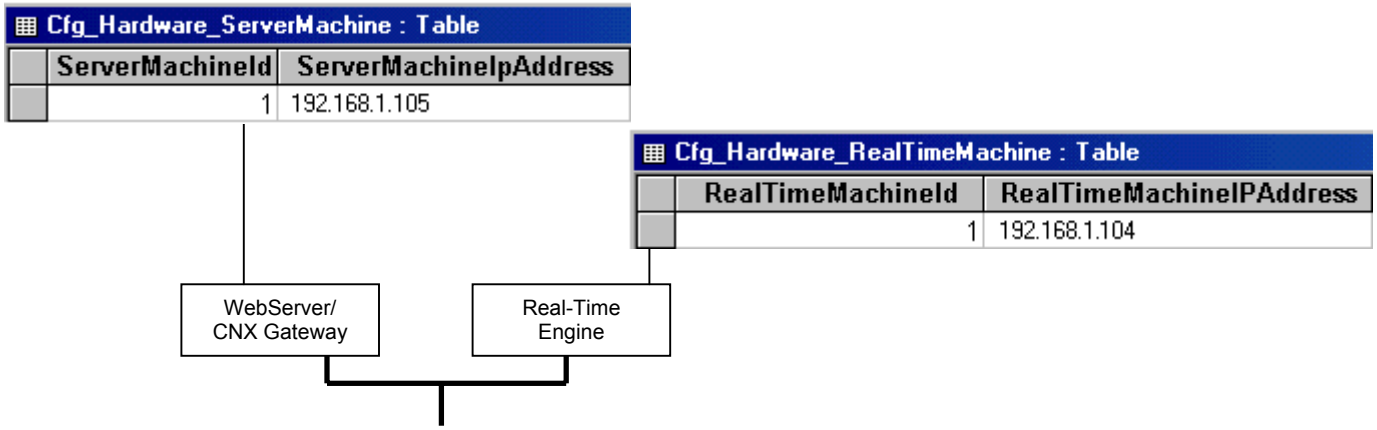
Cfg_Hardware_ServerMachine

Field Name	Description
ServerMachineId	The ID number of the Web Server computer—must be "1", as e-Schedule does not currently support multiple Web Servers.
ServerMachineIPAddress	The static IP Address of the Web Server computer.

Cfg_Hardware_RealTimeMachine

Field Name	Description
RealTimeMachineId	The ID number of the Real-Time Engine computer—must be "1", as e-Schedule does not currently support multiple instances of the Real-Time Engine application.
RealTimeMachineIPAddress	The static IP Address of the Real-Time Engine computer.

Example 1 – Configuration tables for two e-Schedule computers. (Alternatively, the Web Server and Real-Time Engine can be located on the same computer, in which case the IP Addresses would be the same.)



Areas

The following tables define locations, groups and rooms.

NOTE: The system *must* have at least one location, one group and one room.

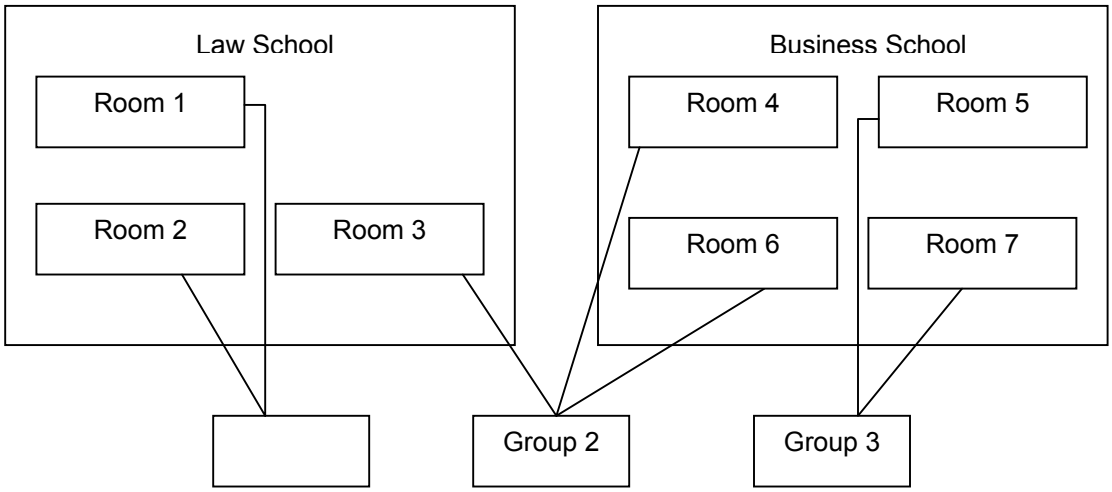
Cfg_Area_Locations	
Field Name	**Description**
LocationId	Each location (building) in the e-Schedule system must be assigned a unique identifier, starting with 1 and proceeding sequentially—gaps are permitted.
LocationName	The name of the location (i.e., *Law School*), referenced by the Location ID, and displayed in the user interface.

Cfg_Area_Groups	
Field Name	**Description**
GroupId	Each group must be assigned a unique identifier, starting with 1 and proceeding sequentially—gaps are permitted.
GroupName	The name of the group (i.e., *First Year Classes*), referenced by the Group ID, and displayed in the user interface.

Cfg_Area_SubLocations	
Field Name	**Description**
SubLocationId	Each sublocation (room) must be assigned a unique identifier, starting with 1 and proceeding sequentially—gaps are permitted.
SubLocationName	The name of the room (i.e., *Room 101*), referenced by the SubLocation ID, and displayed in the user interface.

Cfg_Area_MapTable	
Field Name	**Description**
LocationId	The Location ID taken from Cfg_Area_Locations.
GroupId	The Group ID taken from Cfg_Area_Groups.
SubLocationId	The SubLocation ID taken from Cfg_Area_Sublocations.
Enable	Check box to enable or "remove" the mapping configuration in the system.

Example 2 – Locations, groups and rooms, with corresponding tables mapping the relationships between them.



Cfg_Area_SubLocations

	SubLocationId	SubLocationName
⊞	1	Room 1
⊞	2	Room 2
⊞	3	Room 3
⊞	4	Room 4
⊞	5	Room 5
⊞	6	Room 6
⊞	7	Room 7

Cfg_Area_Locations

	LocationId	LocationName
⊞	1	Law School
⊞	2	Business School

Cfg_Area_MapTable

LocationId	GroupId	SubLocationId	Enable
1	1	1	☑
1	1	2	☑
1	2	3	☑
2	2	4	☑
2	2	6	☑
2	3	5	☐
2	3	7	☐

Cfg_Area_Groups

	GroupId	GroupName
⊞	1	Group1
⊞	2	Group2
⊞	3	Group3

Head End and Source Devices

The following tables define the attributes of all the head end hardware, as well as format types and television settings.

Cfg_Hardware_Switcher	
Field Name	**Description**
SwitcherId	If a switcher is used (multiple switchers are not permitted), it must be assigned "1" as its unique identifier.
SwitcherName	The name of the switcher (i.e., *AutoPatch*)—reserved for future use.
RealTimeMachineID	Taken from Cfg_Hardware_RealTimeMachine, this ID number must be "1".
IPAddress	The static IPAddress of the control system for the switcher.
IPID	The decimal equivalent of the hexadecimal Cresnet IP ID of the switcher.
Enable	Check box to enable or "remove" the device in the system.

Cfg_Source_FormatType	
Field Name	**Description**
FormatTypeId	Each format type must be assigned a unique identifier, starting with 1 and proceeding sequentially—gaps are permitted.
Format	The format of the source device (i.e., *VHS* or *DVD*) displayed in the user interface when media is selected. All media titles must have a corresponding format if they are to be used in a source.
Controllable	Check box that indicates whether a source device must be controlled, either manually or remotely (i.e., a VCR is controllable, whereas a television tuner is not.)
Load Required	Check box that indicates if the device requires that a media title be physically loaded into it. (For example, a VCR or CD player requires manual loading, whereas the television tuner does not).

Cfg_Hardware_LegalChannels	
Field Name	**Description**
ChannelId	Each TV channel must be assigned a unique identifer, beginning with 1 and progressing sequentially (gaps NOT permitted).
ChannelNumber	In broadband systems, the channel number is the actual channel referenced by the Channel ID. (Ignored in baseband systems—enter 0.)
ChannelName	The channel name (i.e., *Bloomberg*, *History Channel*).
SwitcherInput	In baseband systems only, this is the switcher input ID number that is specified in SIMPL Windows. (Ignored in broadband systems—enter 0.)
Valid Channel	Check box that enables or disables the channel setting. When disabled, the channel will be skipped during a Channel Up or Channel Down request, as well as during a scheduling request.

Example 3 – Configuration table for channels

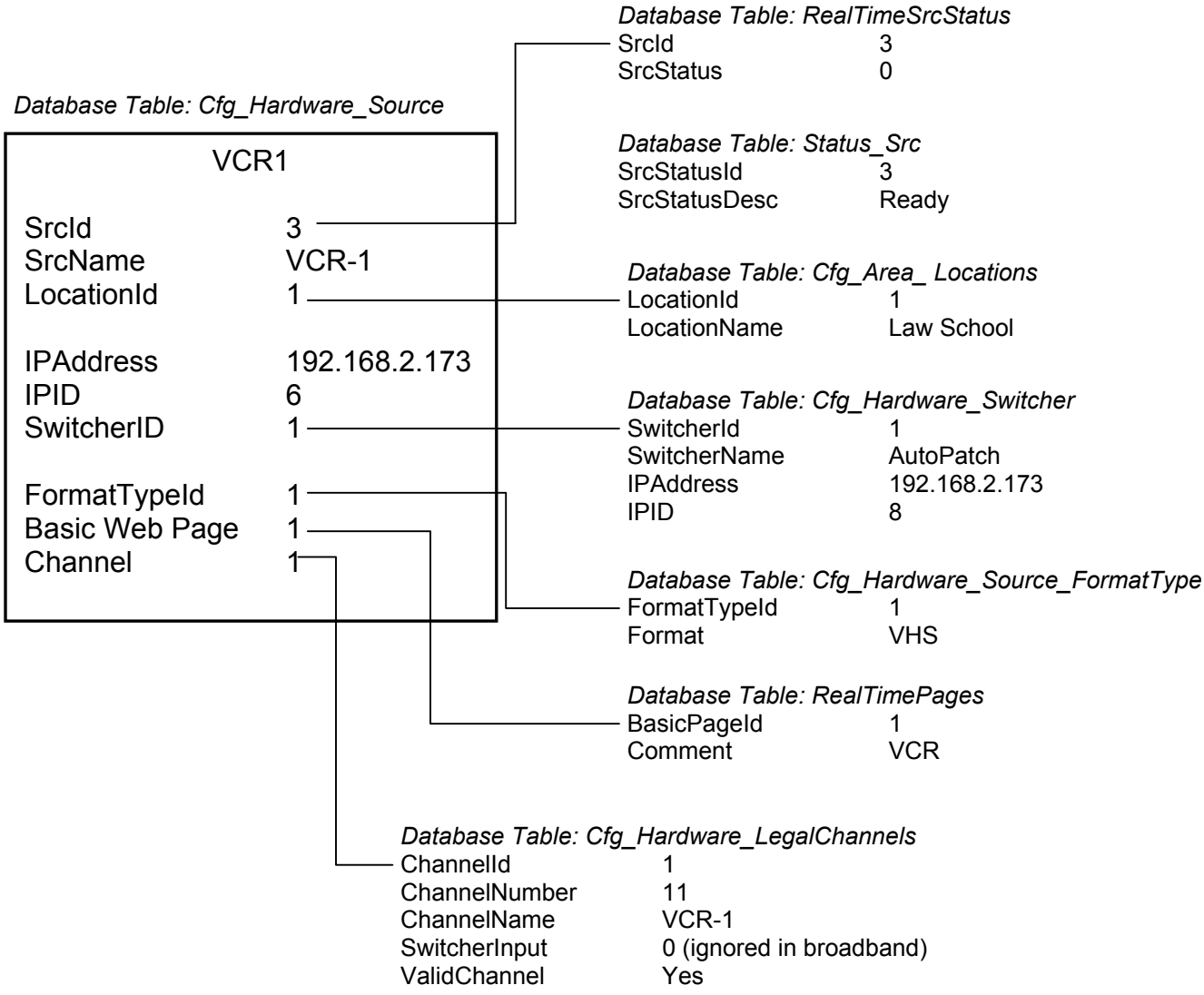
Cfg_Hardware_LegalChannels : Table

ChannelId	ChannelNumb	ChannelName	SwitcherInput	ValidChannel
1	11	VCR-1	21	☑
2	12	2-HBO	22	☑
3	13	3-CBS	23	☑
4	14	4-BLOOMBERG	24	☑
5	15	5-NBC	25	☑
6	16	6-DSNY	26	☑
7	17	7-FOX	27	☑
8	18	8-DISC	28	☑
9	19	9-TLC	29	☑
10	20	10-HIST	30	☑

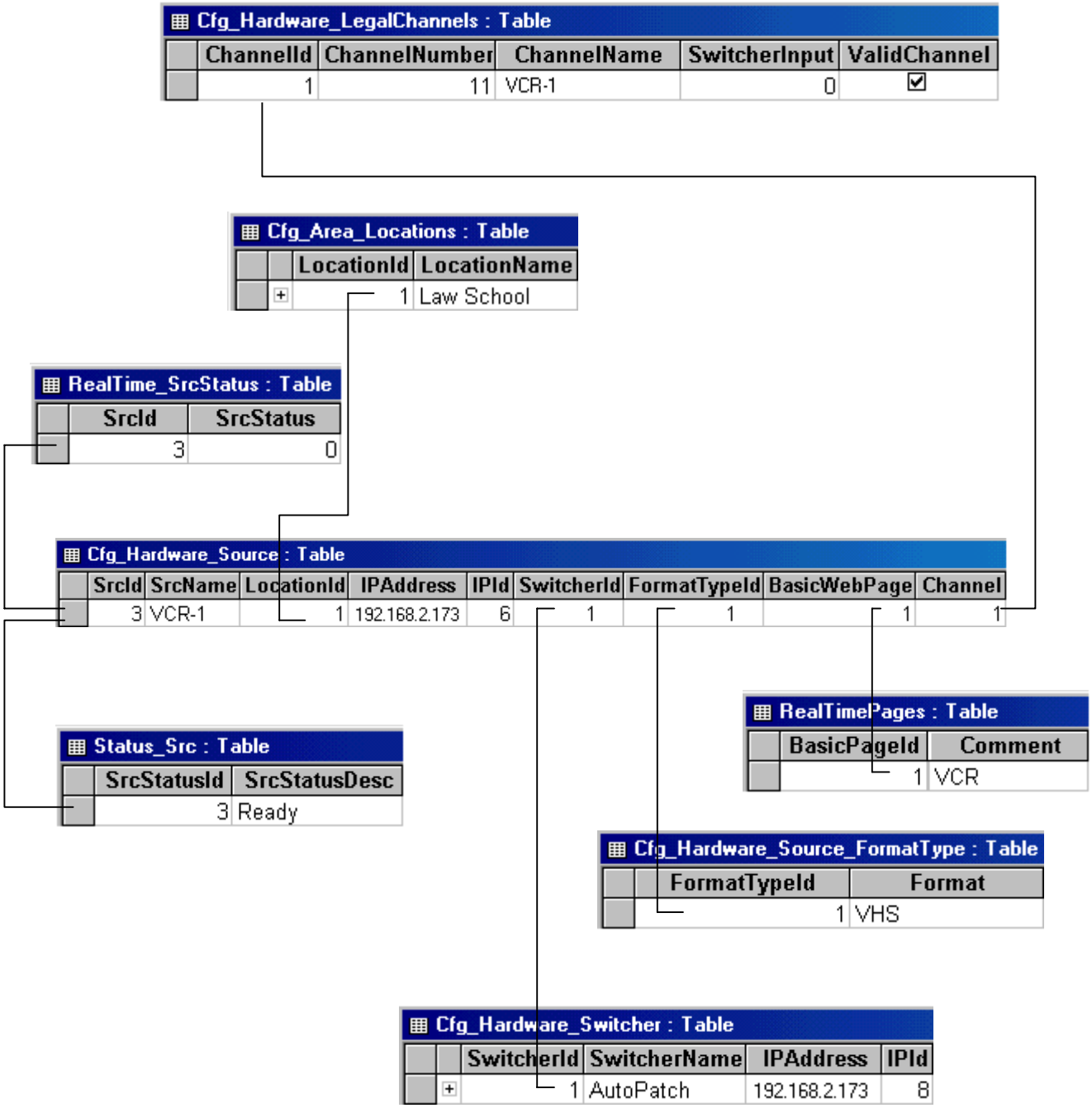
Cfg_Hardware_Source	
Field Name	**Description**
SrcID	Each source device must be assigned a unique identifier, starting with 1 and proceeding sequentially—gaps are permitted.
SrcName	The name of the device (i.e., *TV Tuner*), referenced by the Source ID and displayed in the user interface.
LocationID	The location of the source device. This ID number is taken from the table Cfg_Area_Locations.
RealTimeMachineID	Taken from Cfg_Hardware_RealTimeMachine, this ID number must be "1".
IPAddress	The static IP Address of the control system for this device.
IPID	The decimal equivalent of the Cresnet IP ID of the device.
SwitcherID	For baseband systems, this is the switcher used by the device. This ID number is taken from the table Cfg_Hardware_Switcher. (Ignored in broadband systems.)
FormatTypeId	The ID number taken from Cfg_Hardware_Source_FormatType.
BasicWebPage	This ID number must be taken from the BasicPageID field of the table RealTimePages, located in the read-only database, *Scheduler_RealTimeControl*. (Currently the choices are: 1 = VCR; 2 = DVD; 3 = Projector; 4 = Environment; and 5 = TV Tuner.)
Channel	In broadband systems only, this ID number must be the same as the ChannelId taken from the table Cfg_Hardware_LegalChannels. (Ignored in baseband systems.)
Enable	Check box to enable or "remove" the device in the system.

RealTimeSrcStatus (Scheduler_Events.mdb)	
Field Name	**Description**
SrcId	The ID number of the source, taken from Cfg_Hardware_Source.
SrcStatus	This field must be initialized to the default setting of "0", indicating that the source is "Ready".

Example 4 (below and following page) – Configuration table for head end VCR source device, with corresponding entries in tables for real-time status, location, switcher, format type and channels. The control system that controls both the VCR and switcher is located at IP Address 192.168.2.173.



Example 4 (continued)



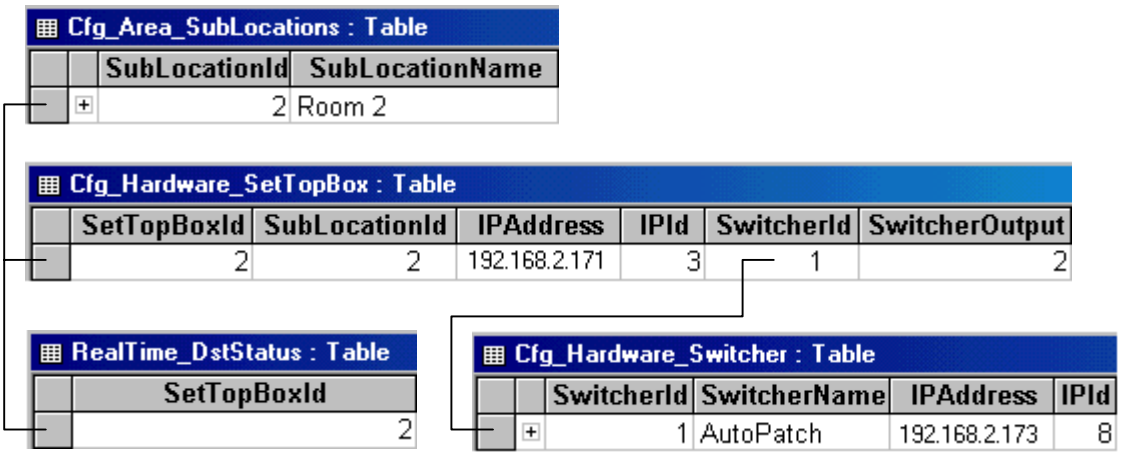
Cfg_System_Variables	
Field Name	**Description**
GlobalSafeChannel	The default television channel for the entire e-Schedule system, both at startup and at the end of a scheduled event, taken from the ChannelId field of Cfg_Hardware_LegalChannels.
BasebandOrBroadband	0 = Baseband; 1 = Broadband.

Destination Devices

Cfg_Hardware_SetTopBox	
Field Name	**Description**
SetTopBoxId	The ID number of the set-top box (room controller)—must be the same as the SubLocationId.
SubLocationId	The ID number of the room where the set-top box is located, taken from Cfg_Area_SubLocations.
RealTimeMachineID	Taken from Cfg_Hardware_RealTimeMachine, this ID number must be "1".
IPAddress	The static IPAddress of the set-top box or control system, if set-top box does not have its own IP Address.
IPID	The decimal equivalent of the hexadecimal Cresnet IP ID of the set-top box.
SetTopBoxType	Type of controller, i.e., *CEN-TVAV*, taken from Cfg_Hardware_SetTopBox_Variables.
SwitcherID	In baseband systems only, this is the ID number of the head end switcher, taken from Cfg_Hardware_Switcher.
SwitcherOutput	In baseband systems only, this is the switcher output ID number that is specified in SIMPL Windows.
SafeChannel	Overrides the global (default) safe channel defined in Cfg_System_Variables (–1 = Use Global Safe Channel)—currently unused.
Enable	Check box to enable or "remove" the device in the system.

RealTime_DstStatus (Scheduler_Events.mdb)	
Field Name	**Description**
SetTopBoxId	The ID number of the set-top box (room controller), taken from Cfg_Hardware_SetTopBox.

Example 5 – Configuration table for set-top box, with corresponding entries in tables for real-time status, sublocation and switcher.



Cfg_Area_SubLocations : Table

SubLocationId	SubLocationName
2	Room 2

Cfg_Hardware_SetTopBox : Table

SetTopBoxId	SubLocationId	IPAddress	IPId	SwitcherId	SwitcherOutput
2	2	192.168.2.171	3	1	2

RealTime_DstStatus : Table

SetTopBoxId
2

Cfg_Hardware_Switcher : Table

SwitcherId	SwitcherName	IPAddress	IPId
1	AutoPatch	192.168.2.173	8

Cfg_ConflictChecking_Options	
Field Name	**Description**
OptionId	ID for the conflict-checking option (see below).
OptionName	1 = RecurringEvents (not available); 2 = Groups; 3 = Multilocation.
Active	Check box to enable or disable each option. Option 2 should be enabled if the system is to permit group scheduling. Option 3 should be enabled if a "location" denotes a separate building. In this way media that is physically located in one building will not be scheduled for viewing in another building.

Example 6 – Configuration table for conflict checking options

Cfg_ConflictChecking_Options : Table

OptionId	OptionName	Active
1	RecurringEvents	☐
2	Groups	☑
3	Multilocation	☑

Signals

Since the Real-Time Engine routes all signals, it is the reference point for input and output. Thus signals can be defined as either input commands to the Real-Time Engine or output commands from the Real-Time Engine. One example of an input command is an *auto-start* signal, which is an action such as *Rewind* or *Play* that the end-user can schedule to take place automatically at the beginning and/or end of an event. The Real-Time Engine interprets the command as if the rewind or play button on a piece of hardware were actually pressed. It then processes the signal and routes it accordingly to execute the action.

In contrast, a *global* signal is an example of an output command, which can trigger a join number on any device and is not processed as a request. The global signal initiates in the Real-Time Engine itself, and can be used to turn the lights on in a given location, for example, or adjust a thermostat.

Cfg_EventSignals_Signals

Field Name	Description
EventSignalId	Every signal must be assigned a unique identifier, starting with 1 and proceeding sequentially—gaps are permitted.
EventSignalName	The name of the signal (i.e., *Rewind*), referenced by the event signal ID and displayed in the user interface.
JoinNumber	The join number that is triggered.
HardwareId	This field, together with the CNXType field, identifies the hardware device—source, set-top box or switcher—that acts on the join number. If the device is a source, its SourceId must be taken from Cfg_Hardware_Source. For a destination device, the SetTopBoxId must be taken from Cfg_Hardware_SetTopBox. For a switcher, the SwitcherId must be taken from Cfg_Hardware_Switcher. (A HardwareId of "0" together with a CNXType of "2" identifies the controlling room.)
CNXType	1=Source; 2=Destination; and 4=Switcher.
IOType	1=Digital; 2=Analog; 4=Serial—taken from IOType table in Scheduler_RealTimeControl.mdb.
IO	Specifies whether the signal is an input command or output command. 0 (zero) = output (global), 1 = input (auto-start).
Enable	Check box to enable or "remove" signal from system.

The following four tables can be used to change the labelling of the folders that are displayed in the e-Schedule user interface during scheduling requests. The two main folders, Event Start and Event End, cannot be modified.

Cfg_EventSignals_Folders

Field Name	Description
FolderNameId	Each folder that displays auto-start signals must be assigned a unique identifier, starting with 1 and proceeding sequentially—gaps are permitted.
FolderName	The name of the folder, referenced by the FolderNameId and displayed in the user interface.

Cfg_EventSignals_MapTable

Field Name	Description
FolderNameId	Taken from Cfg_EventSignals_Folders.
EventSignalId	Taken from Cfg_EventSignals_Signals.

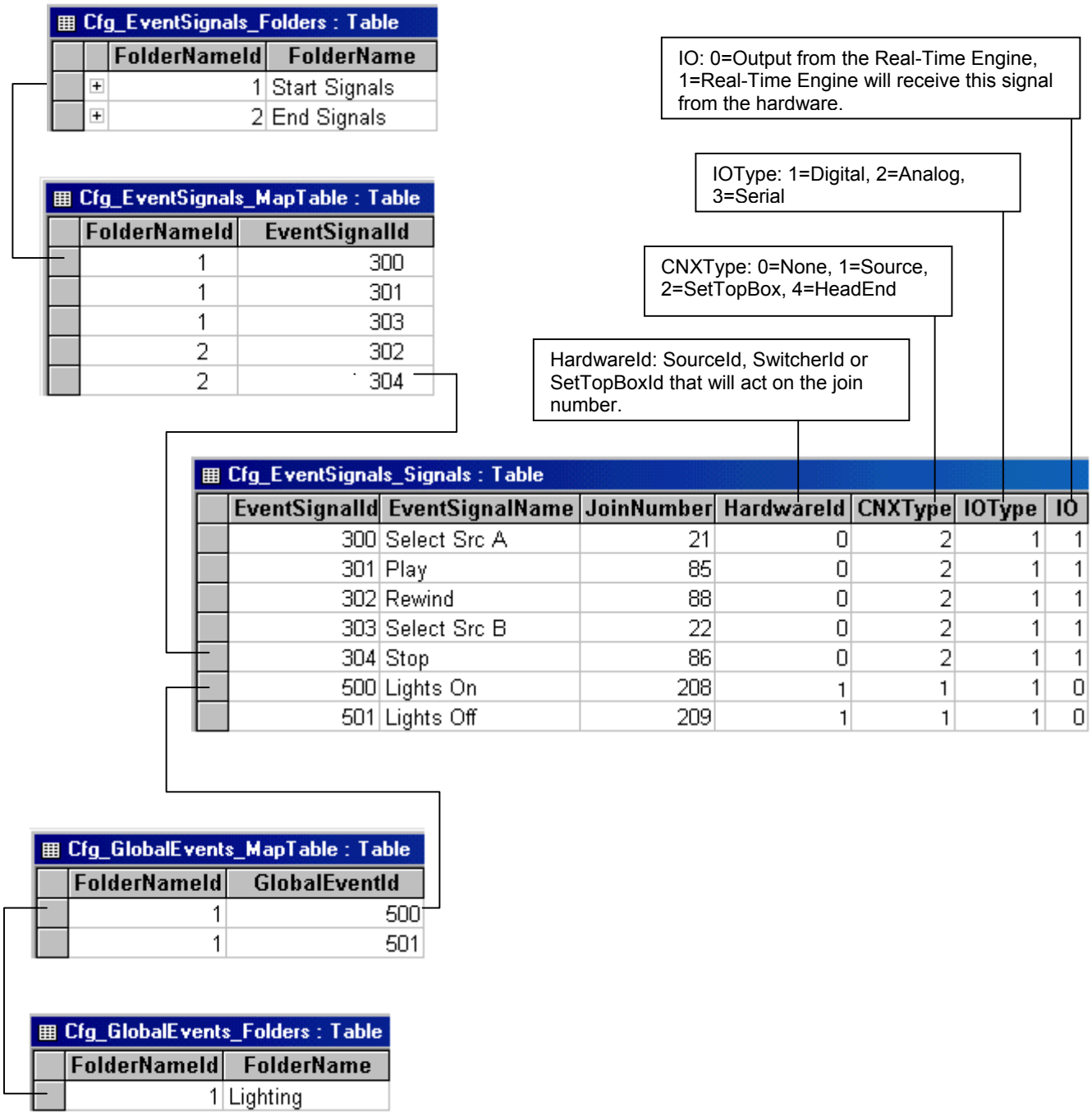
Cfg_GlobalEvents_Folders

Field Name	Description
FolderNameId	Each folder that displays global signals must be assigned a unique identifier, starting with 1 and proceeding sequentially—gaps are permitted.
FolderName	The name of the folder referenced by the FolderNameId and displayed in the user interface.

Cfg_GlobalEvents_MapTable

Field Name	Description
FolderNameId	Taken from Cfg_GlobalEvents_Folders.
EventSignalId	Taken from Cfg_EventSignals_Signals.

Example 7 – Configuration of auto-start and global signals



Signal Macros

Signal Macros are now implemented in e-Schedule v3.02. Signal Macros combine groups of individual signals and eliminate the need for the user to select each signal separately. Signal Macros can be be used at the beginning and/or end of a Media Event and in Global Signal Events.

For example, at the beginning of an media event, a user can select a signal, Auto Start, which will automatically execute the signals, TV Power On, Select Source A, and Play.

To insert a signal macro, insert a new signal into the table, *Cfg_EventSignals_Signals*. The EventSignalID must be >= 1000. Then in the table, *Cfg_EventSignals_MacroMapTable*, define the signals that this macro will trigger. The field, Order, specifies the sequence order in which each signal will be triggered within the event.

For example, the macro, Auto Start, will trigger signals 250, 300, and 301 (TV Power On, Select Source A, and Play).

Cfg_EventSignals_Signals

EventSignalID	EventSignalName	Join Number	HardwareID
250	TV Power On	…	…
251	TV Power Off	…	…
300	Select Source A	…	…
301	Play	…	…
302	Stop	…	…
1000	Auto Start	N/A	N/A
1001	Auto Stop	N/A	N/A

Cfg_EventSignals_MacroMapTable

MacroID	SignalID	Order
1000	250	1
1000	300	2
1000	301	3
1001	251	1
1001	300	2
1001	302	3

Privileges

User privileges have been greatly improved in version 3.02 and later. Following are the recommended default privileges for both an administrator level account and a user level account. The order of the field values is extremely important since this table is very closely tied to the front end web pages. Please make sure the order here and in e-Schedule matches exactly when editing this table:

Administrator (*The recommended default values below assume that the administrator's user ID is 1.*)

Cfg_User_MapTable

UserId	PrivilegeId	_Key
1	1	NONE
1	3	NONE
1	9	NONE
1	10	NONE
1	4	NONE
1	108	NONE
1	5	NONE
1	110	NONE
1	8	NONE
1	124	NONE
1	101	NONE
1	103	NONE
1	104	NONE
1	106	NONE
1	111	NONE
1	112	NONE
1	113	NONE
1	114	NONE
1	115	NONE
1	116	NONE
1	117	NONE
1	118	NONE
1	119	NONE
1	120	NONE
1	121	NONE
1	122	NONE

User (*The recommended default values below assume that the user's user ID is 2.*)

Cfg_User_MapTable

UserId	PrivilegeId	_Key
2	1	NONE
2	4	NONE
2	107	NONE
2	5	NONE
2	109	NONE
2	101	NONE
2	102	NONE

Join Number Pass-Throughs

The **Cfg_Hardware_JoinNumPassThrus** table defines ranges of join numbers that can be used in SIMPL Windows to specify *pass-through* signals, which are passed back and forth directly between a set-top box (room controller) and Web browser. This is useful for commands such as Volume Up that don't need to be transmitted to the head end.

The Real-Time Engine routes both the input and output signals, as usual. Signals sent from a browser are transmitted to its corresponding set-top box and those sent from a set-top box are transmitted to all connected browsers. A pass-through is only valid between a Web browser and a set-top box (not between a Web browser and switcher, for example).

Cfg_Hardware_JoinNumPassThrus Table

Field Name	Description
PassThruStart	Start of the range of join numbers.
PassThruEnd	End of the range of join numbers.
Enabled	When selected, this check box indicates that the specified join numbers will in fact be programmed as pass-throughs in SIMPL Windows.
IOType	1=Digital, 2=Analog.
Comment	Comment for database—not used by scheduing software.

Example 8 – Configuration table for join number pass-throughs

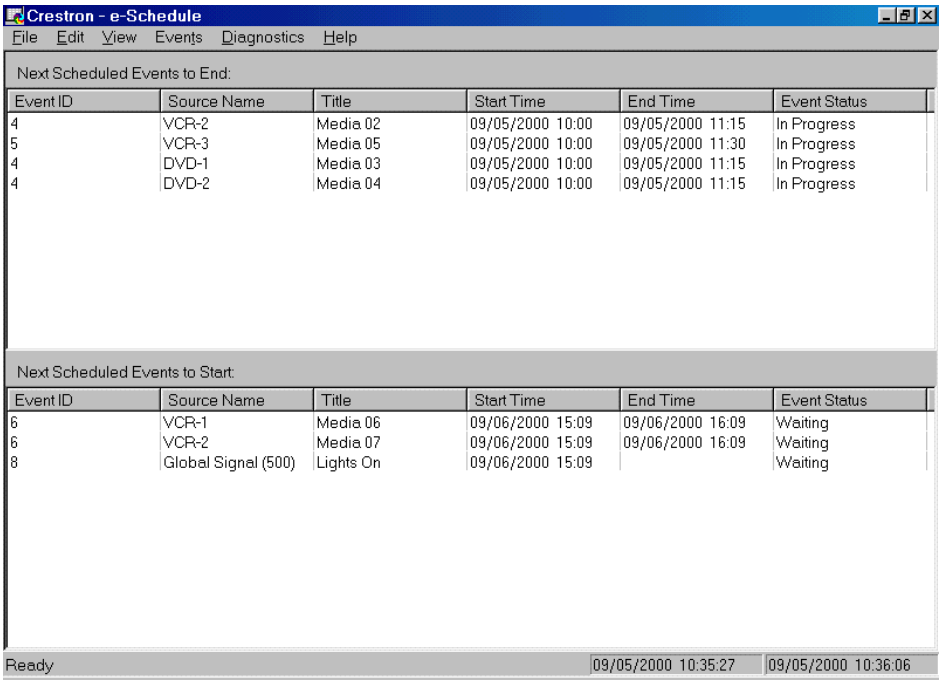
Cfg_Hardware_JoinNumPassThrus : Table

	PassThruStart	PassThruEnd	Enabled	IOType	Comment
	41	42	☑	1	Volume Mute ON/OFF
	45	46	☑	1	TV Power ON/OFF
	61	62	☑	1	VOL+/-
	39	39	☑	1	Mute (toggle)
	47	47	☑	1	TV Power (toggle)
	206	207	☑	1	Lights On/Off
	219	230	☑	1	View Channel Keypad

Real-Time Engine (Scheduler.exe)

After configuring the databases, it is necessary to launch the Real-Time Engine in order to set preferences and connections. To start the Scheduler.exe program (the CNX Gateway starts automatically when the computer boots up), double-click the **Start Real Time Engine** shortcut icon or select **Crestron | e-Schedule | Scheduler.exe** from the Windows Start menu. The e-Schedule icon will appear in the system tray of the Windows status bar. Right-click the system tray icon and then select **Show e-Schedule Event Manager…** to display the Crestron e-Schedule application window.

The e-Schedule application window consists of two panes. The top pane, marked **Next Scheduled Events to End**, lists events that are currently in progress, while the bottom pane, marked **Next Scheduled Events to Start**, lists the events that have been scheduled to start next. The information about each event includes the Event ID, name of the source device, media or signal names, start and end times, and the status of the event.



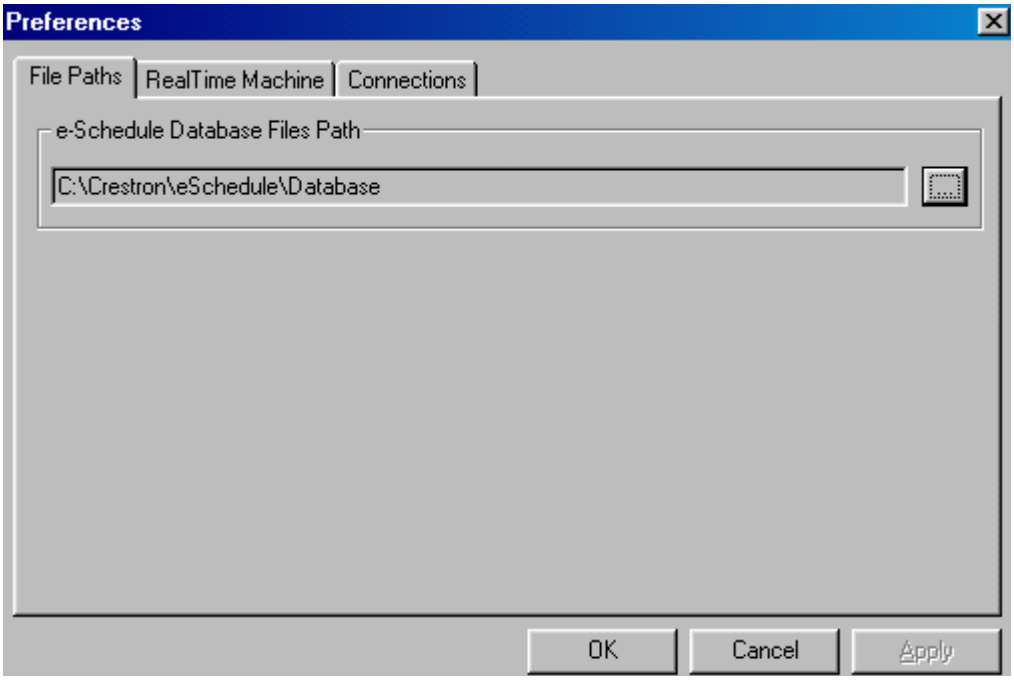
Note: To quit the Scheduler.exe application, right-click the system tray icon and select **Stop Crestron e-Schedule**.

The status bar of the application window displays two date and time areas. The first indicates the latest date and time that a new or modified schedule was received from the Web Server. The second indicates the last time that the Real-Time Engine checked for a scheduled event. (The Real-Time Engine can be configured to check for events at specified intervals, using the **Preferences** dialog box.)

Setting Preferences

File Paths

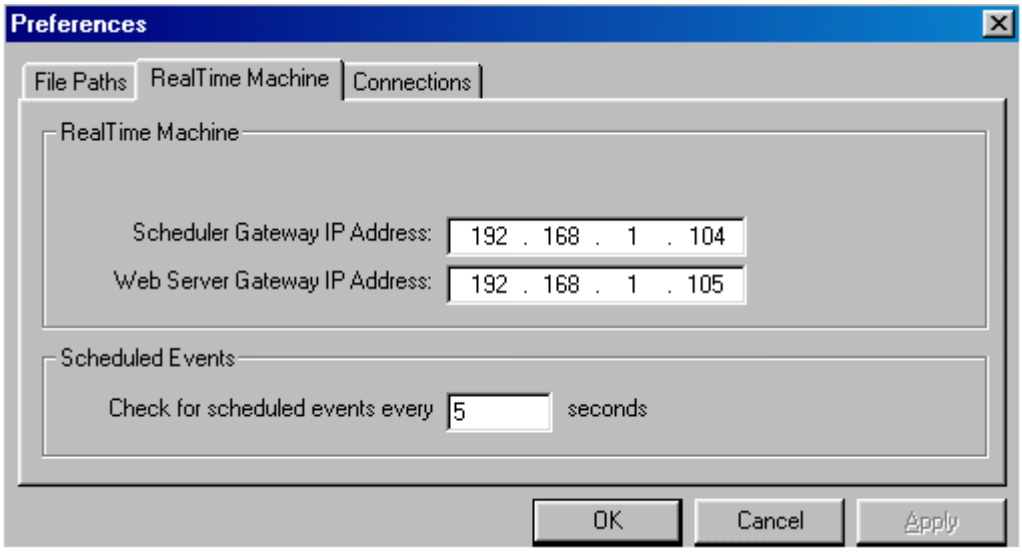
Select **Edit | Preferences** to open the **Preferences** dialog box, which consists of a tabbed page. The **File Paths** tab displays the path that points to the Crestron e-Schedule Database Directory, containing all the e-Schedule databases.



Real Time Machine

The **Real Time Machine** tab of the **Preferences** dialog box is used to specify IP Addresses and other system settings.

- **Scheduler Gateway IP Address**—specifies the IP Address of the CNX Gateway computer for the Real-Time Engine. This IP Address may or may not be the same as that of the Web Server. (See *Web Server Gateway IP Address*, below.)
- **Web Server Gateway IP Address**—specifies the IP Address of the CNX Gateway computer for the Web Server.
- **Check for scheduled events every 'n' seconds**—configures the Real-Time Engine to check for scheduled events at the specified interval. Crestron recommends the default setting. (See NOTE, below.)

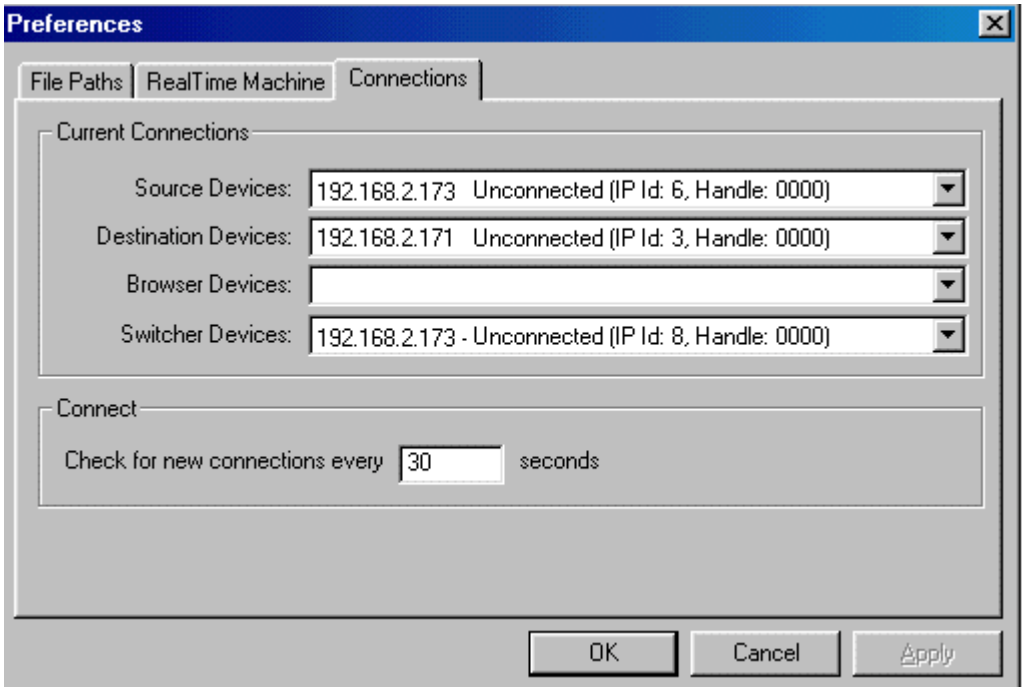


NOTE: Crestron recommends using the default settings for periodic system checks, as lengthening or shortening the time interval may adversely affect system response.

Connections

The **Current Connections** area of the **Connections** tab lists the IP Addresses of all hardware devices that are configured to run with the Real-Time Engine. Each field also displays the connection status and CNX Gateway connection handle, for debugging purposes.

Check for new connections every 'n' seconds—since set-top boxes and browsers are likely to be dynamically connected and disconnected to the system at any time, the Real-Time Engine will continuously poll all hardware at the specified interval, to make sure a connection is active and valid. (See NOTE, below.)



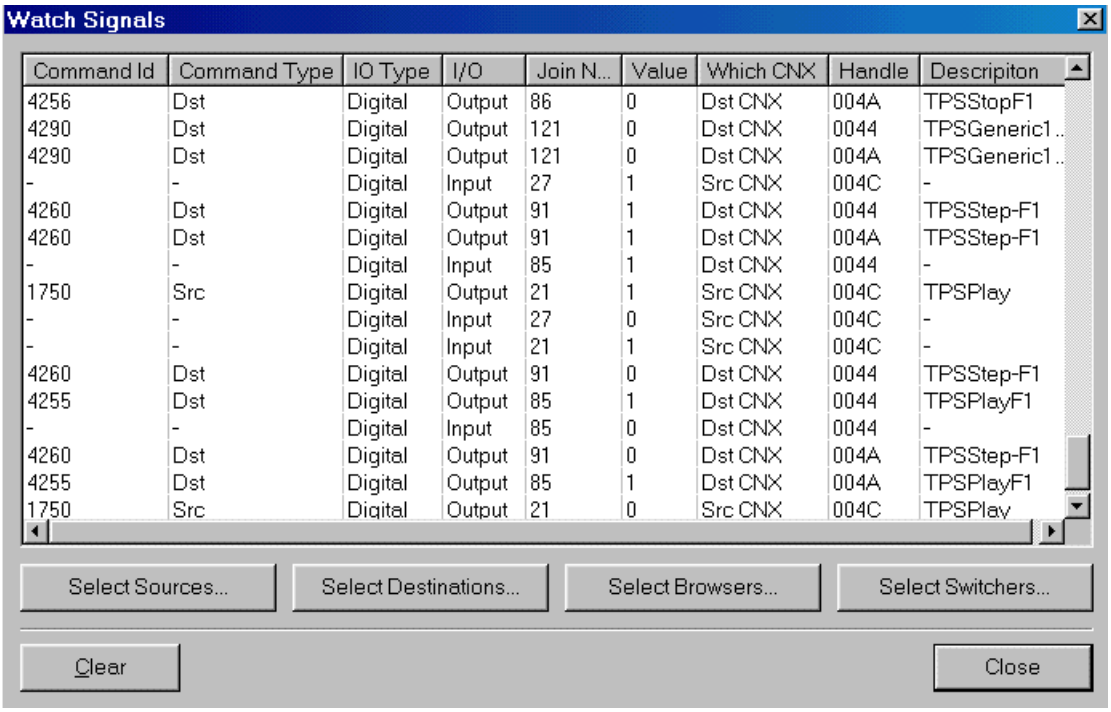
NOTE: Crestron recommends using the default settings for periodic system checks, as lengthening or shortening the time interval may adversely affect system response.

Diagnostic Utilities

The Configuration menu of the Real-Time Engine application window includes two options for debugging, **Watch Signals** and **Configuration**.

Watch Signals

The **Watch Signals** window displays information about all the signals that the Real-Time Engine receives and transmits. As stated previously, all signals are defined as either input to the Scheduler or output from the Scheduler, and this is specified in the **I/O** field. The **IO Type** field gives the type of signal—digital, analog or serial. The **Value** field gives the value that was sent. **Command Type** lists the type of target location for the command. This should match the **Which CNX** field that displays the CNX Interface. **Handle** lists the CNX Gateway connection handle. The Watch Signals window also gives the join number and description of all commands.



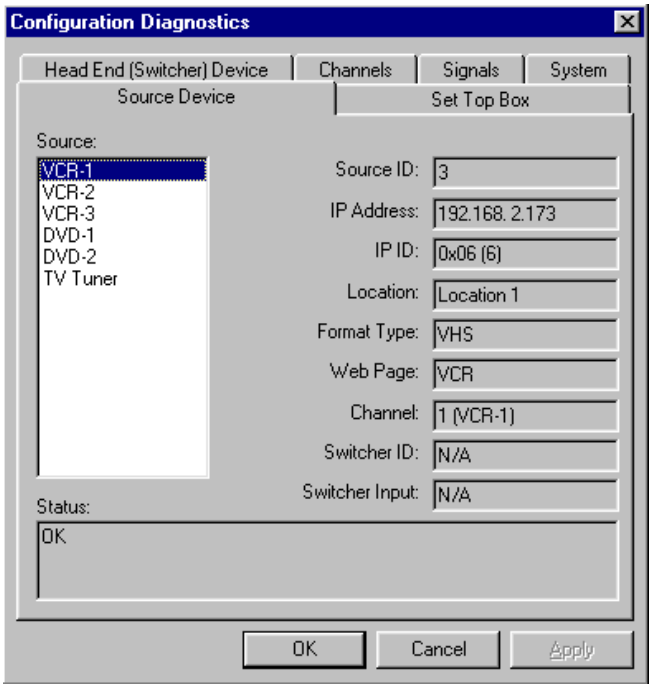
NOTE: The "Watch Signals" window should only be used for debugging, since the system slows down dramatically when this window is open.

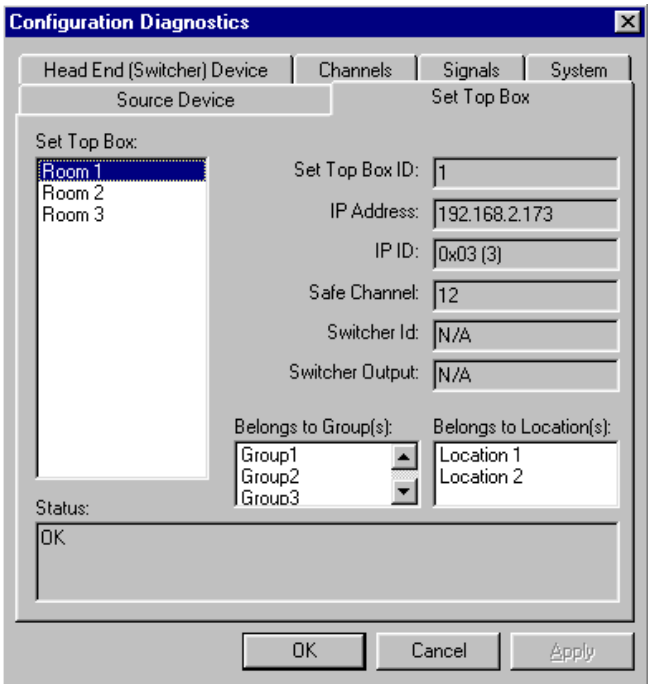
Configuration

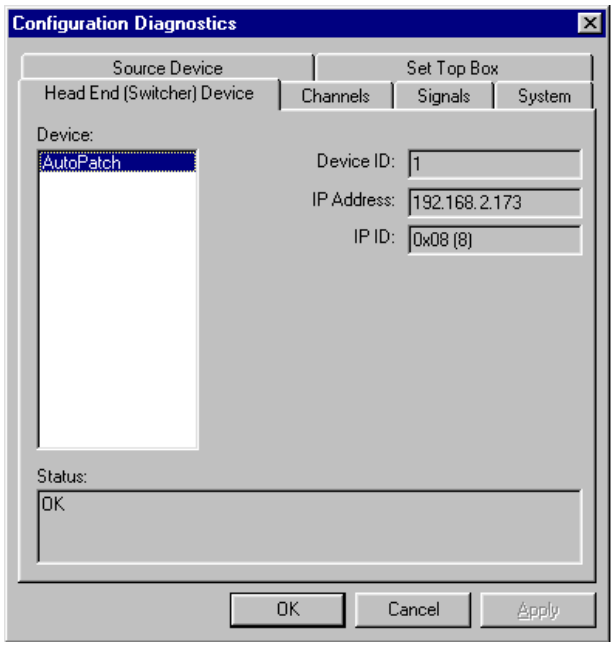
The "Configuration Diagnostics" dialog box includes tabs for each component of the e-Schedule system. Configuration diagnostics should be reviewed whenever the e-Schedule databases are created, modified, or updated. Select a device from the display list to view information about the corresponding entries as they appear in the configuration databases. The **Status** window will list any errors or omissions.

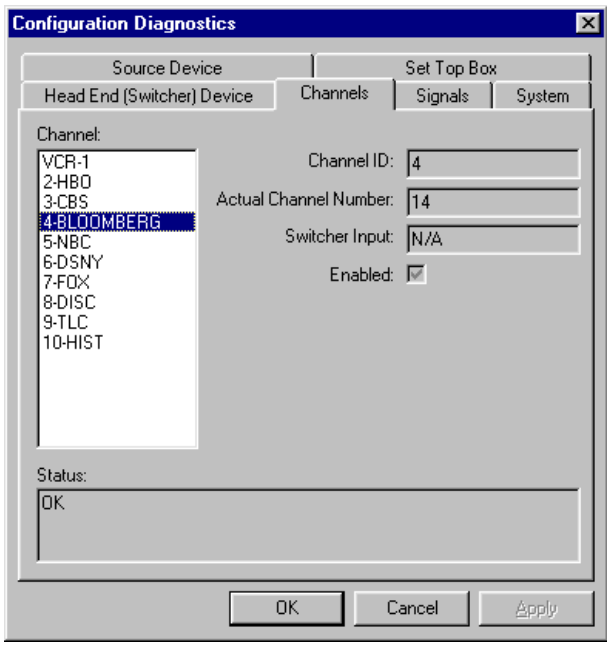
NOTE: Whenever a new e-Schedule version is installed or upgraded the Database Update Utility is automotically launched. This will ensure that the database tables are in the correct format. Crestron recommends viewing the Configuration Diagnostics after this utility runs.

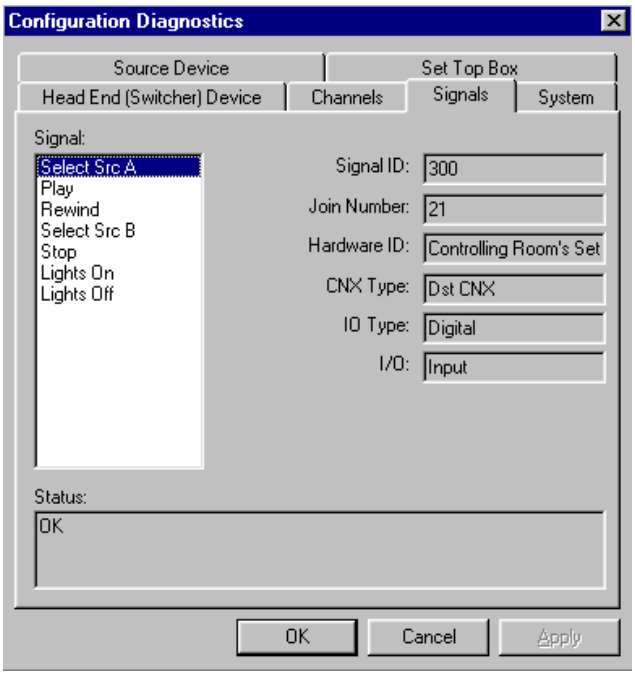
Configuration Diagnostics dialog boxes

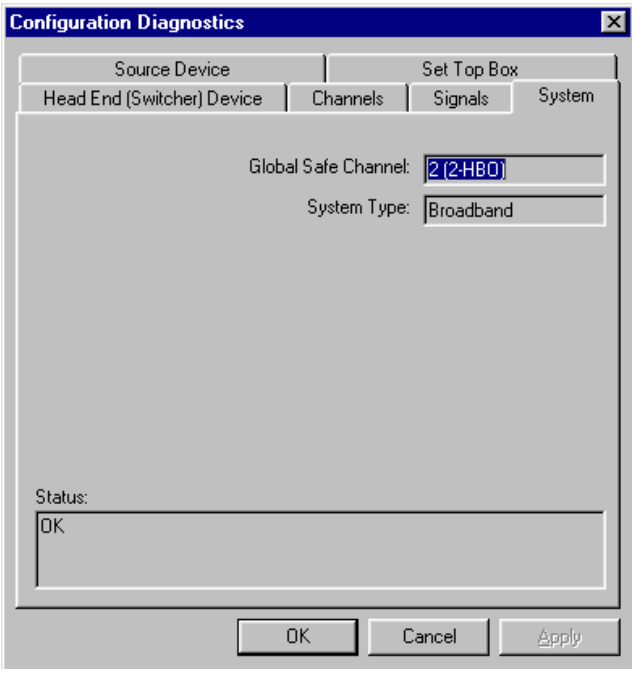





Configuration Diagnostics
Source Device
Set Top Box
Head End (Switcher) Device
Channels
Signals
System
Device:
AutoPatch
Device ID: 1
IP Address: 192.168.2.173
IP ID: 0x08 (8)
Status:
OK
OK
Cancel
Apply


Configuration Diagnostics
Source Device
Set Top Box
Head End (Switcher) Device
Channels
Signals
System
Channel:
VCR-1
2-HBO
3-CBS
4-BLOOMBERG
5-NBC
6-DSNY
7-FOX
8-DISC
9-TLC
10-HIST
Channel ID: 4
Actual Channel Number: 14
Switcher Input: N/A
Enabled:
Status:
OK
OK
Cancel
Apply


Configuration Diagnostics
Source Device
Set Top Box
Head End (Switcher) Device
Channels
Signals
System
Signal:
Select Src A
Play
Rewind
Select Src B
Stop
Lights On
Lights Off
Signal ID: 300
Join Number: 21
Hardware ID: Controlling Room's Set
CNX Type: Dst CNX
IO Type: Digital
I/O: Input
Status:
OK
OK
Cancel
Apply


Configuration Diagnostics
Source Device
Set Top Box
Head End (Switcher) Device
Channels
Signals
System
Global Safe Channel: 2 (2-HBO)
System Type: Broadband
Status:
OK
OK
Cancel
Apply

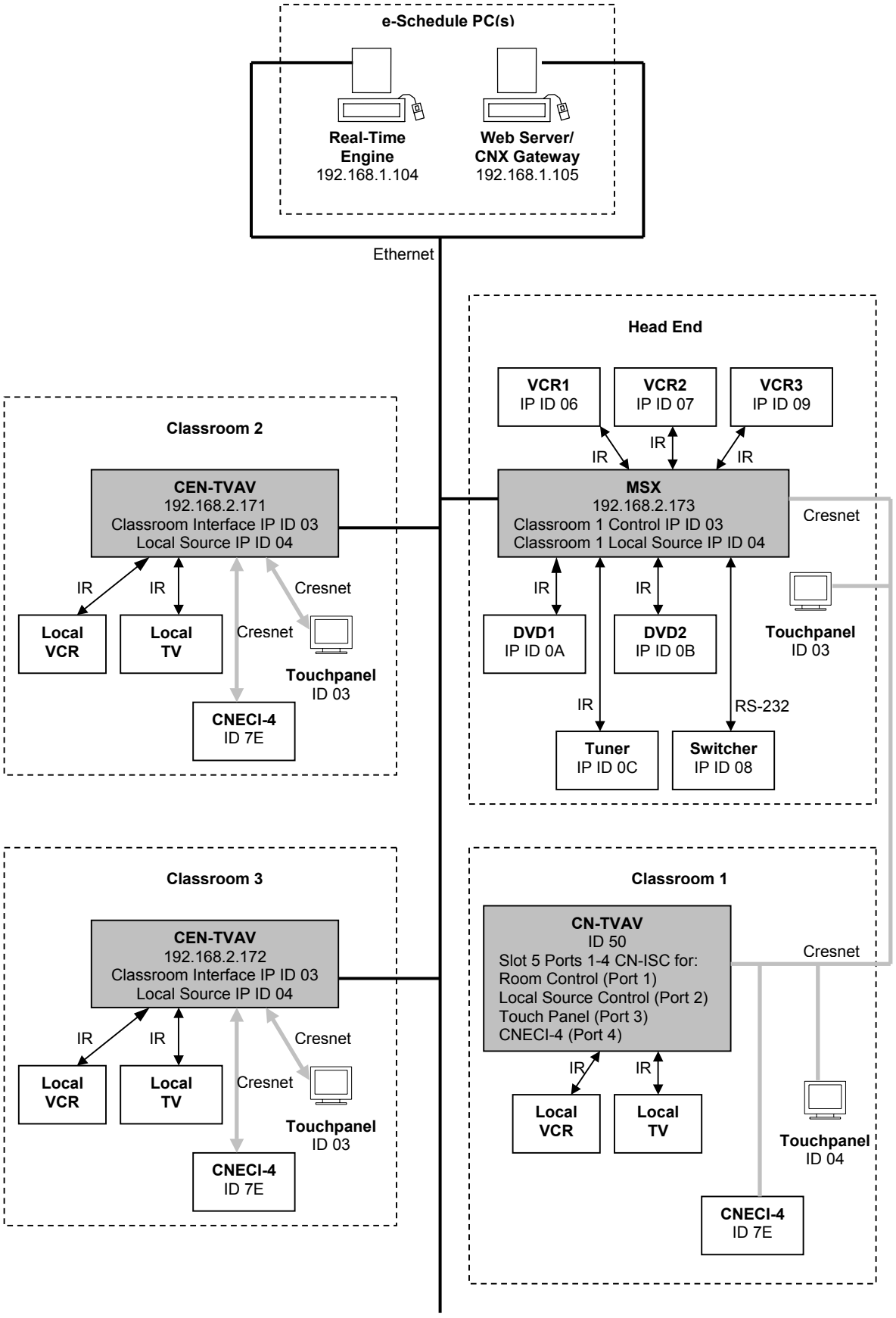
e-Schedule Interface to Control Systems

SIMPL Windows Programming

The e-Schedule Documents directory contains various programs that define the sample system illustrated in Figure 1. Together with the completed configuration databases (also included), these can be used as programming models.

Programming Requirements	
Firmware/Software	**Version (Minimum)**
CNMSX (AV/Pro)	5.12.04x
CNRACKX/CNRACKX-DP	5.12.04w
CEN-TVAV	5.12.05v
SIMPL Windows	1.40.07 (1.50.06 if using CN-TVAV)
Symbol Library	smwlib100.exe

Figure 1: Sample System



Sample System Configuration

As illustrated in Figure 1, the sample system consists of two e-Schedule computers and one head end that controls three classrooms. The head end has six video sources on a CNMSX-Pro, although any Ethernet-enabled control system can be used.

Classroom 1 is controlled locally by a CN-TVAV; Classrooms 2 and 3 are controlled by CEN-TVAVs. All three classrooms have local room control from both an MRHC transmitter and a touchpanel, and lighting control via a CNECI-4 high voltage relay module.

The exact configuration is as follows:

- 1 Real-Time Engine and 1 Web Server/CNX Gateway, located at IP Addresses 192.168.1.104 and 192.168.1.105.
- 1 head end CNMSX-Pro ("Headend MSX #1") at IP Address 192.168.2.173.
- 3 VCR sources at IP IDs 06, 07 and 09, on Headend MSX #1.
- 2 DVD players at IP IDs 0A and 0B, on Headend MSX #1.
- 1 television tuner at IP ID 0C, on Headend MSX #1.
- 1 switcher at IP ID 08, on Headend MSX # 1.
- 1 CN-TVAV ("Classroom 1"), at Cresnet ID 50, which is bridged from Cresnet to Ethernet by Headend MSX #1.
- 2 CEN-TVAVs ("Classroom 2" and "Classroom 3") that are located at IP Addresses 192.168.2.171 and 192.168.2.172.
- CNIRHT-MM transmitters, at RF ID EF, to control each CEN-TVAV.
- 2 CNECI-4 modules at Cresnet ID 7E for local lighting of CEN-TVAV Classrooms 2 and 3.
- 1 CNECI-4 at Cresnet ID 7E, for CN-TVAV Classroom 1, controlled by the bridge Headend MSX #1.
- 2 touchpanels at Cresnet ID 03 for local control of Classrooms 2 and 3.
- 1 touchpanel at Cresnet ID 04 for Classroom 1, controlled by the bridge Headend MSX #1.

Note: All entries in the IP Table of each control system must reference the IP Address of the CNX Gateway.

ActiveCNX Interface

An *ActiveCNX Interface* module (found in the *Ethernet Control Modules* folder of the Configuration Manager) enables Ethernet communication between the devices on a control system and the CNX Gateway/e-Schedule

software. An ActiveCNX Interface is considered an Ethernet "device," and therefore gets an IP ID and an entry in the IP Table, which references the IP Address of the CNX Gateway. The e-Schedule system uses four ActiveCNX Interfaces, each with different definitions for 1) Sources 2) Switchers 3) Destinations and 4) Global Signals.

Sources—each source device in the head end must have a corresponding ActiveCNX Interface programmed into the control system. For example, the six source devices in the head end of the sample system require six "Source"ActiveCNX Interfaces to be programmed into the CNMSX-Pro.

Switchers—if a switcher is used, it must have a "Switcher" ActiveCNX Interface programmed into the control system.

Destinations—each destination (set-top box/room) must have a "Destination" ActiveCNX Interface programmed into the *local* control system. Each local source, if any, must have a "Source" ActiveCNX Interface programmed into the *local* control system. For example, Classrooms 2 and 3 of the sample system each have one "Destination" and one "Source" Interface programmed into the CEN-TVAV.

Global Signals—each location where global events may be scheduled must have a "Global Signals" ActiveCNX Interface programmed into the appropriate control system. The Cfg_EventSignals_Signals table can then be configured to schedule and activate specified join numbers on this ActiveCNX Interface.

Non-Ethernet Cresnet Hardware

In the sample program, Classroom 1 is controlled locally by a CN-TVAV—a Cresnet controller with no Ethernet capabilities. Therefore, an Ethernet-enabled control system must serve as a bridge from the Cresnet-based hardware to the Ethernet network. In this case the "bridge" is the head end control system, but any Ethernet-enabled control system can be used.

There are two ways to enable communication between a CN-TVAV and the Ethernet network. The first is to program all the logic in the bridge control system and pass the signals to the CN-TVAV hardware remotely, with no programming in the CN-TVAV itself. Such a program is difficult to maintain, however, and requires a great deal of repetition.

The second, preferred, method involves the following:

1. Program a "Destination" ActiveCNX Interface for the CN-TVAV, as well as a "Source" ActiveCNX Interface for each local source, into the bridge control system (in this case the head end CNMSX-Pro). The ActiveCNX controls are given IP IDs and entries in the IP Table that reference the IP Address of the CNX Gateway, as usual.
2. Route the signals from each ActiveCNX Interface to the CN-TVAV through an ISC symbol on Slot 5 of the CN-TVAV. In this way the signals can be manipulated locally.

Since the CN-TVAV in Classroom 1 does not support Cresnet peripherals, the local touchpanel and CNECI-4 must be wired directly to the Cresnet network and bridged to Ethernet by the head end control system. Thus the control signals for this hardware must also be routed through ISC symbols.

InterSystem Communications Symbol

An ISC, or InterSystem Communications symbol is used to pass digital, analog and serial signals between control systems. An ISC symbol is programmed identically to an ActiveCNX Interface and its definitions are determined by whether it is a 1) Source or 2) Destination.

CEN-TVAV

The CEN-TVAV units that control Classrooms 2 and 3 of the sample system are loaded with the same program, since they both have the same configuration. Here a "Destination" ActiveCNX Interface and a "Source" ActiveCNX Interface (for the local VCR source) will be programmed into the CEN-TVAV. The touchpanel and CNECI-4 will communicate with the CEN-TVAV through Cresnet, as usual, and the MRHC transmitter will control settings for Power, Mute, Volume, Source Control and View Channel.

Points to Remember

- All components of an e-Schedule system—the Web Server, Real-Time Engine, CNX Gateway(s), and Crestron control systems—must have static IP addresses.
- e-Schedule defines three ActiveCNX Interfaces, each with different signals for 1) Sources 2) Switchers and 3) Destinations.
- An ActiveCNX Interface is considered an Ethernet "device," and therefore gets an IP ID and an entry in the IP Table, which must reference the IP Address of the CNX Gateway.
- An Ethernet enabled control system must serve as a bridge from any non-Ethernet Cresnet-based hardware to the Ethernet network. The programming is as follows:
    1. In the bridge control system, include a "Destination" ActiveCNX Interface for the non-Ethernet controller, and a "Source" Active CNX Interface for each local source (if any).
    2. Use InterSystem Communication symbols to pass signals back and forth from the bridge to the non-Ethernet hardware.
- An ISC is programmed identically to an ActiveCNX Interface.
- Avoid tiered switching, i.e., any environment where resource allocation problems may arise.

ActiveCNX Interface Definitions

The definitions that are outlined in this section are contained in the **Definitions** subfolder of the e-Schedule **Documents** Directory. They are listed as follows:

- Classroom Definitions.smw
- Head End Definitions.smw (includes Switcher definitions)

Destination (Classroom) ActiveCNX Interface

Digital Join Numbers

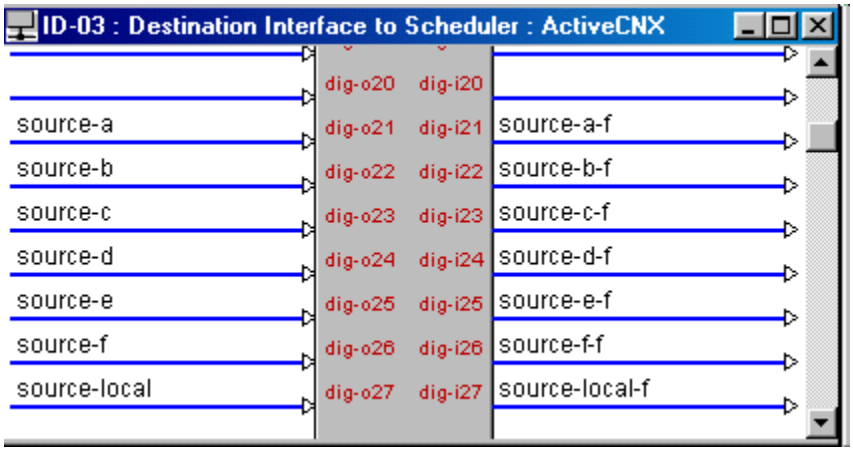
Signals on the left represent data being sent to the Scheduler (input to the Scheduler); signals on the right represent data coming from the Scheduler (output from the Scheduler) .

dig o21 – o27

SourceA – SourceF and SourceLocal: The rising edge of the signal indicates to the Scheduler that the specified source device is being requested for use. (The Scheduler then checks the validity of the request.)

dig i21 – i27

Feedback for SourceA – SourceF and SourceLocal: If the specified request is valid, the Scheduler provides feedback that latches high for the duration of the event, then clears when the event is over.



Note: The switching logic for a local source must be included in the Classroom program. For example, a "Main" feed from the head end might go into one input of a TV, while that of the local source would go on another input of the TV. If any of the SourceA – SourceF feedback signals goes high, the room's control program should then select the "head end" input; if the Local Source feedback signal goes high, the local input should be selected.

dig o39

Mute: Sends feedback to the Web browser when a Mute button (defined in the room's control program) is pressed.

dig i39

Mute: Enables the Web browser to control a room's Mute button.

dig o40

Refreshes the feedback of SourceA - SourceF (digital join numbers **i21-i27**) and Transport Controls (digital join numbers **i84-i104**).

dig o41 – o42

Mute On and Mute Off: Sends feedback to the Web browser when a Mute On or Mute Off button (defined in the room's control program) is pressed.

dig i41 – i42

Mute On and Mute Off: Enables the Web browser to control a room's Mute On or Mute Off button.

dig o43 – o44

TV Power On /Off: Sends feedback to the Web browser when a local TV Power On or Power Off button (defined in the room's control program) is pressed.

dig i43 - i44

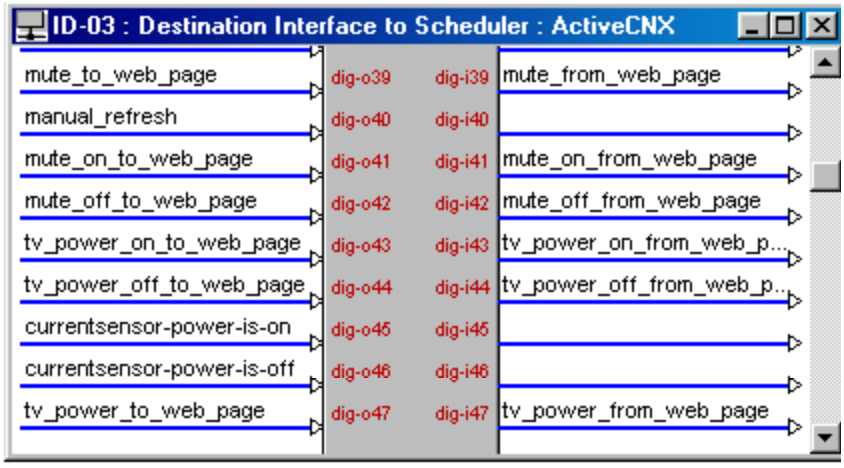
TV Power On/Off: Enables the Web browser to control a room's TV Power On or Power Off button.

dig o45 – o46

Current Sensor Status: When ON signal is high, sets or re-sets the room's TV to a specified channel. TV Power must be managed in the room's control program. (Feature reserved for future use.)

dig o47

TV Power: Sends feedback to the Web browser when a local TV Power button is pressed.



dig o61 – o62

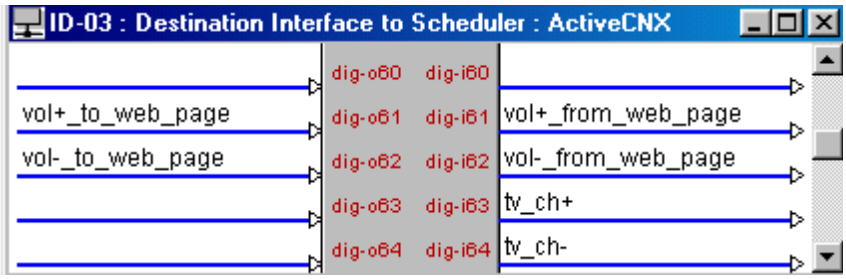
Volume Up/Down: Sends feedback to the Web browser when a Volume Up or Volume Down button (defined in the room's control program) is pressed.

dig i61 – i62

Volume Up/Down: Enables the Web browser to control a room's Volume Up or Volume Down button.

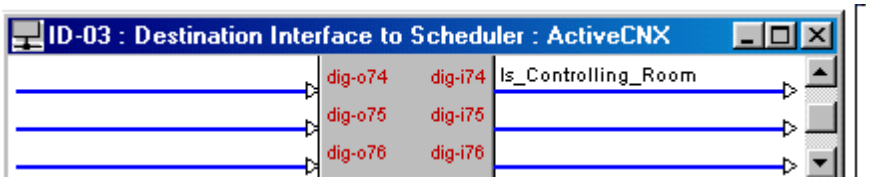
dig i63 – i64

TV Channel Up/Down: Enables the Web browser to control a room's TV Channel Up or Channel Down button.



dig i74

Controlling Room: When signal is high, indicates that a particular room is the controlling room in a group. This is useful for display purposes (such as putting up a flag on a touchpanel so that a user in a non-controlling room will know that they cannot control settings).

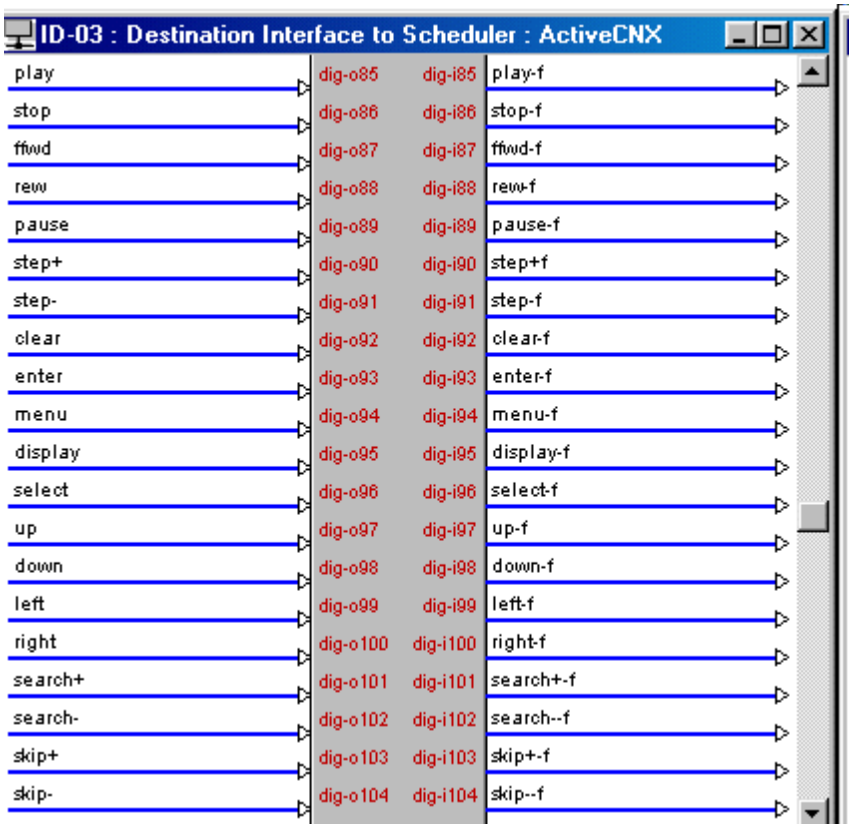


dig o85 – o104

Transport controls for SourceA-SourceF devices.

dig i85 – i104

Feedback of the specified source.



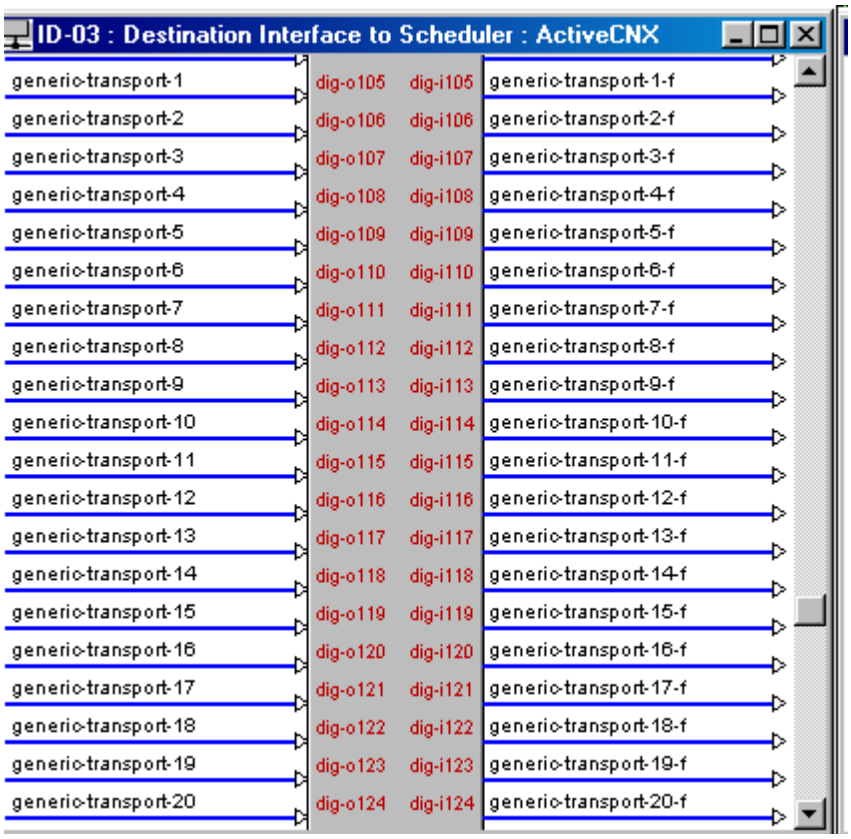
NOTE: If a join number that specifies a Pass-Through signal is also used by the Scheduler (i.e., join number 21, which identifies SourceA on the "Destination" ActiveCNX Interface), the Pass-Through takes priority and the original command is ignored. A signal cannot be configured as both a Pass-Through *and* a Global Event. For example, to pass a LIGHTS-ON command from a Web browser to a room and to schedule it as a global event would require two separate join numbers.

dig o105 – o124

Generic Transport Controls: Can be customized for specified SourceA – SourceF transport controls that may not exist in the database. (i.e. *Super Fast Rewind*).

dig i105 – i124

Generic Transport controls: Feedback from the customized generic transport control.

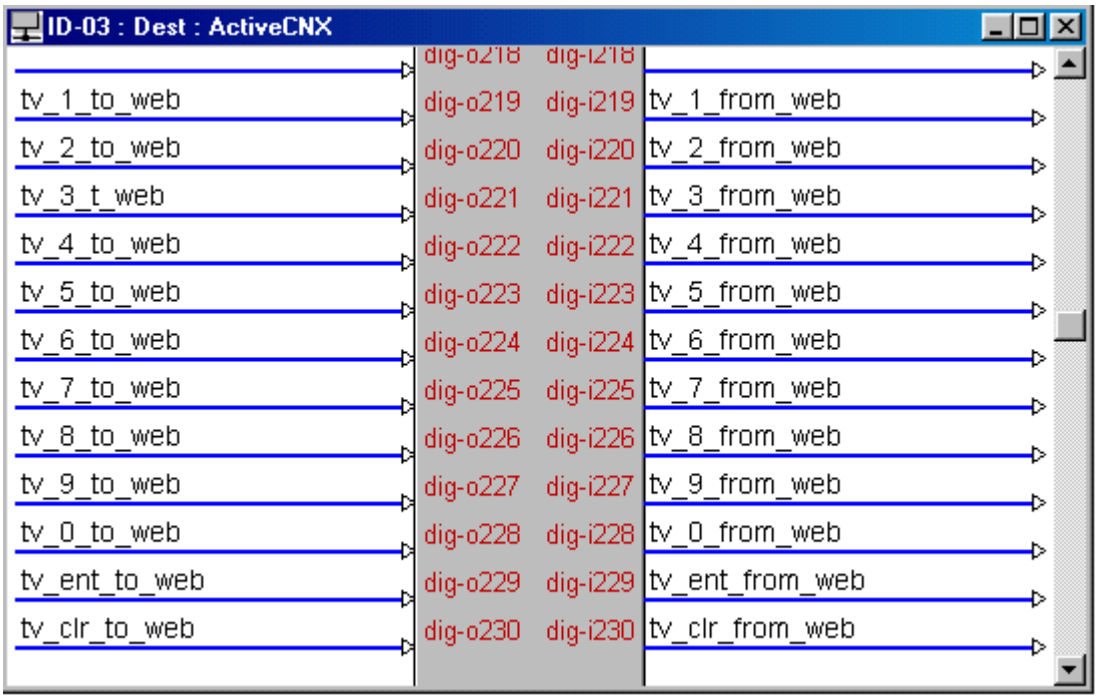


dig o219 – o230

Numeric Keypad for doing a View Channel: Sends feedback to the Web browser when View Channel keypad buttons in a room are pressed.

dig i219 – i230

Numeric Keypad for doing a View Channel: Enables the Web browser to control the View Channel keypad in a room.



dig i500 – i600

Crestron is currently developing support for this range of reserved join numbers (defined in the fixed database, Scheduler_RealTimeControl.mdb.), to be used to indicate the unique page on a Crestron touchpanel that would display the transport controls of a device. For example, if the signal indicates SourceA, then the touchpanel would display a page containing the transport controls for SourceA. The signal can be used to trip logic for a subpage, page flip, etc.

Thus far the following join numbers have been reserved and are available for use: **dig i501** (Environment); **dig i502** (Projector); **dig i503** (VCR); **dig i504** (DVD); and **dig i505** (TV Tuner).

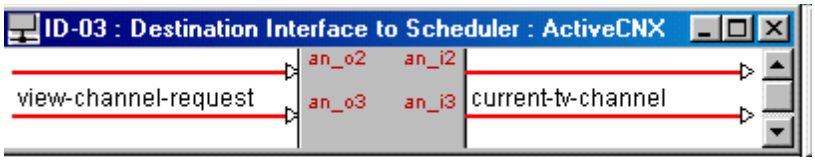
Analog Signals

o3

Indicates to the Scheduler that a particular channel has been requested.

i3

Sets the television to the requested channel, if the channel has been checked as a valid channel in the *Cfg_Hardware_LegalChannels* database table.



Serial Signals

i6 – i11

Media titles for SourceA - SourceF (i.e., *The Matrix*).

i12 – i17

Device names of SourceA - SourceF (i.e., *VCR-5*).

i18

Group name.

i19

Room name.

i20

Status of the event—can be *Waiting*, *Ready*, *In Progress*, *Done*, *Cancelled*, or *Modified*.

i21 – i26

Status of SourceA – SourceF for an event—can be *Ready* or *Not Ready*.

i27

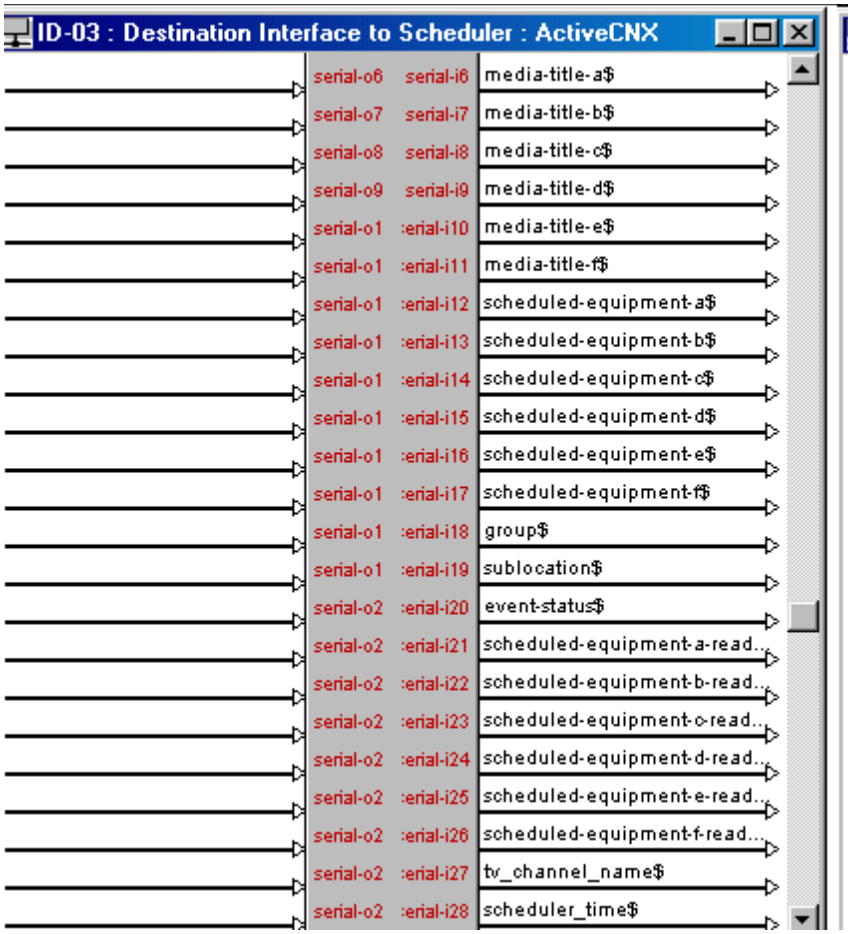
TV channel name.

i28

Time and Date: Reissued every hour in the format **HH:MM:SS\x20MN/DD/YYYY**

(The **\x20** between **SS** and **MN** indicates a space.)

Field	Description	Format
HH	Hour	00-23
MM	Minutes	00-59
SS	Seconds	00-59
MN	Month	01-12
DD	Day	01-31
YYYY	Year	4 digits



NOTE: The Classroom programs of the sample system contain a SIMPL+ module to parse the string and set the time and date in the control system.

Source ActiveCNX Interface

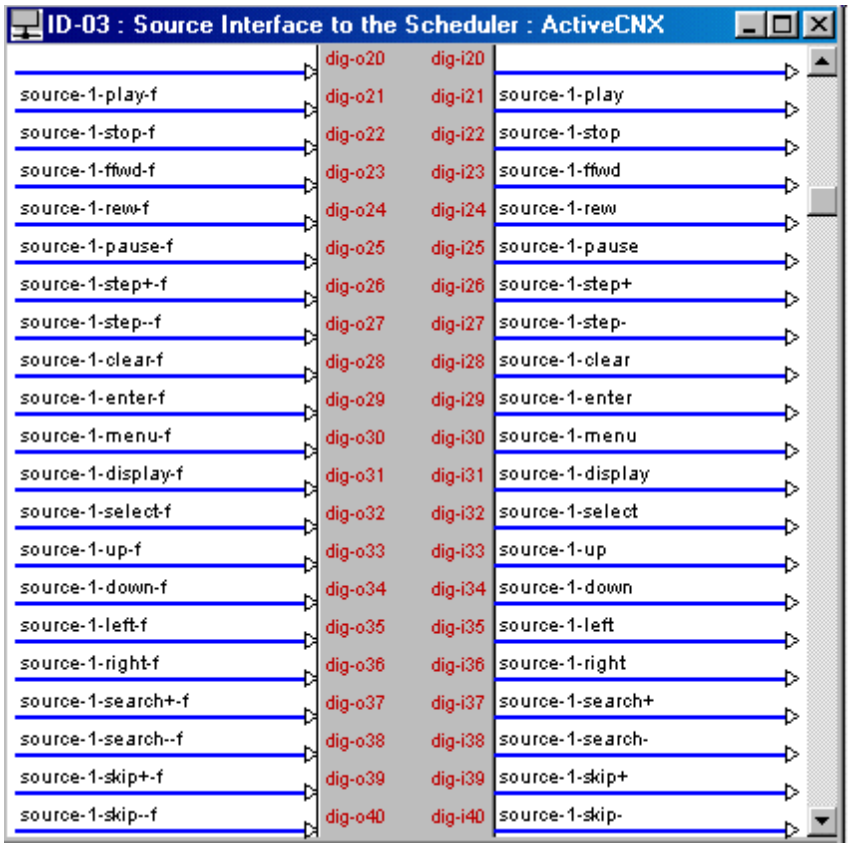
Digital Signals

i21 – i40

Transport controls: Input from the Scheduler to activate a transport control for the corresponding source (typically tied to logic for the device or to an IR driver).

o21 – o40

Transport feedback for the source, routed from the Scheduler to the room that is controlling the source.

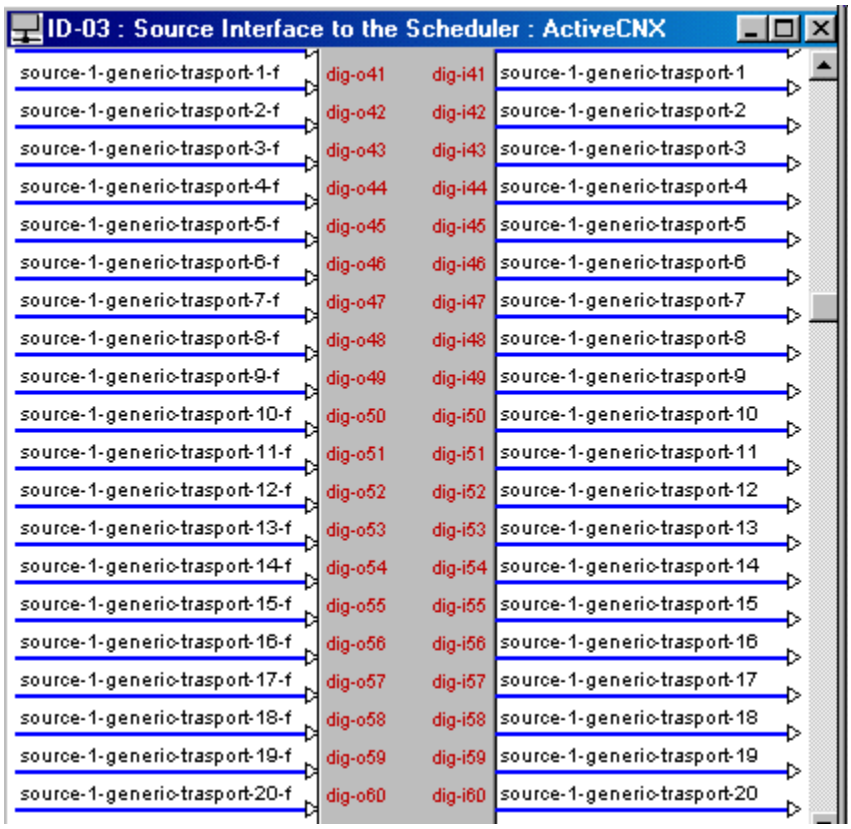


i41 – i60

Generic Transport Controls: Can be customized for any transport controls that may not exist in the database.

o41 – o60

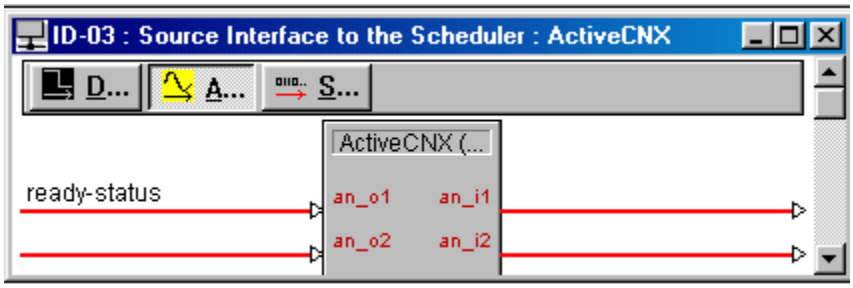
Generic Transport Controls: Feedback for customized transport controls.



Analog Signals

o1

Ready status of the source: When initialized to 0, indicates that the source is READY; when initialized to 1, the source is NOT READY.



Serial Signals

i1

Source Name: The name of the source device (i.e., *VCR-1*), as entered into the configuration database.

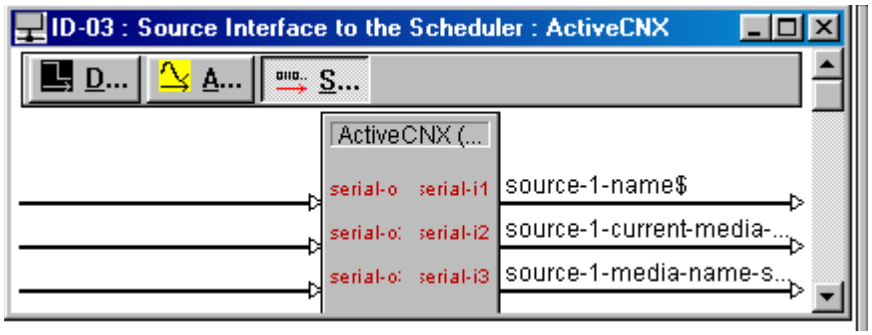
i2

Current Media: The media title (such as a movie or CD) that is currently physically loaded into the source device, based on the scheduling information. (See **i3**, below).

i3

Media Name: The media title that *should* be loaded into the source device for the next event, based on the scheduling information. (When an event is over and the end user physically changes the media in a source device, the READY button must be pressed. This re-initializes **analog o1** to READY and the next media title is posted.)

NOTE: Logic can be written in the control system to compare the "should be" media title (**serial i2**) to the "currently loaded" one (**serial i3**), and if they are different, to send the "NOT READY" value (identified by **analog o1**).

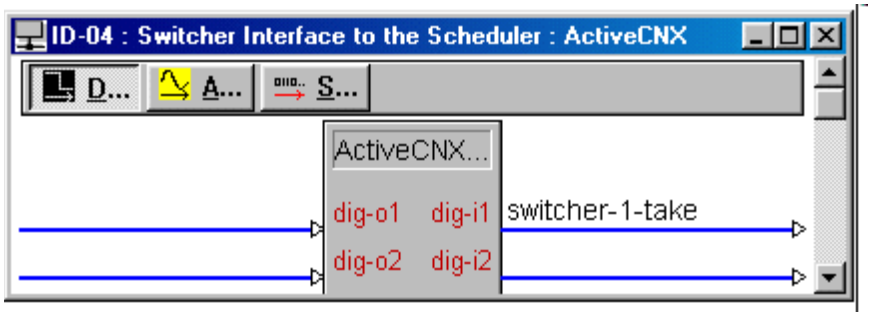


Switcher ActiveCNX Interface

Digital Signals

i1

Switcher TAKE: When high, triggers analog signals **i1** and **i2** to determine the appropriate serial string to send to the switcher, in order to execute the switch.



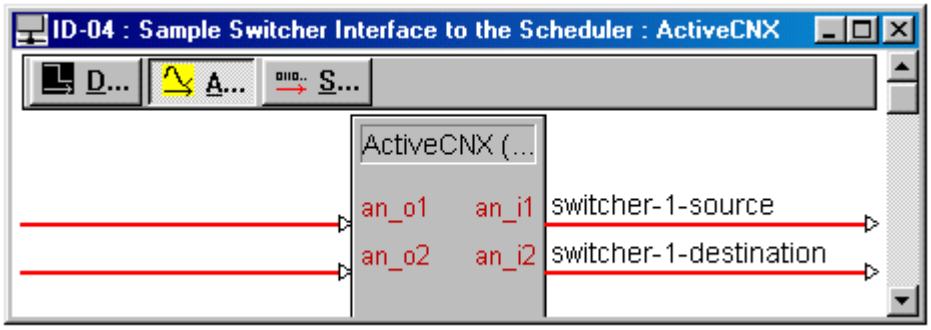
Analog Signals

i1

Switcher input

i2

Switcher output



NOTE: In certain cases the Scheduler may try to send many switches in rapid succession to this ActiveCNX Interface. This might occur if there were several rooms in a group and one source was selected—the switcher would have to switch the input to each room—or if more than one room were set to the safe channel simultaneously. It is suggested to write a SIMPL+ module that queues the input/output pair each time a TAKE is encountered. Using a loop in the Main() function, the strings that are sent to the switcher can be slowed to a manageable pace. The program HeadEndMSX.smw contains a SIMPL+ module that does this.

Software License Agreement

This License Agreement ("Agreement") is a legal contract between you (either an individual or a single business entity) and Crestron Electronics, Inc. ("Crestron") for software referenced in this guide, which includes computer software and, as applicable, associated media, printed materials, and "online" or electronic documentation (the "Software").

BY INSTALLING, COPYING, OR OTHERWISE USING THE SOFTWARE, YOU REPRESENT THAT YOU ARE AN AUTHORIZED DEALER OF CRESTRON PRODUCTS OR A CRESTRON AUTHORIZED INDEPENDENT PROGRAMMER AND YOU AGREE TO BE BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, DO NOT INSTALL OR USE THE SOFTWARE.

IF YOU HAVE PAID A FEE FOR THIS LICENSE AND DO NOT ACCEPT THE TERMS OF THIS AGREEMENT, CRESTRON WILL REFUND THE FEE TO YOU PROVIDED YOU (1) CLICK THE DO NOT ACCEPT BUTTON, (2) DO NOT INSTALL THE SOFTWARE AND (3) RETURN ALL SOFTWARE, MEDIA AND OTHER DOCUMENTATION AND MATERIALS PROVIDED WITH THE SOFTWARE TO CRESTRON AT: CRESTRON ELECTRONICS, INC., 15 VOLVO DRIVE, ROCKLEIGH, NEW JERSEY 07647, WITHIN 30 DAYS OF PAYMENT.

LICENSE TERMS

Crestron hereby grants You and You accept a nonexclusive, nontransferable license to use the Software (a) in machine readable object code together with the related explanatory written materials provided by Creston (b) on a central processing unit ("CPU") owned or leased or otherwise controlled exclusively by You, and (c) only as authorized in this Agreement and the related explanatory files and written materials provided by Crestron.

If this software requires payment for a license, you may make one backup copy of the Software, provided Y*our* backup copy is not installed or used on any CPU. You may not transfer the rights of this Agreement to a backup copy unless the installed copy of the Software is destroyed or otherwise inoperable and You transfer all rights in the Software.

You may not transfer the license granted pursuant to this Agreement or assign this Agreement without the express written consent of Crestron.

If this software requires payment for a license, the total number of CPU's on which all versions of the Software are installed may not exceed one per license fee (1) and no concurrent, server or network use of the Software (including any permitted back-up copies) is permitted, including but not limited to using the Software (a) either directly or through commands, data or instructions from or to another computer (b) for local, campus or wide area network, internet or web hosting services; or (c) pursuant to any rental, sharing or "service bureau" arrangement.

The Software is designed as a software development and customization tool. As such Crestron cannot and does not guarantee any results of use of the Software or that the Software will operate error free and You acknowledge that any development that You perform using the Software or Host Application is done entirely at Your own risk.

The Software is licensed and not sold. Crestron retains ownership of the Software and all copies of the Software and reserves all rights not expressly granted in writing.

OTHER LIMITATIONS

You must be an Authorized Dealer of Crestron products or a Crestron Authorized Independent Programmer to install or use the Software. If Your status as a Crestron Authorized Dealer or Crestron Authorized Independent Programmer is terminated, Your license is also terminated.

You may not rent, lease, lend, sublicense, distribute or otherwise transfer or assign any interest in or to the Software.

You may not reverse engineer, decompile, or disassemble the Software.

You agree that the Software will not be shipped, transferred or exported into any country or used in any manner prohibited by the United States Export Administration Act or any other export laws, restrictions or regulations ("Export Laws"). By downloading or installing the Software You (a) are certifying that You are not a national of Cuba, Iran, Iraq, Libya, North Korea, Sudan, or Syria or any country to which the United States embargoes goods (b) are certifying that You are not otherwise prohibited from receiving the Software and (c) You agree to comply with the Export Laws.

If any part of this Agreement is found void and unenforceable, it will not affect the validity of the balance of the Agreement, which shall remain valid and enforceable according to its terms. This Agreement may only be modified by a writing signed by an authorized officer of Crestron. Updates may be licensed to You by Crestron with additional or different terms. This is the entire agreement between Crestron and You relating to the Software and it supersedes any prior representations, discussions, undertakings, communications or advertising relating to the Software. The failure of either party to enforce any right or take any action in the event of a breach hereunder shall constitute a waiver unless expressly acknowledged and set forth in writing by the party alleged to have provided such waiver.

If You are a business or organization, You agree that upon request from Crestron or its authorized agent, You will within thirty (30) days fully document and certify that use of any and all Software at the time of the request is in conformity with Your valid licenses from Crestron of its authorized agent.

Without prejudice to any other rights, Crestron may terminate this Agreement immediately upon notice if you fail to comply with the terms and conditions of this Agreement. In such event, you must destroy all copies of the Software and all of its component parts.

PROPRIETARY RIGHTS

Copyright. All title and copyrights in and to the Software (including, without limitation, any images, photographs, animations, video, audio, music, text, and "applets" incorporated into the Software), the accompanying media and printed materials, and any copies of the Software are owned by Crestron or its suppliers. The Software is protected by copyright laws and international treaty provisions. Therefore, you must treat the Software like any other copyrighted material, subject to the provisions of this Agreement.

Submissions. Should you decide to transmit to Crestron's website by any means or by any media any materials or other information (including, without limitation, ideas, concepts or techniques for new or improved services and products), whether as information, feedback, data, questions, comments, suggestions or the like, you agree such submissions are unrestricted and shall be deemed non-confidential and you automatically grant Crestron and its assigns a non-exclusive, royalty-tree, worldwide, perpetual, irrevocable license, with the right to sublicense, to use, copy, transmit, distribute, create derivative works of, display and perform the same.

Trademarks. CRESTRON and the Swirl Logo are registered trademarks of Crestron Electronics, Inc. You shall not remove or conceal any trademark or proprietary notice of Crestron from the Software including any back-up copy.

GOVERNING LAW

This Agreement shall be governed by the laws of the State of New Jersey, without regard to conflicts of laws principles. Any disputes between the parties to the Agreement shall be brought in the state courts in Bergen County, New Jersey or the federal courts located in the District of New Jersey. The United Nations Convention on Contracts for the International Sale of Goods, shall not apply to this Agreement.

CRESTRON LIMITED WARRANTY

CRESTRON warrants that: (a) the Software will perform substantially in accordance with the published specifications for a period of ninety (90) days from the date of receipt, and (b) that any hardware accompanying the Software will be subject to its own limited warranty as stated in its accompanying written material. Crestron shall, at its option, repair or replace or refund the license fee for any Software found defective by Crestron if notified by you within the warranty period. The foregoing remedy shall be your exclusive remedy for any claim or loss arising from the Software.

CRESTRON shall not be liable to honor warranty terms if the product has been used in any application other than that for which it was intended, or if it as 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 or license code altered, defaced, improperly obtained, or removed.

Notwithstanding any agreement to maintain or correct errors or defects Crestron, shall have no obligation to service or correct any error or defect that is not reproducible by Crestron or is deemed in Crestron's reasonable discretion to have resulted from (1) accident; unusual stress; neglect; misuse; failure of electric power, operation of the Software with other media not meeting or not maintained in accordance with the manufacturer's specifications; or causes other than ordinary use; (2) improper installation by anyone other than Crestron or its authorized agents of the Software that deviates from any operating procedures established by Crestron in the material and files provided to You by Crestron or its authorized agent; (3) use of the Software on unauthorized hardware; or (4) modification of, alteration of, or additions to the Software undertaken by persons other than Crestron or Crestron's authorized agents.

ANY LIABILITY OF CRESTRON FOR A DEFECTIVE COPY OF THE SOFTWARE WILL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF YOUR COPY OF THE SOFTWARE WITH ANOTHER COPY OR REFUND OF THE INITIAL LICENSE FEE CRESTRON RECEIVED FROM YOU FOR THE DEFECTIVE COPY OF THE PRODUCT. THIS WARRANTY SHALL BE THE SOLE AND EXCLUSIVE REMEDY TO YOU. IN NO EVENT SHALL CRESTRON BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, SPECIAL OR PUNITIVE DAMAGES OF ANY KIND (PROPERTY OR ECONOMIC DAMAGES INCLUSIVE), EVEN IF A CRESTRON REPRESENTATIVE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR OF ANY CLAIM BY ANY THIRD PARTY. CRESTRON MAKES NO WARRANTIES, EXPRESS OR IMPLIED, AS TO TITLE OR INFRINGEMENT OF THIRD-PARTY RIGHTS, MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTIES, NOR AUTHORIZES ANY OTHER PARTY TO OFFER ANY WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY FOR THIS PRODUCT. THIS WARRANTY STATEMENT SUPERSEDES ALL PREVIOUS WARRANTIES.

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, Cresskill, 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 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.