Digital Turnaround Processor

DTP-110 / DTP-220

Installation and Operation Guide

Document # 175-000210-00

Edition A
June 2005

LEITCH

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Warranty Information

The Leitch Limited Warranty Policy provides a complete description of your warranty coverage, limitations, and exclusions, as well as procedures for obtaining warranty service. See the inside back cover of this manual for a warranty summary. To view the complete warranty, visit www.leitch.com>Support>Warranties.

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Preface

Manual Information

Purpose

This manual is written to detail the installation, maintenance and operation of Leitch DTP Hardware and Software.

Audience

This manual is written for Engineers and Operators of Leitch DTP hardware and software.

Chapter 1

Installation and Connections

Introduction

The DTP product line from Leitch aims to help broadcasters avoid decoding and re-encoding ATSC-encoded programs at the local station level to help save capital and operational costs, while still allowing the broadcaster to offer locally-relevant content and services.

Now, in addition to grooming (add/dropping), splicing/switching, and re-statistically multiplexing individual programs within ATSC multi-program multiplexes, broadcasters can offer the following localization services through the deployment of the DTP:

- Local station branding through logo overlays, Local Emergency Alert Systems including text crawls and audio switch overs, to comply with government regulations and to provide better local community service,
- Per-program switching (splicing) to allow local promos and advertisements within network feeds,
- Overlay advertising on program video or national ads to burn in local ads. This allows local ad revenue generation without the cost of a full audio/video ad spot creation. This also allows broadcasters to prevent fast-forwarding of ads in digital and personal video recorders.
- Community outreach with localized text crawls (e.g. police alerts, local government alerts, etc.)
- Bandwidth management to optimize for the local 19.39 Mbps multiplex, with the distribution multiplex arriving at different bit rates.

Product Specification

Feature	Specification
Video format Audio format	• All SD and HD ATSC formats*. Supports GOP lengths N<=30, and 3:2 pull-down (RFD) • Up to four Dolby Digital AC-3 audio services, each up to 384kbps. An audio service could be AC-3 1.0, 2.0 or 5.1.
Rate-shaping, output	Single-program or multi-program transport stream output, HD or SD.
Splicing / Switching	Seamless splicing of HD and SD programs. Complete audio and video switching.
MPEG-2 Logo overlays (HD and SD) DTP-220 Only	• 2 logo overlay, with dissolve on and off effects. • Size: Up to ¼ screen width and length (for all logos combined) • Local and Ethernet-based (via RCS application) logo loading onto the DTP • Logo format for ingest: TARGA • Logo transparency: The full spectrum from completely transparent to completely opaque. Determined in the alpha channel of the imported logo file. • Logo fade-in/fade-out (dissolve): Rate controllable between 0.1 to 10 sec. • Logo positioning is expressed as a percentage of picture width and height from a specified point of reference in the picture (one of: Bottom Right, Bottom Left, Top Right, Top Left, Center). Accuracy is to 1/100 of 1%, operator-controllable
Embedded ancillary data	Closed captioning pass-through
Inputs (for program data)	• 1, 2, 3, or 5 ASI inputs. • Both MPTS and SPTS supported.
Input data rate	100 Mbps maximum transport stream data rate on each ASI input.
Output interfaces	1 ASI output (mirrored output on two physical outputs)

Feature	Specification
Output data rate	19.39 Mbps (ATSC-compliant data rate).†
Number of output programs in output multiplex transport stream DTP-110	Up to 1-HD and Multiple SD MPTS simultaneously.
DTP-220	Simultaneously allows 1-HD and 1-SD MPTS with logo overlay.
Bandwidth management (output bit rate control)	• Stat mux with per-program priority. • Priority set through user-specified minimum program video bit rates.
Graphical User Interface Control (RCS – Remote Control System)	Windows-based application (PC required) running over 10/100 Base T Ethernet allowing local or wide area networking for control.
Diagnostic control, manual override	• Command line interface via direct DTP connections (mouse, keyboard, VGA monitor). • User access control supported.
Alarms	• Application-level alarms • On-board, time-stamped, archived log file (up to 30 days)
TCP/IP-based control API	• Complete control of the DTP with IP connections (two-way network required). • API available for external control system integration. Additional integration efforts required.
PAT, PMT generation, insertion	Generated for output programs selected.

Feature	Specification
Static PSIP Generation and Optional Dynamic PSIP	Data entered by operator through RCS GUI and allows population of the following ATSC tables for compliance purposes: • System Time Table (STT) • Master Guide Table (MGT) • Virtual Channel Table (TVCT) • Rating Region Table (RRT) • Event Information Table (EIT-0-3) with static text
Form factor	• 2RU • Standard 19’ rackmount.
Dimensions	• Height 87.5 mm 3.445” • Width 430 mm 16.930” • Depth 672 mm 26.457” • Max. Weight 27.22 kg 60 Lbs)
Power supplies	Redundant, 1+1 hot swappable

* Input video data rate not limited to ATSC data rates and can exceed the prescribed ATSC data rates

† Other output transport stream data rates can be supported – contact Leitch for details.

Product Model Configurations

DTP-110-A	Digital Turnaround PRocessor (DTP) system with 1 ASI input (expandable to multiple inputs, ordered separetely, 1 ASI output, functions include MPEG-2 switching and stat mux for up to 1HD + 4SD programs, or 6 SD programs. Includes graphical user interface application license. 4:2:0 MPEG video format, Dolby AC-3 audio format. ASI input allow up to 100Mbs transport stream, ASI output at 19.39 Mbps transport stream.
DTP-220-A	Digital Turnaround Processor (DTP) system with 1 ASI input (expandable to multiple inputs, ordered separetely, 1 ASI output, functions include MPEG-2 logo overlays, switching and per program bit rate reduction for 1 HD Program and 2-SD programs simultaneously. Includes graphical user interface application license.4:2:0 MPEG video format, Dolby AC-3 audio format. ASI input allow up to 100Mbs transport stream, ASI output at 19.39 Mbps transport stream.
DTP-ASI-IN-1	Digital Turnaround Processor (DTP) 1-ASI Input interface, allowing up to 100Mbps transport stream bit rates.
DTP-ASI-IN-4	(Optional) Digital Turnaround Processor (DTP) 4-ASI Input interface, each allowing up to 100Mbps transport stream bit rates.
DTP-ASI-INB-1	Digital Turnaround Processor (DTP) 1-ASI Input interface, with Hardware ByPass, allowing up to 100Mbps transport stream bit rates.

Detailed Hardware Specifications

The following section provides Hardware specifications for the DTP.

The DTP has a protective faceplate on the front of the unit. To remove the faceplate use the faceplate handles. To replace the faceplate, align and push it back onto the front of the unit.

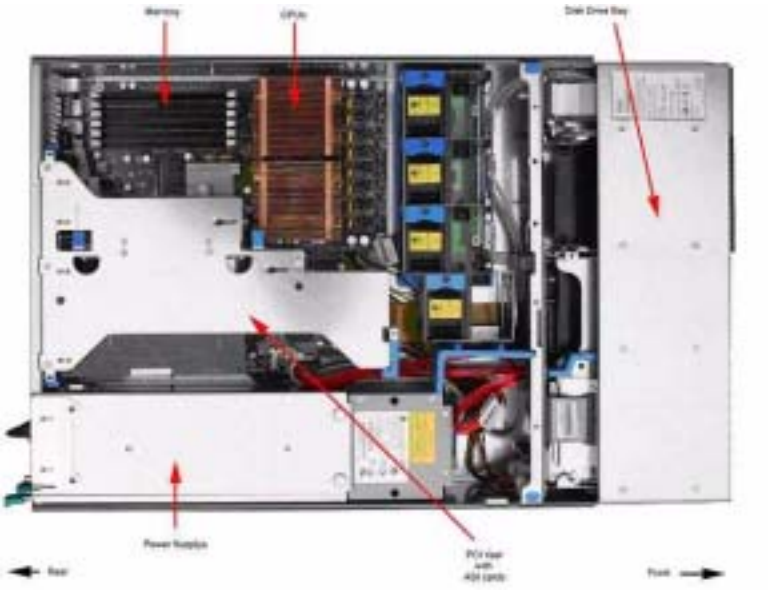


Figure 1. DTP Top View with Cover Removed

Chassis Dimensions

- **Height** 87.5 mm 3.445”
- **Width** 430 mm 16.930”
- **Depth** 672 mm 26.457”
- **Max. Weight** 27.22 kg 60 Lbs

Power Specifications

The DTP supports redundant power supplies: The power subsystem supports the implementation of remote management features, including remote enable that permits power to be activated from a variety of sources. Each 500W supply consists of the power supply bay and one power supply module.

The supply operates within the following voltage ranges and is rated as follows:

- 100 - 127VAC « at 50/60 Hertz (Hz); 8.9A maximum
- 200 - 240VAC « at 50/60 Hz; 4.5A maximum

The power supply module provides three outputs; 5V, 12V, -and 12. The module provides a handle to assist in insertion and extraction and can be inserted and extracted without the assistance of tools.

Rack Mounting

For rack mounting instructions please refer to the rack mount kit that arrived with your system.

Connectivity

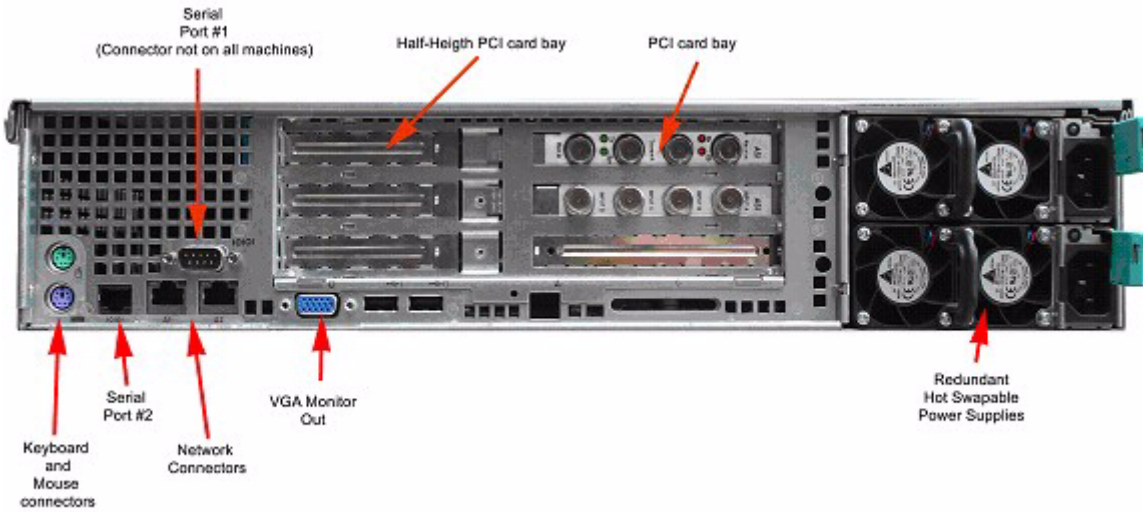


Figure 2. DTP Rear View

The DTP (base model) is equipped with only one ASI I/O Module. Two additional **DTP-ASI-IN-1** modules and the **ASI-ASI-IN-4** (shown in Figure 3, “4 Channel DTP Connections,” on page 7) are available for order. Please consult with your Leitch Sales Representative.

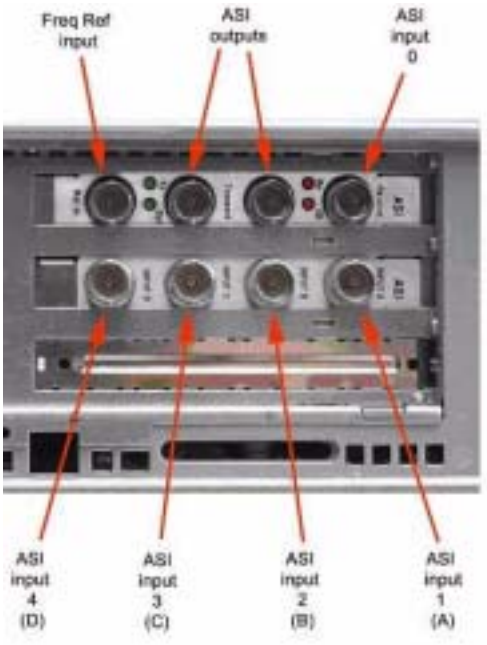


Figure 3. 4 Channel DTP Connections

Physical port designations (see below for IP address setup referencing these ports):

- Ethernet 1: “1000 Base T Ethernet (control)”
- Ethernet 2: “1000 Base T Ethernet (GPI)

Note that the RJ-45 port to the right of the Keyboard/mouse port is not used.

Optional EAS and GPI Extender Connectivity

Please refer to the Addendum on EAS and GPI Extender Installation.

Keyboard/Mouse and VGA

Connecting a keyboard and mouse to the DTP requires the use a the "Y" connector PS/2 cable that arrived with your DTP system. This connects to the DTP's single PS/2 port and splits to connect to the keyboard and mouse. These are only necessary during initial DTP platform configuration and troubleshooting.

Before Beginning Set-Up

Check your invoice to make sure certain that you have all the required cables and devices, including the "Y" PS/2 connector cable for connecting a keyboard and mouse. Before beginning set up, you must provide the following:

1. **Power Source:** Connect the power inlet to an adequate power source using the supplied cords. We ***strongly recommend a UPS***.
2. **Adequate Airflow:** As with any high speed component, the DTP requires adequate airflow for proper operation. All components draw air in through the front and exhaust out the rear. These surfaces must be clear of obstructions to assure proper cooling.
3. **External Device Connections:** All connections to the external devices that you'll be attaching to the DTP.

Chapter 2

Getting Started

Configuring IP Networking on DTP

1. Verify that the DTP is powered down. If it is not, power down the unit before continuing.
2. Connect the RJ-45 connector to the *bottom* Ethernet port (Ethernet 1).
3. Using the break-out "Y" PS/2 cable connect a mouse and keyboard to the DTP.
4. Connect a video monitor.
5. Power on the DTP.

IP Configuration

The DTP application is loaded automatically after powering up. You must exit the DTP application to change IP configurations.

1. After boot up, wait for the main menu to appear.
2. Press `<Shift> + <X>` to terminate the DTP CLUI application. The `$` prompt appears.
3. Type `su` and press `<Enter>`.
4. Type the password "DTVinabox". The `#` prompt appears.
5. To change the IP address, you need to use the QNX GUI (Graphical User Interface). From the `#` command prompt, start the QNX GUI by typing '`ph`' and pressing `<Enter>`.
6. Access the Network Configuration Properties screen by clicking **Configure > Network**.

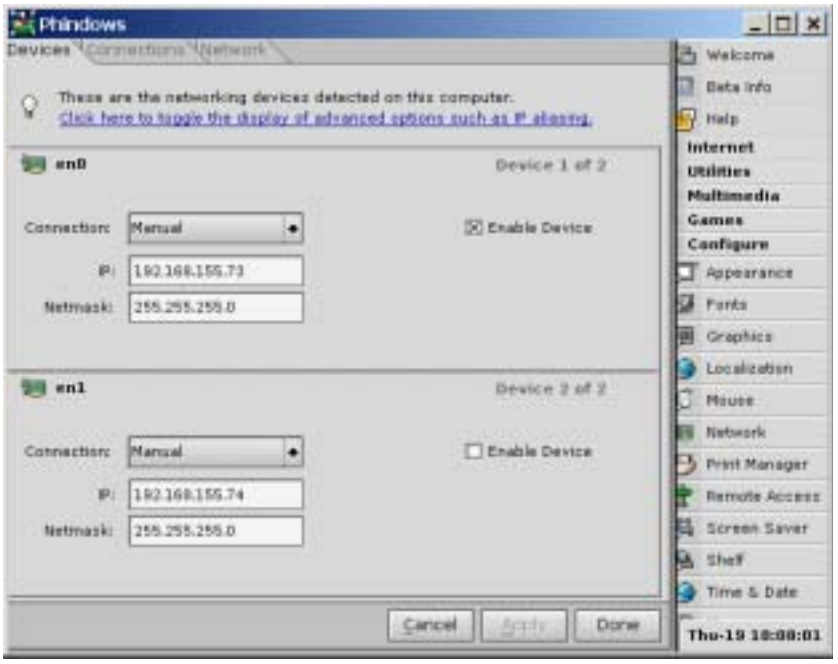


Figure 1. QNX GUI > Configure Network

7. Click the **Devices** tab.
8. Change the IP Address and Netmask of the adapter **en0**. The System Wiring and Configuration Diagram that arrived with your order specifies the correct settings.
9. Make sure that the **Connection** clicked is **Manual** and the second network device **en1** is cleared.
10. Click **Apply** to save the changes.
11. Click the **Network** tab.

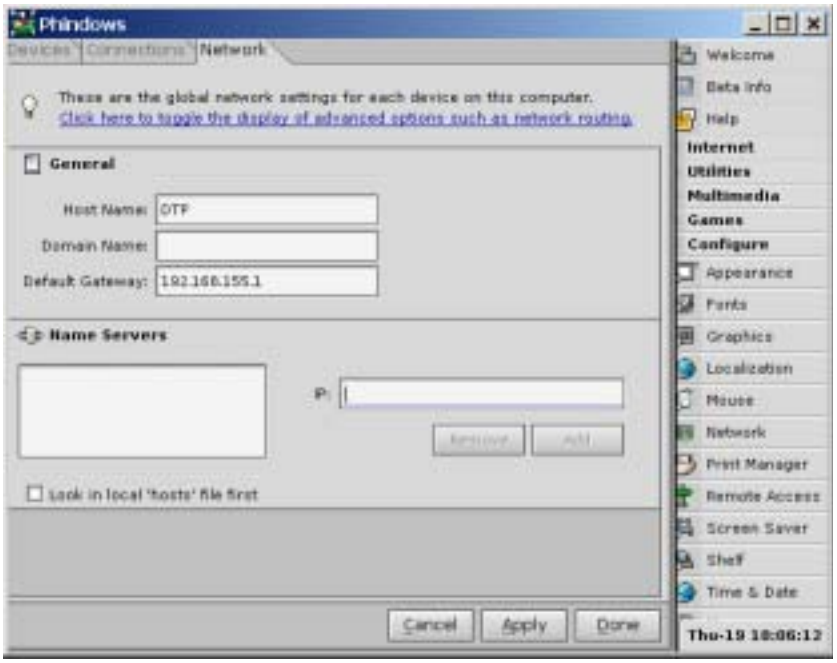


Figure 2. QNX GUI Network Window

12. Change **Host Name** and **Default Gateway**. If you are uncertain about the proper settings for these, refer to your System Wiring and Configuration Diagram.
13. If there is a **Domain Name** type the `<Space>` once key to clear it.
14. Click **Apply** to save the changes.
15. Click **Done**.
16. After changing the network settings, add an entry in the `/etc/hosts` file with the new IP address and Host Name. Refer to “Adding Host Names in the Hosts File” on page 12.
17. Reboot the DTP. You must restart for network changes to take effect.

Adding Host Names in the Hosts File

1. Log on to QNX by typing `root` and pressing `<Enter>`.
2. From the command prompt, start the QNX GUI by typing '`ph`' and pressing `<Enter>`.
3. Open a terminal window by navigating to **Utilities > Terminal.**
   a. Type `cd /etc`.
   b. Type `ped hosts &` to invoke the editor with hosts file loaded.

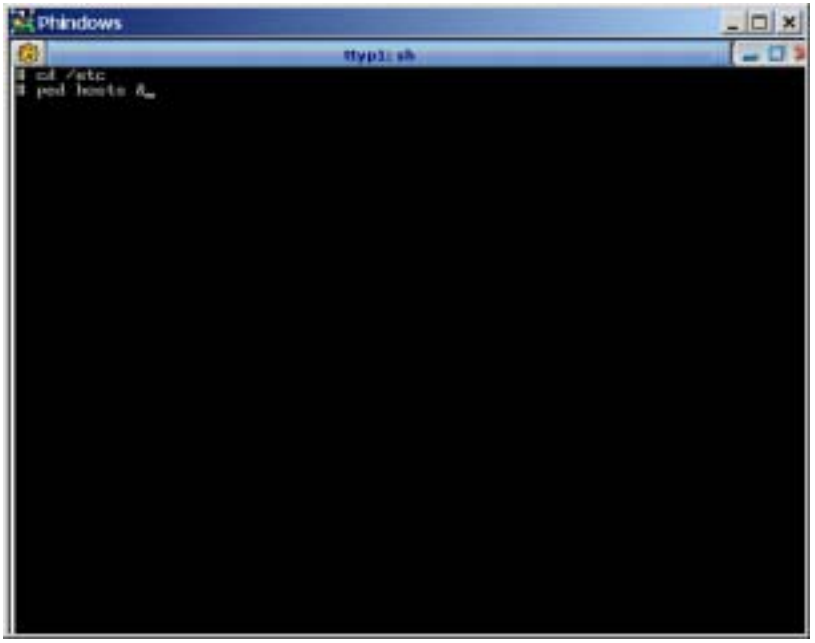


Figure 3. Opening the Host File

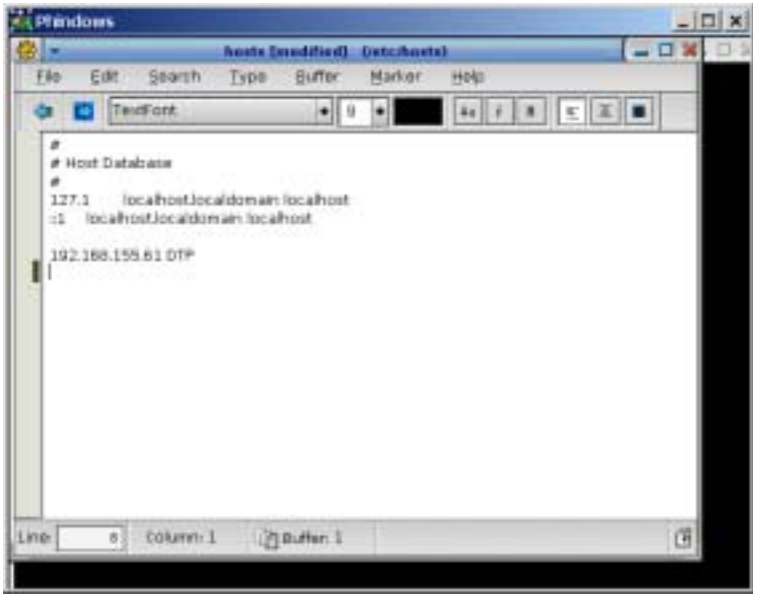


Figure 4. Host File

4. At the terminal command prompts type IP address and Host Name that were assigned assigned to the DTP.
5. Press the <Enter> key.
6. On the **File** menu, click **Save** to save the file.
7. On the **File** menu, click **Exit** to terminate the editor.

Configuring The RCS Application

The RCS can be invoked from any Windows PC that is connected to the same Local Area Network (LAN) as the DTP. To install the RCS application, run the install program located on the included CD.

Running the Installation Program

1. Start the installation by opening the install CD folder and clicking **RCSInstall_xxx.exe**.

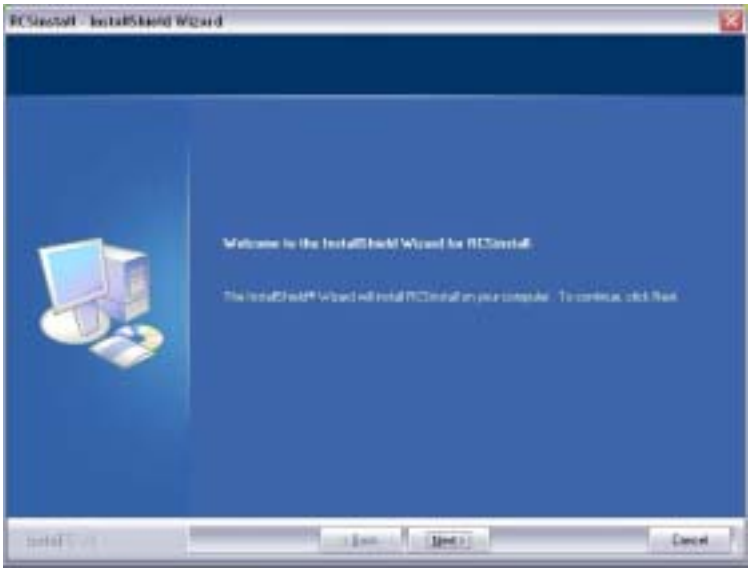


Figure 5. The RCS Install

1. Follow the on-screen instructions, accepting the default values.

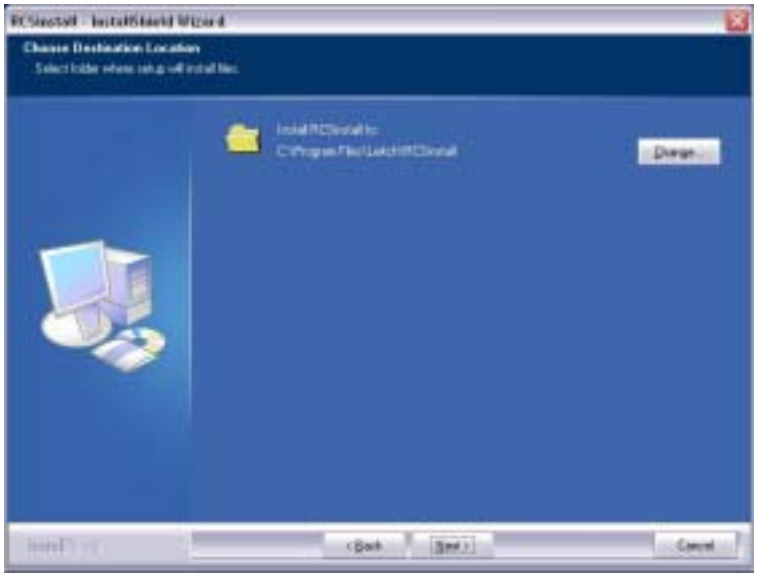


Figure 6. Default Values

2. When the install application prompts for the IP Address or Host Name of the DTP, type the IP address or Host Name in the text box. (See Figure 7).

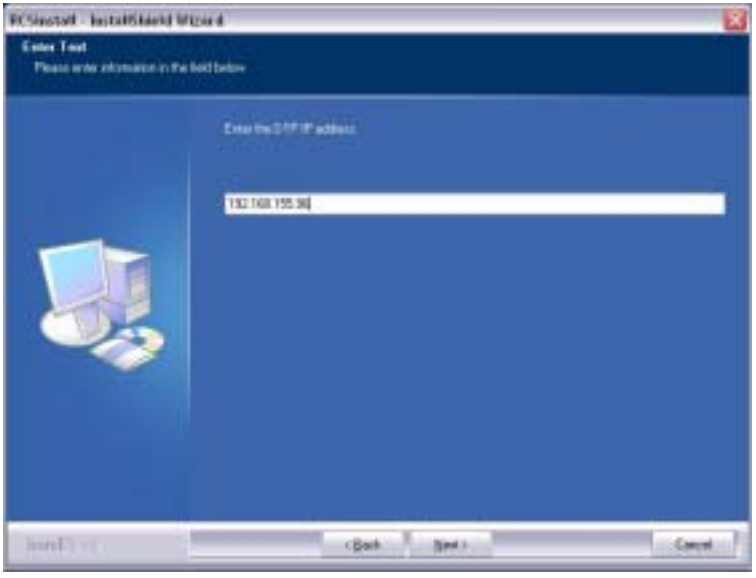


Figure 7. IP Address Prompt

3. Click **Next** and continue the installation, accepting default values, until completing the installation. The installation creates an RCS shortcut icon on the desktop.

Starting the RCS Application

Start the RCS application by clicking the shortcut icon on the desktop labeled **RCS**.

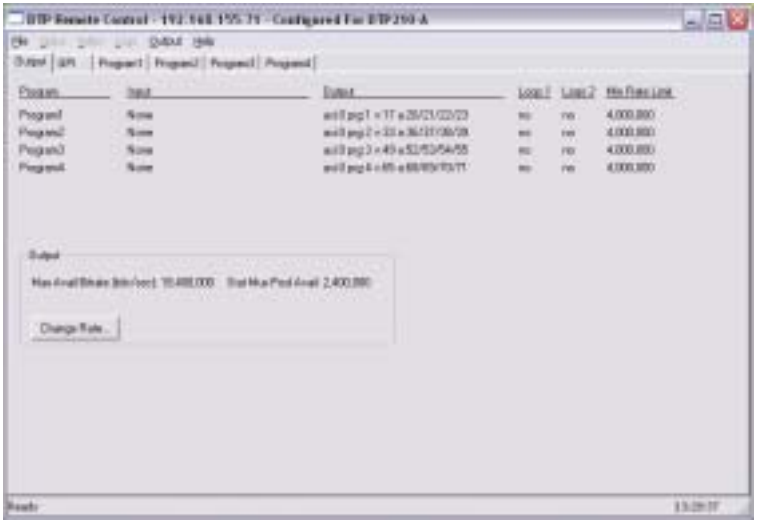


Figure 8. The RCS Output Screen

Chapter 3

Using the RCS Application

Starting the RCS

Start the RCS application by double-clicking on the desktop shortcut icon.

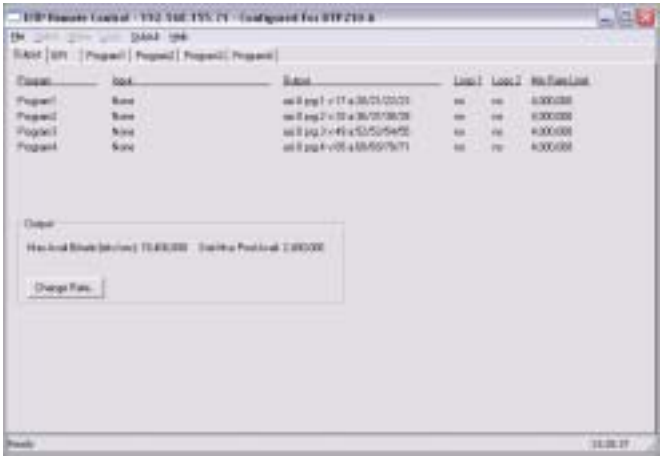


Figure 1. Output Screen - DTP Shown

Note

DTP-110 users will see "Configured for DTP-110" in the title bar of their RCS application.

RCS Output Window

The RCS **Output** screen displays a table with six columns and one row per program. The columns are as follows:

- **Program:** Program ID.
- **Input:** Identifies the ASI input stream associated with the program.
- **Output:** Identifies the ASI output stream associated with the program.
- **Logo 1:** Gives the On/Off status of the Logo 1.
- **Logo 2:** Gives the On/Off status of the Logo 2.
- **Min Rate Limit:** Displays the minimum rate limit in bts/sec

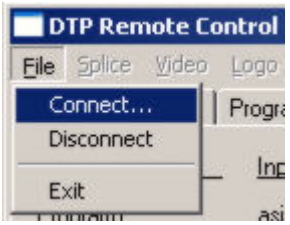
Setting Maximum Available Bitrate and Statmux Pool

- The Video **Output** settings are also on the **Output** screen. The **Max Avail Bitrate** indicates the maximum bitrate that is available for the video portion of the 19.39 Mbps transport stream. The user must subtract the aggregate audio bitrates from the 19.39 number. In addition, there is approximately 200,000 bits that must be subtracted out for system overhead, such as PATs, PMTs, and static PSIP. When the aggregate audio bitrate and system overhead are taken out of the 19.39Mbps you are left with the available video bandwidth.
- **Statmux Pool** available indicates the amount of bits available to distribute to the programs via the min rate limit on each program's program tab. If the sum of the selected input programs is greater than the Statmux Pool available figure then the programs may be rate controlled to ensure they fit into the output transport stream.

Connecting to a DTP

The RCS is a remote control application that connects to and controls DTP host frames. After you have started the RCS application you can connect to a DTP by following these instructions:

1. On the **File** menu, click **Connect**



2. Type the IP address of the target DTP in the **Machine** text box.

3. Click OK. You are now connected to the target DTP and can begin setting up programs.

You can disconnect from a DTP by clicking **Disconnect** on the **File** menu.

Setting up Programs

The RCS interface has tabs labeled Program1 up to Program4. Use these tabs to set video bitrate, ASI input content, splices and logo overlays.

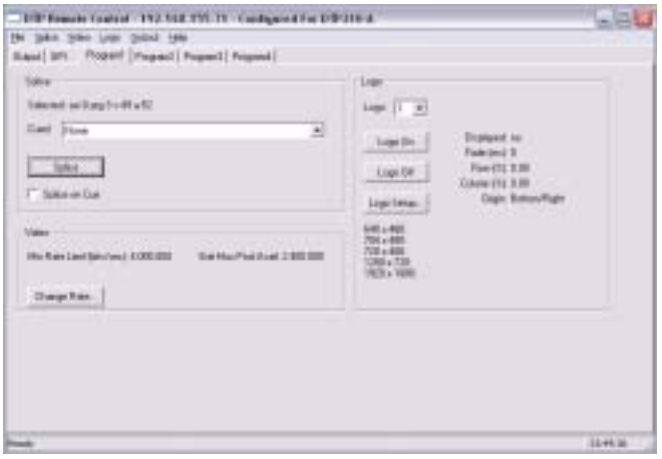


Figure 2. RCS Program 1

Video Min Rate Limit

The **Max Avail Bitrate** indicates the bitrate that is available for the video portion of the 19.39 Mbps transport stream. To determine each programs **Min Rate Limit**, you must subtract the aggregate audio bitrates from the 19.39 number. In addition, there is approximately 200,000 bits that must be subtracted out for system overhead, such as PATs, PMTs, and static PSIP. When the aggregate audio bitrate and system overhead are taken out of the 19.39Mbps you are left with the available video bandwidth.

1. Click **Change Rate** on the interface or click **Change Rate** on the **Video** menu.
2. Change the existing rate by typing in a new one, following the numeric format already present in the dialog box.

3. Click **OK.**

Video Splicing

Input Program Cueing

The following input cueing instructions use **Program 1** as an example, the procedures are identical on each of the program screens.

1. Using the **Cued** item list, select the ASI Program input. Once selected, the input is automatically cued.

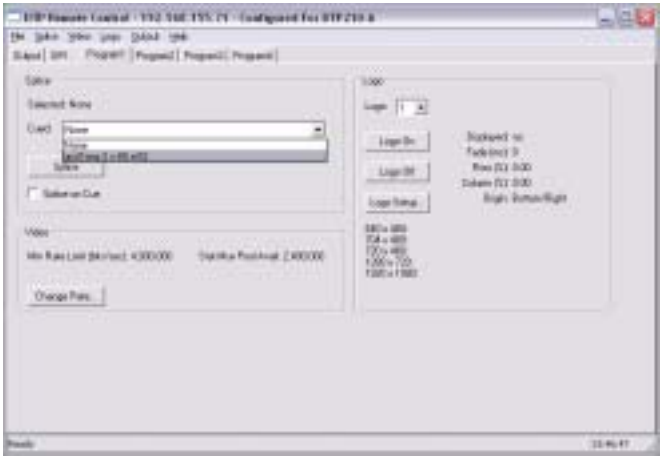


Figure 3. Splicing

Splicing a Selected Input

Clicking **Splice**, changes the **Cued** program input to a **Selected** program input. The previously **Selected** program input ("None" in this example) then becomes the **Cued** program. To splice to **None**, click the **Splice** button again.

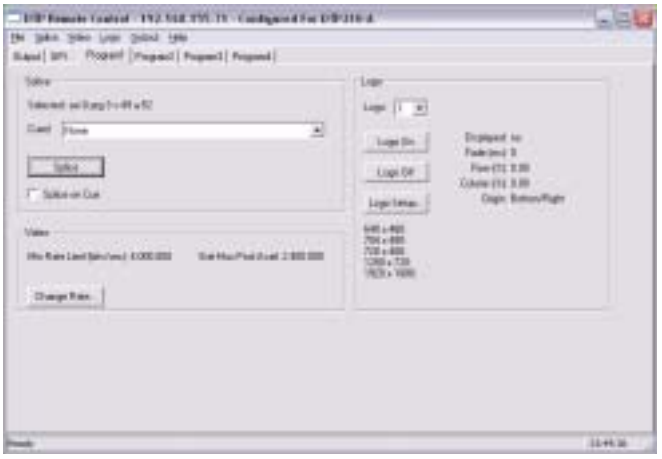


Figure 4. Program Input Selected

The entire Cue/Splice sequence can be simplified into one step by selecting the **Splice on Cue** check box. When the **Splice on Cue** check box is selected, as soon as a program input is chosen from the **Cued** item list, it is both **Cued** and **Selected**.

Setting GPI Presets

You can set 16 different GPI preset actions. If EAS is enabled, then one preset is reserved for EAS (Emergency Alert System). Each preset, including EAS corresponds to a standard GPI trigger. By setting the presets you can determine what happens to each program (1 through 4 or 5) when the corresponding GPI signal is received.

GPI may be triggered via an external trigger device or an external automation system. If you need or want to enable EAS and assign the GPI preset being used for the EAS you can, see the "Emergency Alert System Setup" section on page 53 in Appendix B.

Setting the Presets

1. Click on the **GPI** tab at the top of the RCS application window.

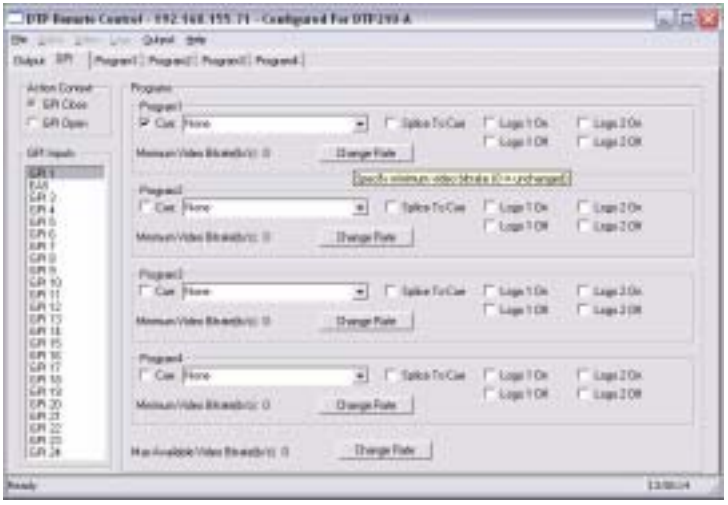


Figure 5. Setting GPI Presets

2. Select an available (not designated for EAS) **GPI** preset.
3. Click **GPI Close** or **GPI Open**, this determines the context of the action taken (when the function is triggered, either upon the opening of the GPI port, or upon closing).
4. Beginning with **Program1** set the splicing, rate and logo properties.
5. Make settings for each of the programs, keeping model and bandwidth restrictions in mind.

6. If necessary adjust the **Max Available Video Bitrate**, at the bottom of the screen.
7. Repeat steps one through five for each **GPI** preset you intend to use.

Splicing with GPI Presets

There are two basic methods for splicing a program input using GPI. The following example will show you how to splice Program 1 but can be used for splicing multiple programs as well.

Method One: Cue and Splice on One Trigger

Using this method causes the selected program input to be cued and immediately spliced when the GPI is triggered.

1. Select an available (not designated for EAS) **GPI** preset.
2. Click **GPI Close**.
3. Select a program input from the item list in **Program 1**.
4. Select **Cue.**
5. Select **Splice to Cue.**

Method Two: Cue and Splice on Seperate Triggers

Using this method requires two triggers, the first cues the program input and the second splices the input.

1. Select an available (not designated for EAS) **GPI** preset.
2. Click **GPI Close**.
3. Select a program input from the item list in **Program 1**.
4. Select **Cue.**
5. Select another available (not designated for EAS) **GPI** preset.
6. Select the same program input as in Step 3.
7. Select **Splice to Cue.** Verify that **Cue** is not selected.

Logo Setup and Selection (DTP-220 Only)

From the RCS you can select your program logo, logo location and store new logos. Each logo is assigned an ID number (1,2). This section describes setting up and selecting logos.

Animated logo features require the purchase of a Graphics package (DTP--GFX –OPT), which is available for the DTP-220-A only.

Logo Formatting

The Targa file has the following limitations:

- The non-zero alpha channel area of the logo must be less than ¼ of the screen width and ¼ of the screen height.
- In the case where the non-zero alpha channel area of the logo is not an even number of pixels horizontally and vertically, padding will be automatically added to achieve an even number of pixels horizontally and vertically.

The DTP uses a `[filename].lgo` format. When a `[filename].tga` is downloaded to the DTP it is converted to `[filename].lgo` for DTP internal use.

DTP-GFX - OPT Animated Logos

Individual Targa files forming a single animation must be located in a common folder prior to conversion. Each Targa file corresponds to a single frame of the animation. A 4-digit suffix consisting of the current file's frame number within the animation must be appended to the end of the file name. E.g. for an animation whose base file name is *`animation`*, name the first three frames (first three Targa files) as follows:

animation0000.tga
animation0001.tga
animation0002.tga

Animated logos, by default, once overlaid, remain on until you turn them off.

Animated Logo Resource Restrictions

Animated Logos have the following additional resource restrictions:

- The non-zero alpha channel area of the logo must be less than ¼ of the screen width and ¼ of the screen height.
- The animation cannot be greater than 999 frames.
- The total memory required by loaded animations cannot exceed 300Mb.

The memory requirement limit is the sum for all programs, all logo buffers, and all formats. File size can be mapped to memory usage by the following rules:

1. If the file has an alpha plane memory usage equals file size.
2. If the file does not have an alpha plane memory usage equals twice the file size.

E.g.

File size to memory conversion:

$File_1$ is 20Mb and has an alpha plane.

$File_2$ is 30Mb and does not have an alpha plane.

Memory consumption for $File_1$ equals 20Mb.

Memory consumption for $File_2$ equals 30x2 = 60Mb.

System memory usage:

Consider:

Program1: $File_1$ loaded in logo buffer two format 704x480.

Program 2: $File_2$ loaded in logo buffer one format 1920x480.

Program 3: $File_1$ loaded in logo buffer two format 704x480.

The total system memory usage is 20Mb + 60Mb + 20Mb = 100Mb. One third of the available resources are in use.

Logo Setup

New Logo

1. Click **Logo Setup**.
2. Select a **Logo ID** (Logo 1, Logo 2).

Figure 6. Setup Logo

3. Click **Download**.
4. Click **Select**.

Figure 7. Logo Selected

5. Navigate to and select the desired `.lgo` or `.tga` file (`.tga` files are converted to `.lgo` after download) you wish to download to the DTP.

   If you are downloading an animated logo in `.tga` format (DTP-GFX – OPT only) select the ***first file*** in the `.tga` sequence. If the file is already in `.lgo` format, select the `.lgo` file

Figure 8. Animated Logo Selected

Click **Open.**

6. Type a Name for the Logo. The Logo Name should contain no spaces.

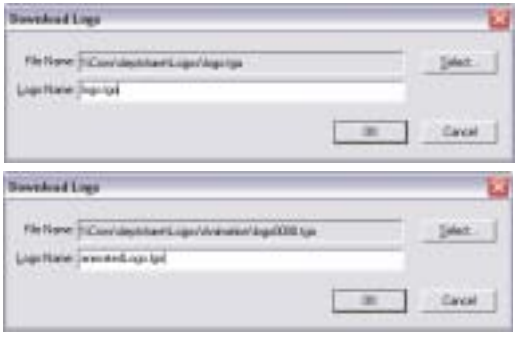


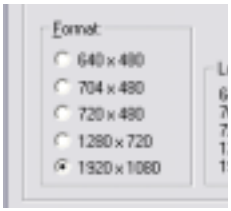
Figure 9. Naming Logos

7. Click **OK**.

Once the logo is downloaded, you may select it for Logo overlays.

Assigning a Logo ID

1. Click **Logo Setup**.
2. Select a **Logo ID** (Logo 1, Logo 2)
3. Select the logo **Format** size.
4. Click **Select**.



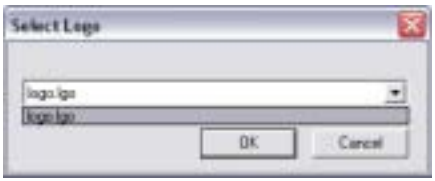


Figure 10. Logo Selection

5. Select a logo from the stored logo files.
6. Click **OK.**
7. Click **Load**.
8. Set the desired **Buffer Parameters**:
   - **Fade** (in milliseconds),
   - **Origin**
   - **Row Offset**
   - **Column Offset**

   Note that selecting the **Origin** labeled ***Original*** provides a base band-centric approach resulting in the logo displaying at the original location in the `.tga` file. Selecting this **Origin** is only meaningful when the source `.tga` file(s) dimensions match the video format (no scaling is applied to the original graphics and/or location).

Figure 11. Buffer Parameters

9. Click **Apply.**
10. Click **OK.**

Displaying a Logo

Logos must be assigned to a **Logo ID** before they can be selected for display. To select a logo for display, use the menu on the program screen.

1. Select a **Logo ID** (1 or 2).

Figure 12. Logo Display Selection

2. Display the selected logo by clicking **Logo On .**
3. Turn off the logo display by clicking **Logo Off**.

Chapter 4

TROUBLESHOOTING / Q&A

Hardware

Q 1

The DTP application seems to be running, but there is no video output. What has happened?

A

Check the LEDs on the ASI cards from the back of the chassis. Both the input red LED and output green LED should be flashing. If the input red LED is off with the ASI cable connected, check the input source.

Software

Q 1

The DTP application failed to start and shows an initialization error. What should I do?

A

Follow these steps in order:

1. Check the network setting of the box. Make sure the domain entry is blank and /etc/hosts file includes an entry for the DTP IP address and hostname.
2. Make sure the ASI drivers are started by typing “ls /dev” and verify that the ASI drivers are listed.
3. For one-in-one-out ASI card, the following devices should be listed for each card.
   - - asi-fd0-ctrl

- - asi-fd0-rx
- - asi-fd0-tx

For quad-inputs ASI card, the following devices should be listed for each card.

- - asi-qi0-ctrln
- - asi-qi0-rxn

Q 2 **I Turn on the logo, but no logo appears on the screen. What do I do?**

A Check the network setting of the box. Make sure the domain entry is blank and /etc/hosts file includes an entry for the DTP IP address and hostname.

Q 3 **RCS is connected to the DTP, but nothing happens when turning on/off logos, splicing or changing bitrates. What is wrong?**

A If the DTP application has been restarted after the RCS was successfully connected, the RCS has to be restarted.

Q 4 **How do I save the DTP IP address so that I do not have to type it in every time the RCS starts up?**

A Create a shortcut to RCS and save the DTP's IP address with the shortcut.

Q 5 **RCS is unable to connect to the DTP server. What do I do?**

A Follow these steps in order:

1. Verify the DTP application is running.
2. Verify the network connection by pinging the DTP IP address.

Q 6

My video output appears to be blanking or dropping frames, both audio and video. What is causing this?

A

A possible cause to this problem could be that the output transport stream is being over subscribed. Verify that the total available video bandwidth is set correctly. “Setting Maximum Available Bitrate and Statmux Pool”, page 18.

Appendix A

Operating Using the Command Line User Interface

Opening the CLUI Menu

1. After boot up, press <shift> + <~> to bring up the CLUI menu

Adding Logos to the DTP System

Logo Formatting

The Targa file has two limitations:

- The non-zero alpha channel area of the logo must be less than ¼ of the screen width and ¼ of the screen height.
- The non-zero alpha channel area of the logo must be an even number of pixels horizontally and vertically.
- The DTP uses a [filename].lgo format. When a [filename].tga is downloaded to the DTP it is converted to [filename].lgo for DTP internal use.

Storing and Converting

CD-ROM Access

Use the CD-ROM to transfer files to the DTP:

a. Insert the CD into the CD-ROM drive
b. Type mount /dev/cd0 /home/cd
c. You should then be able to type 'cd /home/cd' and copy files.
d. When you are done, make sure you aren't in /home/cd, and type umount /home/cd (not 'unmount', but 'umount')

Directory Organization

Copy the Logo Files to the proper directory

a. /home/dtpuser/bin for executable and .lgo logos that are accessible by the command line UI at run-time. .lgo files are created using the “logoconvert” utility (see below)

b. “logoconvert.exe” is a DTP utility that takes a [filename].tga (TARGA file) and converts it to [filename].lgo. Once that file is copied into /home/dtpuser/bin, it can then be directly accesses by the application.

To use logoconvert.exe, make sure that this file is in the directory you are working from (/home/dtpuser/bin), and type:

./logoconvert.exe [filename].tga

You should see output messages similar to the messages listed in the screen dump shown here.

This allows the system to use the locally available logoconvert.exe file

```
# ./logoconvert.exe leitchHD.tga
0 (1): File: leitchHD.tga.
 at targa.cpp(129)
5 (1):    Color map field (0) in header.
   True Color, uncompressed.
   X origin: 0.
   Y origin: 0.
   Width: 300.
   Height: 50.
   Bits per pixel: 32.
 at targa.cpp(278)
Removing any extra borders
Converting to YUV from RGB
Converting to 4:2:0
Saving image
11 (1):    File leitchHD.lgo written.
   Version: 2
   topRowOffset: 0
   bottomRowOffset: 0
   leftColumnOffset: 1
   rightColumnOffset: 1
   Image width after processing 298 pixels
   Image height after processing 50 pixels
Image area was reduced 0.006667 percent.
 at targa.cpp(615)
   File leitchHD.lgo written.
   Version: 2
   topRowOffset: 0
```

The logo file will then be made available to the system for inserting into video programs.

DTP Operation using the CLUI

After starting up the DTP application, hit <shift> and <~> keys together and the following Main Menu will appear.

```
Main Menu
---------
(0) Status
(1) Program 1
(2) Program 2
(3) Program 3
```

To set up output program 1, select "1." The following menu will appear.

```
Program 1
---------
(0) Status
(1) Splice to Input A
(2) Splice to Input B
(3) Splice to None
(4) Splice Continuous
(5) Turn Logo On
(6) Turn Logo Off
(7) Setup Splicer
```

Select "7" to set up splicer for program 1.

```
Setup Splicer (Program 1)
---------
(1) Select Input A
Select InputB
Set Max Bitrate
(x) Exit to Program
```

Select "1" to set up input A.
A list of available asi programs will displayed.

```
(1) ASI 0, Program 3
Select an input (1 – 1 ):
```

Type in the desired input for Input A.
Messages similar to the following should appear.

Create Play Object, Program 1
PID 49 → 17
PID 52 -> 20

Splice input 1 chosen for program1, splicer A

Select “x” to exit to program 1 menu.

Program 1
---
(0) Status
(1) Splice to Input A
(2) Splice to Input B
(3) Splice to None
(4) Splice Continuous
(5) Turn Logo On
(6) Turn Logo Off
(7) Setup Splicer

To setup logos, select “8”

Setup Logo (Program 1)
---
(0) Status
(1) Load Logo
(2) Move Logo
(3) Set Logo Fade Period
(4) Select Current Logo Number
(5) Select Current Logo Format
(6) Turn Logo On
(7) Turn Logo Off
(8) Turn All Logos On for Current Program

Select “4” to select current logo number

Select a logo number (1 – 2):

Type in a number 1 or 2 for logo number.

Setup Logo (Program 1)
---
(0) Status
(1) Load Logo
(2) Move Logo
(3) Set Logo Fade Period
(4) Select Current Logo Number
(5) Select Current Logo Format
(6) Turn Logo On
(7) Turn Logo Off
(8) Turn All Logos On for Current Program

Select "5" to select current logo format.

Current Logo Format is 1920x1080
1) 640x480
2) 704x480
3) 720x480
4) 1280x720
5) 1920x1080

Select a logo format (1 – 5):

Select the correct format and hit <ENTER>

Setup Logo (Program 1)
---
(0) Status
(1) Load Logo
(2) Move Logo
(3) Set Logo Fade Period
(4) Select Current Logo Number
(5) Select Current Logo Format
(6) Turn Logo On
(7) Turn Logo Off
(8) Turn All Logos On for Current Program

Select "1" to load a logo. That will bring up a list of available logos that are located under /home/dtpuser/bin directory.

Logo1.lgo
Logo2.lgo
Logo3.lgo

Select a logo (1 – 3):

Type in the number for the desired logo and hit <ENTER>
A Message similar to the following should displayed.

Loaded Logo ‘Logo1.lgo’, Program 1, Format 1920x1080

Setup Logo (Program 1)
---
(0) Status
(1) Load Logo
(2) Move Logo
(3) Set Logo Fade Period
(4) Select Current Logo Number
(5) Select Current Logo Format
(6) Turn Logo On
(7) Turn Logo Off
(8) Turn All Logos On for Current Program

Select “6” to turn on the logo.

Appendix B

DTP Configuration File

Overview

The configuration file is used to build the output configuration of the DTP. At startup, the configuration file is read and the DTP output is configured accordingly. During runtime, the DTP configuration may change via automation or manual control. The configuration file will be updated to reflect the "as running" configuration. In the event of a system restart, the last configuration will be started. Each line of the file contains a configuration parameter whose format is:

`<Parameter name> <Parameter value> <#> <Default value>`

where:

`<Parameter name>` is the name of the parameter.

`<Parameter value>` is the value given to the parameter name at startup and is written by the DTP during run-time when the parameter is changed in real-time.

`<#>` indicates the end of the parameter value

`<Default value>` the value after `<#>` is the default value if there is no config file present. If no configuration file is present the DTP will create one and set all values to the Default value. In some cases there will be a space character after **<#>** which is a valid default value.

PSIP Options in the DTP Configuration File

Specifying the PSIP Mode

There are three modes of PSIP operation: dynamic, static, and none. When the DTP is using Dynamic PSIP, it will process incoming PSIP from a user-specified input and multiplex it into the output. Static PSIP operates in the same manner except that the source of the PSIP is a text configuration file residing on the DTP file system (see ““PSIP Options in the DTP Configuration File”, page 44”). There is also a mode where PSIP is not operational and hence not multiplexed into the output. The following configuration settings control the modes:

```
psipInput <input>
```

“input” is –1 for static or no PSIP and 0-7 for dynamic PSIP

```
psipDatabase <file>
```

“file” is a text configuration file containing commands that define the static PSIP contents. “file” is left blank to disable static PSIP.

The following table summarizes the combinations and the resultant PSIP modes:

psipInput	psipDatabase	PSIP Mode
-1	Blank	None
-1	Valid file name	Static
0-7	Don’t care	Dynamic
0-7	Don’t care	Dynamic

Specifying PSIP Table Intervals

ATSC A/65B specifies the rate at which PSIP tables must be generated. The following parameters are available for setting the various table intervals.

Base Tables (MGT, VCT, STT, RRT)

Base table intervals are calculated as a multiple of the baseTableInterval parameter, for example the VCT cycle time is calculated as follows:

```
VCT cycle time (ms) = ( baseTableInterval *
vctInterval )
```

If the value of vctIntervalOffset is non-zero, the VCT will be scheduled at a rate given by the equation above plus the value of vctIntervalOffset. Consider the following example:

```
baseTableInterval = 148 milliseconds
vctInterval = 2
vctIntervalOffset = 1
VCT cycle time = 148 * 2 = 296 milliseconds
VCT offset = 1 * 148 = 148 milliseconds
```

The VCT will be scheduled every 296 milliseconds, offset by 148 milliseconds. Therefore the scheduled times for the VCT will be 148, 444, 740, 1036, etc. Without adding an offset, the scheduled times would be 0, 296, 592, 888, 1184, etc. The purpose of the offset is to stagger the scheduling times of the various tables, thus making better use of the output bandwidth.

Parameters for base tables are shown below. The values shown are defaults. The baseTableInterval is specified in milliseconds. All other parameters are specified as multiples or counts of the baseTableInterval. The maxIntervalCount reflects the maximum interval count of all table intervals.

```
baseTableInterval 148
mgtInterval 1
mgtIntervalOffset 0
sttInterval 6
sttIntervalOffset 0
vctInterval 2
vctIntervalOffset 1
rrtInterval 396
rrtIntervalOffset 0
maxIntervalCount 396
```

Event and Extended Text Tables

Event and extended text table intervals are all specified in milliseconds. The values shown are defaults. Prime numbers were chosen as the defaults to distribute the transmission of the various tables more evenly.

```
eit0Interval          499
eit1Interval          2999
eit2_3Interval        5003
eit4_7Interval        8501
eit8_15Interval       12007
eit16_23Interval      15511
eit24_31Interval      19001
eit32_39Interval      22501
eit40_47Interval      26003
eit48_55Interval      29501
eit56_63Interval      33013
eit64_71Interval      36497
eit72_79Interval      40009
eit80_87Interval      43517
eit88_95Interval      47017
eit96_103Interval     50503
eit104_111Interval    54001
eit112_119Interval    57503
eit120_127Interval    59743
ett0_3Interval        5009
ett4_7Interval        8513
ett8_15Interval       12011
ett16_23Interval      15527
ett24_31Interval      19009
ett32_39Interval      22511
ett40_47Interval      26017
ett48_55Interval      29527
ett56_63Interval      33023
ett64_71Interval      36523
ett72_79Interval      40013
ett80_87Interval      43541
ett88_95Interval      47017
ett96_103Interval     50513
ett104_111Interval    54011
ett112_119Interval    57527
```

```
ett120_127Interval    59981
channelEttInterval    10007
```

Gap Event Title

The DTP can fill gaps in the incoming PSIP event schedule with default events. The title of such events can be set using the following entry in the DTP configuration file:

```
psipGapEventTitleYour text here.
```

Number of EITs

This setting controls the number of EITs (and ETTs) in the output stream.

```
psipNumEits<num>  where "num" is 0-128
```

Schedule Gap Fill Enable

This setting enables/disables filling schedule gaps in the database.

```
psipGapFill<value>
```

Where "value" is either true (gap fill is enabled) or false (gap fill is disabled).

Dynamic PSIP Tips

When setting up the DTP to accept dynamic PSIP from an external generator, it is important to ensure that the PIDs match for the various services. The PIDs listed in the Service Location Descriptors of the incoming VCTs (Virtual Channel Tables) must match the output PIDs configured in the DTP configuration file. If these do not match, set-top boxes typically cannot tune the video channels using the major and minor channel numbers from the VCT. Also, note that the PIDs specified in the DTP configuration file are in DECIMAL, not hex.

The table rates for EITs and ETTs recommended in ATSC A/69 (PSIP Implementation Guides for Broadcasters) sometimes do not result in satisfactory performance of some set-top boxes. With recommended EIT/ETT times of one minute, display of the program guide can become slow and tedious. The default EIT/ETT rates for the DTP were chosen

to strike a balance between reasonable set-top performance and bandwidth conservation. Increasing EIT/ETT table rates (i.e. shortening the interval) will result in more PSIP bandwidth utilization of the output channel, leaving less available for video and other services.

PSIP depends on an accurate real-time clock. If the clock settings on the DTP, external PSIP generator, or encoder are significantly out-of-synch, PSIP generated by the DTP may not be consistent with the external PSIP generator. It is important to ensure that all three devices are synchronized as closely as possible.

Other Values and Descriptions

`numPrograms 5 # 3`
Specifies the number of programs in the output transport stream.
The following parameters are configuration items on a per program basis. There are a maximum of 6 programs configurable. The programs are identified as Pn_, where n indicates the number of the program in the configuration file. The value n has no relationship with the program numbers in the output transport stream. See example below.

`totalvideobandwidth 18000000 # 18400000`
Specifies the bitrate that is available for the video portion of the 19.39 Mb/s transport stream. The user must subtract the aggregate audio bitrates from the 19.39 number. In addition, there is approximately 200,000 bits that must be subtracted out for system overhead, such as PATs, PMTs, and static PSIP. When the aggregate audio bitrate and system overhead are taken out of the 19.39Mb/s you are left with the available video bandwidth.

`psipDatabase psip.txt #`
Pathname to the static PSIP configuration file

`P0_program 3 # 1`
Specifies the number of the program in the output transport stream.

`P0_pmtPid 48 # 16`
Specifies the PMT pid value for this program.

`P0_pcrPid 49 # 17`
Specifies the PCR pid value for this program

`P0_videoPid 49 # 17`
Specifies the Video pid value for this program

`P0_numAudios 1 # 4`
Specifies the number of audio streams present in the output for this program. A maximum of 4 audios can be present. Multiple audios can be specified even if the input program has only 1 audio. In this case multiple audio pids will be present in the output with only the first pid having audio associated with it. This allows a user to configure the system whose audio services vary in number, but whose maximum is known. The pid values for the audio services (below) are relevant only for the number of audio services configured. If two audio services are configured then the pid values for the 3rd and 4th audio services are ignored.

`P0_audioPid0 52 # 20`
Specifies the pid value of the first audio service for this program.

```
P0_audioPid1 21    # 21
```

Specifies the pid value of the second audio service for this program.

```
P0_audioPid2 22    # 22
```

Specifies the pid value of the third audio service for this program.

```
P0_audioPid3 23    # 23
```

P0_description Program 3 # Program1
Specifies the name of the program. In this case, the program name is Program 3. A station's call letters could also be used (WXYZ). The characters after the <_description> will show up as the tab name for this program in the RCS GUI.

```
P1_program 4    # 2
P1_pmtPid 64    # 32
P1_pcrPid 65    # 33
P1_videoPid 65    # 33
P1_numAudios 1    # 4
P1_audioPid0 68    # 36
P1_audioPid1 37    # 37
P1_audioPid2 38    # 38
P1_audioPid3 39    # 39
P1_description Program 2    # Program2
P2_program 3    # 3
P2_pmtPid 48    # 48
P2_pcrPid 49    # 49
P2_videoPid 49    # 49
P2_numAudios 4    # 4
P2_audioPid0 52    # 52
P2_audioPid1 53    # 53
P2_audioPid2 54    # 54
P2_audioPid3 55    # 55
P2_description Program 3    # Program3
P3_program 4    # 4
P3_pmtPid 64    # 64
P3_pcrPid 65    # 65
P3_videoPid 65    # 65
P3_numAudios 4    # 4
```

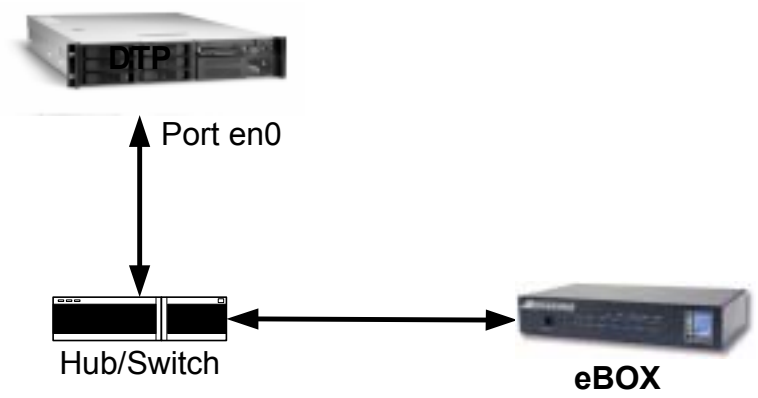
```
P3_audioPid0 68    # 68
P3_audioPid1 69    # 69
P3_audioPid2 70    # 70
P3_audioPid3 71    # 71
P3_description Program 4    # Program4

P4_program 5    # 5
P4_pmtPid 80    # 80
P4_pcrPid 81    # 81
P4_videoPid 81    # 81
P4_numAudios 4    # 4
P4_audioPid0 84    # 84
P4_audioPid1 85    # 85
P4_audioPid2 86    # 86
P4_audioPid3 87    # 87
P4_description Program5    # Program5
P5_program 6    # 6
P5_pmtPid 96    # 96
P5_pcrPid 97    # 97
P5_videoPid 97    # 97
P5_numAudios 4    # 4
P5_audioPid0 100    # 100
P5_audioPid1 101    # 101
P5_audioPid2 102    # 102
P5_audioPid3 103    # 103
P5_description Program6    # Program6
```

Additional Values

GPI (eBOX) System Setup

These instructions are Leitch specific, and are customized for setting up the DTP and eBOX together. While the manufacturer's instructions are included, the instructions listed here should be followed first.



Part 1 – Unpacking and Connecting the Box

Unpack and rack the eBOX. Using the provided power cable, power up the unit and verify the power light turns red.

Connect a GPI cable to the back of the eBOX. The other end should connect to the automation system. Pin 1 is the common connection, and pins 2-25 represent GPIs 1-24, respectively.

The eBOX should **NOT** be connected to the local network until the IP address has been set. Since it comes with a default IP address, connecting the box may cause a conflict with another device on the network.

Setup Procedure

1. By default, the eBOX has the IP address `192.168.254.102`, we will change the IP address to `192.168.254.1`, with Netmask `255.255.255.0`.

Note

IP Address schemes may vary on a system by system basis.

2. Set DIP switches 1-3 on the back of the eBox to the down position, and DIP switch 8 in the up position.

3. Power cycle the eBOX.
4. On the GPC (General Purpose Computer used to configure the eBOX, open Microsfot Internet Explorer to *http://192.168.254.102*.
5. Change the network settings on the page to match IP Address `192.168.254.1`, with Netmask `255.255.255.0`.
6. Click **Submit** on the bottom of the page.
7. Return to the eBOX and set DIP switches 1-3 to the up position, and DIP switch 8 to the down position.
8. Power cycle the eBOX, and verify that you have network connectivity to the new IP address.

Note

An alternative to changing the eBOX IP address is to add a static route to Windows. That method is not covered in this document.

The management web application for the eBOX, maintained by the eBOX manufacturer, is only available when the box is set to IP 192.168.254.102. If you need to connect to the management site in the future, you must follow the Setup Procedure again.

Part 2 – Connecting the DTP to the eBOX

Now that the eBOX is up and running, it is time to have the DTP connect to it and start receiving GPI updates. Before doing the following steps, make sure the eBOX has been plugged into the network

- Edit the DTP config file (`dtptest_config.txt`), and modify the line named eboxServer to have the eBOX IP address following it

```
eboxServer <eBOX IP> #
```

- After this has been saved, restart the DTP application.

Part 3 – Testing the DTP + eBOX

The DTP should now be receiving updates from the eBOX. In order to test this, open up the RCS application and connect it to the DTP. For this test, make sure there is already a video output on program 1.

1. Select **GPI 1**.
2. Make sure **GPI Open** is selected, then select **Cue** for **Program #1**.

3. From the drop down menu, choose a program to splice to, and select **Splice to Cue.**
4. Select the **GPI Close** option, and then select **Cue** for **Program #1**.
5. From the drop down, choose the **None** option, and select **Splice to Cue**.
6. Make sure you have output video on program 1, and then close GPI 1, wait 3 seconds for the video to go black, then open **GPI 1**. The video should return.

If the video goes to black when GPI 1 is closed, and returns when GPI 1 is opened, then the system is set up properly.

Part 4 – Setting up EAS

To setup and enable EAS for the DTP, edit the config file (`dtptest_config.txt`) and modify the line titled `gpiEasPort` to match your EAS source:

```
gpiEasPort 4   # 0
```

The default value is 0, which disables GPI EAS actions. The GPI port designated as the EAS port will not be able to execute normal GPI actions, so be sure to choose an unused port.

See the next section for completing the EAS setup.

Emergency Alert System Setup

In order for EAS to work you must make sure the following requirements have been met:

- The GPI (eBOX) has been set up and is working properly (see the above section for setup instructions).
- ASI carrying the EAS audio stream must be connected to an ASI input port.
- The ASI port number and audio PID in must be changed in the DTP config file (`dtptest_config.txt`).
- An RJ45-to-DB9 adapter and null-modem serial cable must be used to connect the EAS box to the DTP. The port configuration must be in the config file . The DTP uses the RJ45 side of the adapter. page 55.

Default EAS values are shown below. Make sure to set the EAS type to one of the supported values (tft911 or sageCgen).

```
eas_type none # none, tft911, sageCgen
eas_serialPort 2    # 2
eas_baudRate 9600    # 9600
eas_dataBits 8    # 8
eas_stopBits 1    # 1
eas_parity none    # none
eas_audioAsiPort 0    # 0
eas_audioPid 21    # 21
```

Appendix C

DTP Static PSIP Configuration

PSIP Configuration File Guidelines (STATIC PSIP ONLY)

Static PSIP in the DTP is controlled via a text configuration file. An internal database is created from the configuration file by the DTP on startup. This database is the source of PSIP information in the outgoing program stream. The name of the file is specified in the DTP configuration file as per the following example:

```
psipDatabase psip_config.txt
```

If no filename is specified, static PSIP is disabled.

The PSIP configuration file contains function call-like commands that allow the user to specify the content and behavior of the PSIP stream output by the DTP. The following table data types and descriptors can be specified in the PSIP configuration file for output:

```
Virtual Channel
Event
Rating Region
Extended Text for channel names, event titles, etc.
Caption Service Descriptor
Content Advisory Descriptor
Extended Channel Name Descriptor
Time-shifted Service Descriptor
Service Location Descriptor
```

```
AC3 Audio Descriptor
Redistribution Control Descriptor
```

In addition, the PSIP configuration file allows setting of the following parameters:

```
Current Time
Base PIDs for EIT, ETT
Transport Stream ID
Event Titles for filling gaps in the program schedule
Number of EITs output
```

A typical PSIP configuration file would consist of commands to set the various parameters and several commands for specifying a channel lineup. Program events can be added, although their usefulness is questionable when using static PSIP.

The following sections describe the various elements of the PSIP configuration file. Note that examples are provided with sample values. Actual values will differ in an operational situation.

Data Format

Numbers can be entered in decimal (e.g. 123) or hexadecimal format (e.g. 0x134bc). Text is enclosed with double quotes “”.

Comments

Comments can take the form of single line or multi-line. A single line comment is denoted by “//”. A multi-line comment starts with “/*” and ends with “*/”. Multi-line comments are a convenient way to quickly remove elements of the file while leaving the text intact for future use.

Set the Transport Stream ID for the VCT

The following command sets the transport stream ID. This parameter applies to all virtual channels.

```
SetTransportStreamId( transportStreamId = 0x086f )
```

From ATSC A/65B...

> "The 16-bit MPEG-2 Transport Stream ID, as it appears in the ProgramAssociation Table (PAT) identified by a PID value of zero for this multiplex. The transport_stream_id distinguishes this Terrestrial Virtual Channel Table from others that may be broadcast in different PTCs."

Set the base PID for the EITs

The following command sets the base PID used for all EITs. The valid range is 0x1000 - 0x1fef. Users must ensure that base PID values do not overlap.

```
SetEITBasePid( pid = 0x1000 )
```

Set the base PID for the ETTs

The following command sets the base PID used for all ETTs. The valid range is 0x1000 - 0x1fef. User must ensure that base PID values do not overlap.

```
SetETTBasePid( pid = 0x1200 )
```

Sets the base PID for the ETT-V

The following command sets the base PID for the channel ETT (i.e. ETT-V). The valid range is 0x1000 - 0x1fef. User must ensure that base PID values do not overlap.

```
SetETTVPid( pid = 0x1400 )
```

Set text to appear in events generated when no programming exists

The following command sets text that will appear in “gap-filler” events (i.e. where no programming exists). Size of the text is limited to 255 characters. NOTE: This command applies only when the psipGapFill parameter is set to “true” in the DTP configuration file.

```
SetEmptyEventTitle( text = "Regularly scheduled
programming" )
```

Set the current time

The following command sets the current database time. This command is only useful for testing. It is not advisable to include it in an operational situation, as the database time will be updated continuously by the DTP.

```
SetTime( currentTime = 02/15/1980 00:00:00 )
```

Set maximum number of EITs listed in the MGT

The following command controls which EITs, 0 through 127, will be listed in the MGT. The valid range is 0-127.

```
SetMaxEitsInMgt( maxEitsInMgt = 4 )
```

Set GPS-UTC offset field in the STT

The following command sets the GPS-UTC offset field in the STT. The valid range is 0-255.

```
SetGpsUtcOffset( timeOffset = 0 )
```

Set daylight savings field in the STT

The following command sets the daylight savings field in the STT. See ATSC A/65B Annex A for a complete description.

```
SetDaylightSavings(
   dsStatus = 0
   dsDayOfMonth = 0
   dsHour = 0
)
```

Add a Virtual Channel

The following command adds a virtual channel. Field names correspond directly to those referenced in ATSC A/65B for the VCT with the exception that underscores do not appear between words (e.g. major_channel_number -> majorChannelNumber). The Service Location Descriptor is mandatory when adding a virtual channel. All other descriptors shown are optional.

```
AddVirtualChannel(
   shortName = "Leitch"
   majorChannelNumber = 14
   minorChannelNumber = 1
   modulationMode = 4
   carrierFrequency = 0
   channelTSID = 128
   programNumber = 2
   accessControlled = 0
   hidden = 0
   hideGuide = 0
   serviceType = 2
   sourceId = 0
   extendedTitle = "Leitch security camera video"
   descriptors = {

      timeShiftedServiceDescriptor(
         services(
```

```
                {
                    timeShift = 720
                    majorChannelNumber = 999
                    minorChannelNumber = 0
                }
                {
                    timeShift = 1
                    majorChannelNumber = 1
                    minorChannelNumber = 7
                }
            )

        )

        ac3AudioDescriptor(
            sampleRateCode = 7
            bsid = 0
            bitRateCode = 34
            dsurmod = 2
            bsmod = 0
            numChannels= 7
            fullSvc = 1
            langCod = 0
            langCod2 = 0
            mainId = 7
            asvcFlags = 0
            textCode = 1
            text =  "Mexican Radio"
            additionalInfo = { 0xfe 0x01 0x02  }
        )

    serviceLocationDescriptor(
     pcrPid = 5
     numberElements = 2
```

```
 { streamType = 0x2 elementaryPid = 5 language = ""
}
 { streamType = 0x81 elementaryPid = 7 language =
"eng" }
)

      extendedChannelNameDescriptor(
         longChannelNameText = "Leitch security
camera video."
      )
   }

 )
```

Add an Event

The following command adds an event. Field names correspond directly to those referenced in ATSC A/65B for the VCT with the exception that underscores do not appear between words (e.g. major_channel_number -> majorChannelNumber). All descriptors shown are optional.

Note

The start time of the event must be greater or equal to the current database time for the event to appear in the PSIP output. When using static PSIP in an operational situation, events are typically not present in the configuration file. The DTP will fill empty programming slots with "filler" events with a title settable via the SetEmptyEventText command.

```
AddEvent(
   majorChannelNumber = 14
   minorChannelNumber = 1
   startTime = 09/28/2004 15:00:00
   duration = 3600
   eventId = 1
   title = "Strangers Have the Best Candy"
   extendedTitle = "The quick red fox jumped over
the lazy brown dog."
   descriptors = {

      captionServiceDescriptor(
```

```
        services(
            {
                language = "eng"
                ccType = 1
                line21Field = 1
                captionServiceNumber = 6
                easyReader = 1
                wideAspectRatio = 1
            }
            {
                language = "eng"
                ccType = 0
                line21Field = 0
                captionServiceNumber = 7
                easyReader = 0
                wideAspectRatio = 0
            }
        )
    )

    contentAdvisoryDescriptor(
        ratingRegions(
            {
                ratingRegion = 1
                ratedDimensions(
                    {
                        ratingDimensionJ = 1
                        ratingValue = 1
                    }
                    {
                        ratingDimensionJ = 2
                        ratingValue = 2
                    }
                )
                // 16 chars or less
```

```
                        ratingDescriptionText = "aaa-aaa"
                    }
                    {
                        ratingRegion = 2
                        ratedDimensions(
                            {
                                ratingDimensionJ = 3
                                ratingValue = 3
                            }
                            {
                                ratingDimensionJ = 4
                                ratingValue = 4
                            }
                        )
                        // 16 chars or less
                        ratingDescriptionText = "bbb-bbb"
                    }
                )
            )

            redistributionControlDescriptor( )

        } // end descriptors
    )
```

Add a Rating Region

The following command adds a rating region. Field names correspond directly to those referenced in ATSC A/65B for the VCT with the exception that underscores do not appear between words (e.g. major_channel_number -> majorChannelNumber). Note that rating regions are referenced in the Content Advisory Descriptor.

```
AddRatingRegion(
   ratingRegion = 1
   // Max 32 characters
   ratingRegionName = "US (50 states +
possessions)"
   ratingDimensions(
      {
         // Max 20 characters
         dimensionName = "Fred"
         graduatedScale = 1
         ratingValues(
            {
               // Max 8 characters
               abbrevRatingValueName = "abc"
               // Max 150 characters
               ratingValueName = "abc abc abc"
            }
            {
               // Max 8 characters
               abbrevRatingValueName = "def"
               // Max 150 characters
               ratingValueName = "def def def"
            }
            {
               // Max 8 characters
               abbrevRatingValueName = "ghi"
               // Max 150 characters
               ratingValueName = "ghi ghi ghi"
            }
```

```
            )
        }
        {
            // Max 20 characters
            dimensionName = "Barney"
            graduatedScale = 1
            ratingValues(
                {
                    // Max 8 characters
                    abbrevRatingValueName = "jkl"
                    // Max 150 characters
                    ratingValueName = "jkl jkl jkl"
                }
                {
                    // Max 8 characters
                    abbrevRatingValueName = "mno"
                    // Max 150 characters
                    ratingValueName = "mno mno mno"
                }
                {
                    // Max 8 characters
                    abbrevRatingValueName = "pqr"
                    // Max 150 characters
                    ratingValueName = "pqr pqr pqr"
                }
            )
        }
    )
)
```

Typical PSIP Configuration File (STATIC PSIP ONLY)

Following is a typical PSIP configuration file with three channels.

```
//
// Sets the transport stream ID for the VCT.
//
// From ATSC A/65B...
//
// "The 16-bit MPEG-2 Transport Stream ID, as it
appears in the Program
// Association Table (PAT) identified by a PID
value of zero for this
// multiplex. The transport_stream_id
distinguishes this Terrestrial Virtual
// Channel Table from others that may be broadcast
in different PTCs."
//
// This parameter applies to all virtual channels
and must match the
//   channelTSID in each.
//
SetTransportStreamId( transportStreamId = 136 )


//
// Sets the base PID for the EITs.  Range = 0x1000
- 0x1fef
// User must ensure that base pid values do not
overlap.
//
SetEITBasePid( pid = 0x1000 )
```

```
//
// Sets the base PID for the ETTs.   Range = 0x1000
- 0x1fef
// User must ensure that base pid values do not
overlap.
//
SetETTBasePid( pid = 0x1200 )

//
// Sets the base PID for the ETT-V.  Range = 0x1000
- 0x1fef
// User must ensure that base pid values do not
overlap.
//
SetETTVPid( pid = 0x1400 )

//
// Sets the text to appear in events generated
when no programming exists.
// Limited to 255 characters.
//
SetEmptyEventTitle( text = "Regularly scheduled
programming" )

//
// Adds a virtual channel to the VCT.
// Field names correspond directly to those
referenced in ATSC A/65B
// with the exception that underscores do not
appear between words.
// E.g. major_channel_number -> majorChannelNumber
//
AddVirtualChannel(
   shortName = "WXXX-HD"
   majorChannelNumber = 10
```

```
   minorChannelNumber = 1
   modulationMode = 4
   carrierFrequency = 0
   channelTSID = 136
   programNumber = 1
   accessControlled = 0
   hidden = 0
   hideGuide = 0
   serviceType = 2
   sourceId = 1
   extendedTitle = "WXXX High Definition"
   descriptors = {

      //
      // PIDS in this descriptor must match those
in the PMT
      //
      serviceLocationDescriptor(
         pcrPid = 33
         numberElements = 2
         // Video
         { streamType = 0x02 elementaryPid = 33
language = "" }
         // Audio
         { streamType = 0x81 elementaryPid = 36
language = "eng" }
      )

      //
     // Set-tops sometimes will display this field
over the ext. title
      //
      extendedChannelNameDescriptor(
         longChannelNameText = "WXXX High
Definition"
      )
```

```
    }
)


//
// Adds a virtual channel to the VCT.
// Field names correspond directly to those
referenced in ATSC A/65B
// with the exception that underscores do not
appear between words.
// E.g. major_channel_number -> majorChannelNumber
//
AddVirtualChannel(
    shortName = "WXXX-SD"
    majorChannelNumber = 10
    minorChannelNumber = 2
    modulationMode = 4
    carrierFrequency = 0
    channelTSID = 136
    programNumber = 2
    accessControlled = 0
    hidden = 0
    hideGuide = 0
    serviceType = 2
    sourceId = 2
    extendedTitle = "WXXX Standard Definition"
    descriptors = {

        //
        // PIDS in this descriptor must match those
in the PMT
        //
        serviceLocationDescriptor(
            pcrPid = 49
            numberElements = 2
```

```
            // Video
            { streamType = 0x02 elementaryPid = 49
language = "" }
            // Audio
            { streamType = 0x81 elementaryPid = 52
language = "eng" }
         )

         //
        // Set-tops sometimes will display this field
over the ext. title
         //
         extendedChannelNameDescriptor(
            longChannelNameText = "WXXX Standard
Definition"
         )
      }
)

//
// Adds a virtual channel to the VCT.
// Field names correspond directly to those
referenced in ATSC A/65B
// with the exception that underscores do not
appear between words.
// E.g. major_channel_number -> majorChannelNumber
//
AddVirtualChannel(
   shortName = "WXYZ"
   majorChannelNumber = 10
   minorChannelNumber = 3
   modulationMode = 4
   carrierFrequency = 0
   channelTSID = 136
   programNumber = 3
   accessControlled = 0
```

```
   hidden = 0
   hideGuide = 0
   serviceType = 2
   sourceId = 3
   extendedTitle = "WXYZ News"
   descriptors = {

      //
      // PIDS in this descriptor must match those
in the PMT
      //
      serviceLocationDescriptor(
         pcrPid = 65
         numberElements = 2
         // Video
         { streamType = 0x02 elementaryPid = 65
language = "" }
         // Audio
         { streamType = 0x81 elementaryPid = 68
language = "eng" }
      )

      //
     // Set-tops sometimes will display this field
over the ext. title
      //
      extendedChannelNameDescriptor(
         longChannelNameText = "WXYZ News"
      )
   }
)

AddRatingRegion(
   ratingRegion = 1

   // Max 32 characters
```

```
   ratingRegionName = "US (50 states +
possessions)"

   ratingDimensions( )
)
```