

Technicolor COM2000

Integrator's Manual



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1 Introduction

This document describes the processes and procedures for configuring a COM2000 system. The following sections will provide a brief overview of the system hardware, an in-depth guide to the COM46 user interface, and descriptions of certain system processes. Also included are several indices that cover common troubleshooting problems.

It is recommended that you read through the entirety of the manual, or at least review the main sections before working with the system, as it contains some important pointers that may come in handy during setup and maintenance

2 COM2000 Product Description

A COM360 chassis fully populated with COM46 receivers is capable of tuning and transcribing up to 48 DIRECTV channels. The satellite signal is tuned and demodulated resulting in a DIRECTV legacy or MPEG-4 transport stream. This transport stream is then IP-encapsulated using standard Internet protocols and sent out over the chassis backplane.

The data can be routed to an internal QAM6 modulator for RF output and also to two GIGe network connections for distribution on an IPTV network or external QAM modulator. The original DIRECTV broadcast video encoding format is preserved and the output transport stream is encrypted with the Pro:Idiom or other optional encryption standards.

Multiple COM360 chassis can be “stacked” in order to provide more than 48 output channels. Up to 16 chassis can be connected in the same system.

The COM46 receiver cards are controlled and managed via an Ethernet connection on the COM360 chassis. The COM46 card includes a built-in web interface and can be configured using a web browser. To view high definition video from the COM2000 a TV equipped with decryption technology must be used. Additionally the COM2000 is compatible with Samsung Link and Verimatrix DRMs, and Video Propulsion MPEG2 Pro:Idiom edge QAMs. Standard definition channels may be distributed in-the-clear.

In addition to high quality DIRECTV programming the COM2000 system offers additional powerful features:

- Optional Mediature 2.0 software upgrade offers switched matrix control capabilities for public space environments.
- Internal “home screen” channels stream direct from the COM2000 system.
- An electronic program guide that is fully customizable to system channel lineup and local programming. PSIP data will pass to televisions and “map” the channels without intervention. (PSIP interpretation is TV dependent, not all TVs respond to PSIP in the same manner. Test the TVs before installing.)
- External content from a variety of sources can be modulated through the COM2000.
- Remote monitoring and management through Technicolor web server.
- Interfaces with Emergency Alert Systems (EAS). Capable of sending locally originated streams to all video channels for site specific emergency broadcast. (Only available on systems utilizing the Technicolor QAM6 modulator).
- Optional ATSC-8 tuner facilitates streaming 8 off air channels through the COM2000 system. Multiple program streams from each off-air channel can add dozens of local channels to your lineup at no monthly cost to your customer.

Refer to Figure 1 below for a diagram illustrating a complete COM2000 system.

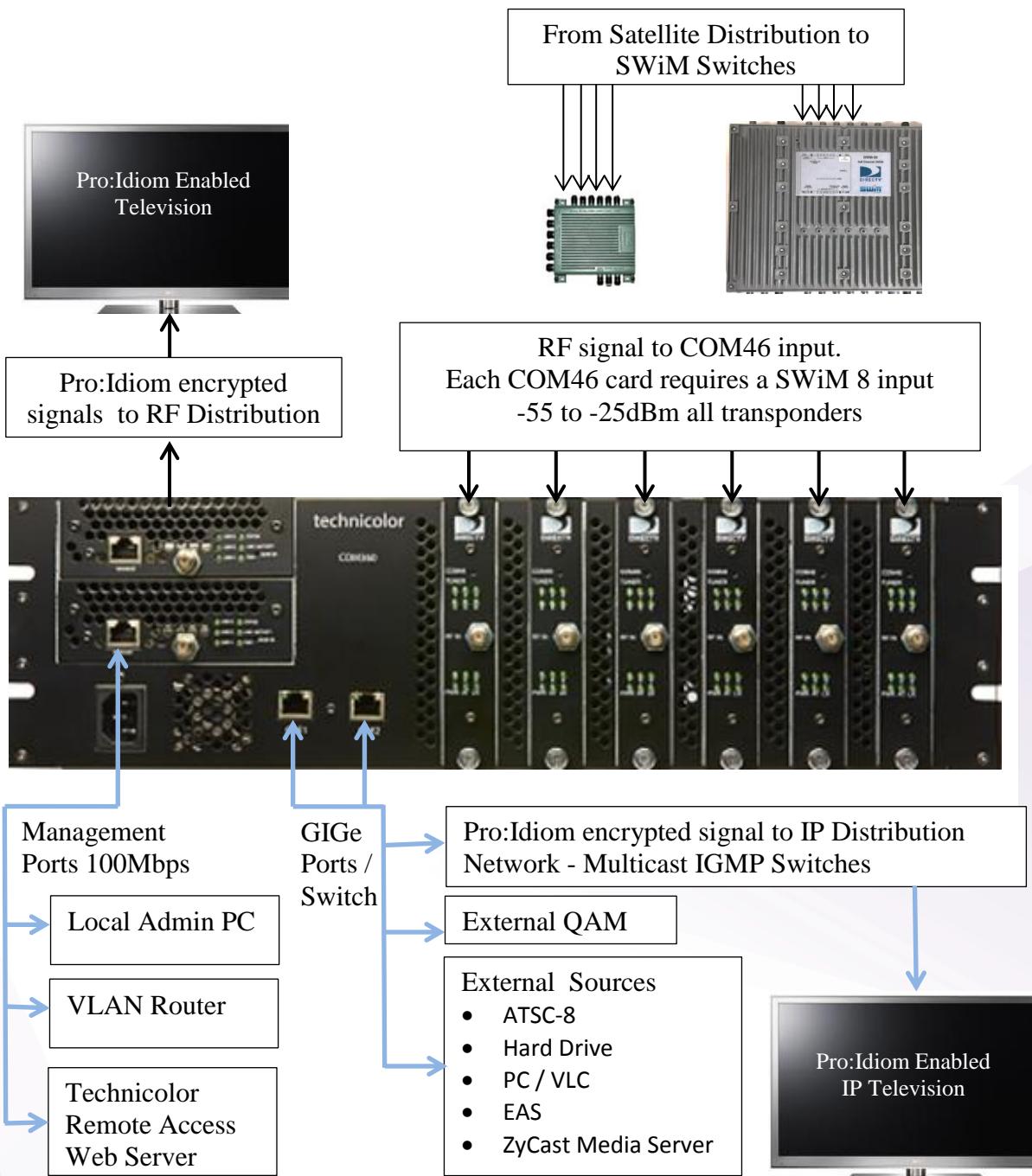


Figure 1 - COM2000 System Overview

3 Definitions

Term	Definition
Admin PC	A PC is required for initial setup and configuration. It is highly recommended to set up remote access to the COM2000 system for monitoring and maintenance post installation. This can be accomplished via several methods: A PC on site, connected to the internet running Team Viewer or a similar remote desktop program. PC will need to be on the same IP subnet as the COM2000 system VPN router set up for remote access via a Virtual Private Network
ATSC	Advanced Television Systems Committee. An international organization developing voluntary standards for digital television. Typically used to describe terrestrial off air broadcast TV standards. ATSC Tuner describes a TV capable of receiving digital off-air broadcasts. http://atsc.org/
ATSC-8	This is a device provided by Technicolor to provide ATSC off air television signals to the COM2000. It is configured and controlled through the COM2000 web interface. Depending on configuration it can deliver 8 program channels or 8 complete ATSC8 broadcasts including all sub channels in the carrier.
COM2000 System	This describes the Technicolor system consisting of a COM360 chassis, COM46 cards and QAM 6 modulators. Replaced previous product COM1000
COM360 Chassis	This device houses the COM46 and QAM 6 components. All video traffic is routed through the two Gigabit Ethernet (GbE) ports on the front of the chassis or to the QAM6 slots. System management and control can be done by connecting a computer to one of the management ports on the front panel of QAM6 cards or the GIe ports. Replaced previous product version COM200
COM46 and COM46-FLX Cards	The bulk of this manual is dedicated to these cards. They are the means by which the property will be able to receive the desired television programming for their network and control the entire COM2000 system. Replaced previous product version COM24 / Com24-FLEX.
EAS	Emergency Alert Systems can be interfaced with the COM2000 to stream emergency notifications to all channels. Similar to this a local message can be created and played via a PC and VLC or a ZyCast Media Server. https://www.fcc.gov/encyclopedia/emergency-alert-system-eas
Edge QAM	In a typical installation, the COM46 cards will be configured to stream to a QAM6 modulator. Alternatively the COM46 IP streams can feed an external edge QAM.
GIe	Gigabit Ethernet High speed Ethernet standard for transmitting data at one gigabit per second. All switches in the GIe (video) network must be rated to pass this level of traffic.
Hard Drive	The COM2000 can process content on a hard drive to stream on a video channel.
HD	High Definition

Hot-swappable	The unit or device this term describes may be added to, removed from, or replaced within the system it is a part of without powering anything down.
MPEG	Moving Pictures Experts Group - A working group of ISO/IEC with the mission to develop standards for coded representation of digital audio and video and related data. Most commercial and some residential TVs support MPEG4 standards. All DIRECTV HD signals are MPEG4. Many residential and some older commercial TVs will only support MPEG2 signals and will require transcription from MPEG4 to MPEG2, or the use of a setback box like the Technicolor DCI401MCS. http://mpeg.chiariglione.org/
PC/VLC	The COM2000 can accept streaming video from a networked PC running VLC, an open source video software. http://www.videolan.org/vlc/index.html
PID	Packet Identification
Pro:Idiom	Pro:Idiom is an industry accepted digital rights management encryption technology for video signals broadcast in commercial establishments such as hotels, dormitories and hospitals. All major programmers have accepted Pro:Idiom as an encryption method to secure programming. Only televisions or set-back boxes with built in Pro:Idiom encryption system decoders will be able to decrypt the signal. http://www.zenith.com/wp-content/uploads/2013/05/ProIdiom_Overview_2010-10-08.pdf
Property Distribution Network	This network, set up and maintained by the system operator or property owner, distributes television signals via RF or IP technology. Traditional analog RF plants often are in need of repairs and upgrades before they will pass digital HD programming. RF levels and signal to noise ratios (Modulation Error Rate) should be tested to industry standards. IP systems require technicians proficient in IP switch configurations, specifically multicast networks utilizing Internet Group Management Protocols (IGMP).
PSIP	Program and System Information Protocol. Signals included in a digital TV signal that instruct the TV to tune to a specific channel. For example an off-air channel may be broadcast on UHF ch 38 but the station call letters are ch 7. PSIP data instructs the TV to look for ch 7 on UHF38. PSIP data also includes current and future programming information. In a COM2000 system your first RF channel may be 23.1. You can configure PSIP within the COM2000 electronic program guide to map this programming to channel 2. http://www.atscforum.org/
QAM6 Cards	A board that installs in the upper left side of a COM360 Chassis. It converts the COM46's IP-packetized streams to QAM-modulated RF for distribution throughout a property. The board provides up to 12 QAM modulator channels in addition to a 10/100 Ethernet port. The QAM6 base unit outputs 6 QAM channels each capable of carrying 3 HD or 8 SD channels. Units are upgraded via 2 QAM licenses making the unit cost effective for smaller applications. Each QAM channel can carry up to three HD or eight SD video channels. A fully loaded COM2000 system broadcasting 48 HD channels requires 16 QAM channels leaving additional capacity for additional services.

Satellite Distribution Network	This network consists of the dish, LNB and associated equipment necessary to provide KA/KU band satellite signals to the COM2000. The COM2000 requires a SWiM 8 signal to each card. It is assumed that installation technicians have adequate expertise and proper test equipment required to install the distribution system to DIRECTV specifications.
SD	Standard Definition
SWiM Switch	Single Wire Multi-switch – A DIRECTV module used for distribution of satellite signals. Available models support 8,16, or 32 tuners.
SWQAM2	The SWQAM2 is a software key that will enable 2 QAM channels per key on a QAM6 card. By purchasing 3 SWQAM2 keys a QAM6 can be expanded to 12 QAM channels.
System Integrator	The person or company that performs the onsite installation.
System Operator	The company or organization that typically holds the “right of entry” and is responsible for installation and all onsite support on a daily basis.
Transcription	The process by which the COM 1000 system converts content streaming from DIRECTV’s conditional access system to Pro:Idiom encrypted video.
ZyCast Media Server	The ZyCast media server converts video and audio from HDMI or Composite video and creates an IP stream that can be modulated on the RF network via the QAM 6. http://www.zycast.com.tw/

4 Mechanical Overview

The following sections contain a brief overview of the devices that you will be interacting with along with the associated hardware. The intent is to give you a working knowledge of how the system operates under normal circumstances so that you will be able to recognize it when something goes wrong.

4.1 COM360 Chassis

Figure 2 below shows the faceplate of the COM360 chassis.

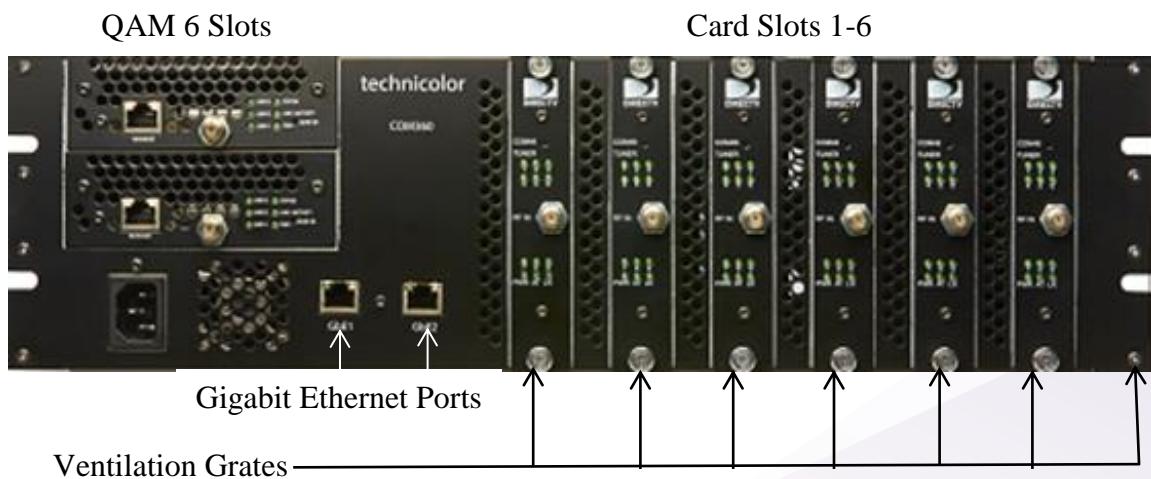


Figure 2 - COM2000 Front View

The AC input connection shown at the bottom left provides power to the COM360 chassis.

The two Gigabit Ethernet ports on the right of the power cord allow for direct connections to other devices such as an ATSC-8, external media, edge QAM, Ethernet switch, management PC and allows any additional chassis in the system to be interconnected.

Along the sides of each card is a ventilation grate, which, combined with the exhaust fans in the back, allow air to flow over the internal system.

The majority of the face shows the 6 available card slots, each corresponding to a unique Slot ID, capable of supporting 6 individual cards.

Figure 3 below shows the rear of the COM360 chassis.



Figure 3- COM2000 Rear View

The COM360 chassis also contains two 5-inch exhaust fans to provide cooling to the system. Airflow is pulled through the ventilation grates on the front of the COM360 chassis across the COM46 cards and out the back. In the case of an equipment failure, a broken fan should be serviced and/or replaced as soon as possible.

Multiple chassis can be linked together for larger channel line ups.

4.2 COM46 Card

The COM46 card, shown in Figure 4 below, is a customized DIRECTV receiver with a built-in smart card and has been specifically designed to meet the unique requirements of the Lodging and Hospitality markets. The COM46 is an 8 channel receiver capable of receiving up to 8 HD or SD streams from a single SWiM output, removing the NDS conditional access system, and adding the Pro:Idiom content protection DRM. The output from the card is delivered over an internal Ethernet connection to the integrated Ethernet switch on the backplane of the COM360 chassis.

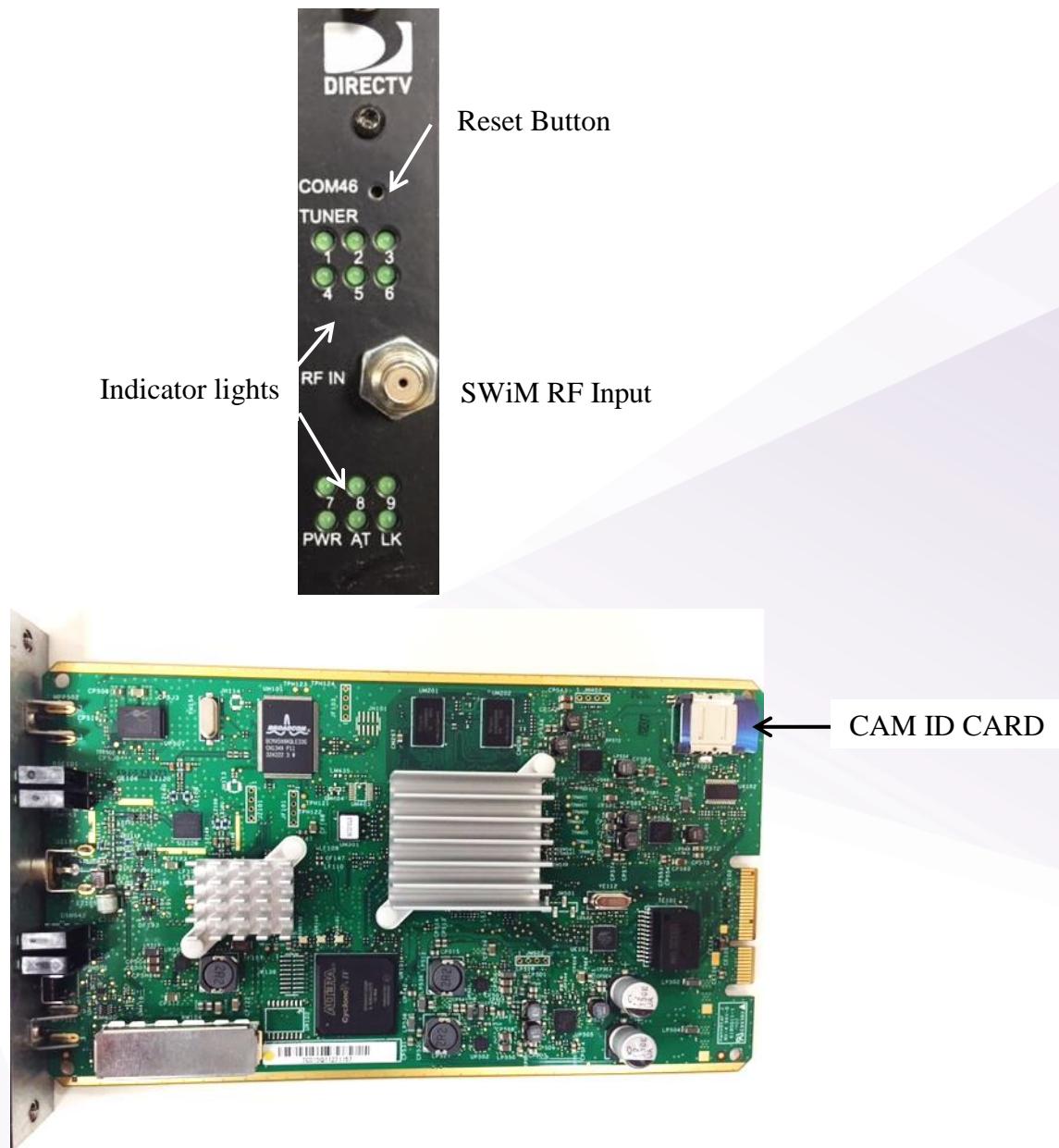


Figure 4 - COM46 Card

Each COM46 card contains an RF input, 12 indicator lights, a recessed reset button, and thumbscrews on either end. The cards are hot-swappable, allowing one card to be serviced independently of the other cards. In order to remove a card, simply loosen the thumbscrews that secure the card in place and pull it straight out of its slot.

The RF input on a COM46 card feeds a dedicated DIRECTV tuner bank which is capable of streaming up to eight Pro:Idiom encrypted HD channels simultaneously over the internal COM360 Gigabit Ethernet backplane to an installed QAM6 modulator or one of the two Gigabit Ethernet ports on the COM360 front panel. The COM46 is designed such that each tuner on a card only needs to be set once. Once configured, the cards should remain locked unless there is a disruption in the signal due to weather, dish misalignment, or other RF distribution issues. However, the cards will automatically recover when the disruption to the RF is removed.

The COM46 card only works with DIRECTV input signals in the range of 950 - 2150 MHz as supplied by a DIRECTV SWiM module. Unlike the legacy COM24 receiver, the COM46 does not support legacy multi-switch installations. The RF input system must be built with SWiM modules.

4.3 COM46-FLX Card

The COM46-FLX card, shown in Figure 5 below, is a variant of the standard COM46 card that is only capable of receiving standard definition programming as shipped from the factory. It can be upgraded to receive HD programming through installation of an upgrade license key provided by Technicolor or DIRECTV.

Upgrade of FLEX cards to COM46 cards require DIRECTV approval.

Almost all of the information regarding identification and configuration of the COM46 cards applies to the COM46-FLX. The only exception is the upgrade of a COM46-FLX from SD to HD. The COM46-FLX tuners are configured exactly the same way as the COM46 tuners although if an HD channel is selected the card will return a channel number of 0 in the Discovery page.



Figure 5 - COM46 Flex Card

4.4 QAM6 Overview

The QAM6 card is an Edge QAM that can be installed directly into a COM360 chassis. It connects to the COM46 cards via a GigE connection on the back edge of the card. The board provides 12 QAM modulators in addition to the front 100mbps Ethernet port, which can be used to manage the COM2000 system. Each QAM channel can carry up to 3 HD or 8 SD DIRECTV video channels. A COM360 chassis fully populated with COM46 receivers (48 HD channels total) requires 16 QAM channels (3 HD channels per QAM). This requires 2 QAM6 modulators (12 QAMs) plus 2 additional SWQAM2 upgrade licenses. Additional SWQAM2 upgrades can be purchased for a maximum of 24 QAM channels. These can be utilized for additional services such as ATSC-8, or externally sourced video streams. The QAM6 can be seen in Figure 6 below.

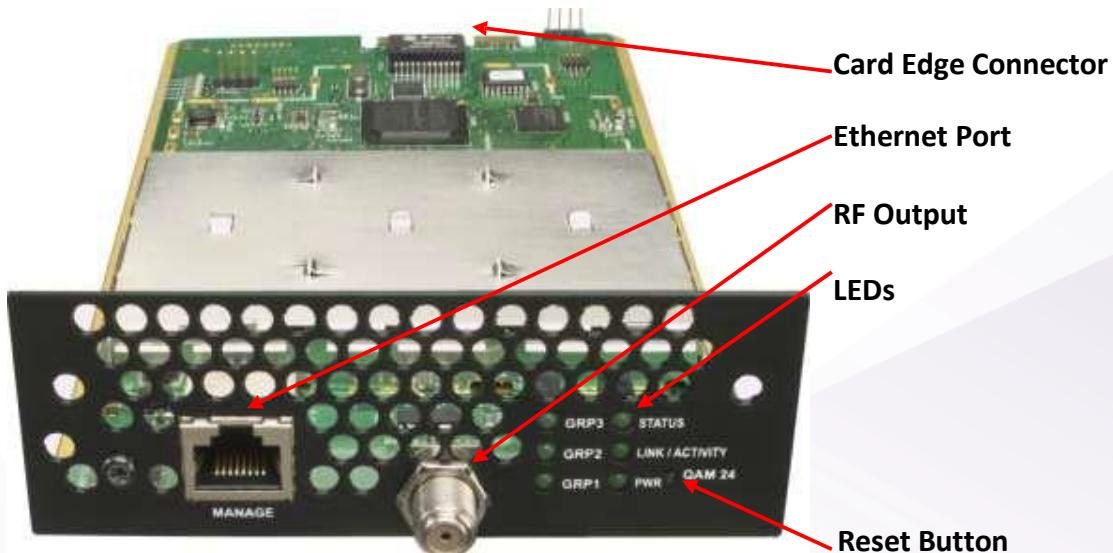


Figure 6 - QAM6 Card

The QAM6 outputs three unique channel-grouping of four channels each according to the EIA North American Cable Television Frequency Plan (see EIA-542B) from the front RF connector. The four channels within each channel-grouping must be adjacent to one another and within the same band. Refer to a CATV frequency chart if you are not sure. It is recommended practice to start the first QAM on ch 23. This reduces the possibility of ingress from VHF high band broadcast channels and keeps the lineup out of frequencies shared with aeronautical communications.

The QAM6 card contains six (6) green LEDs on its front panel that indicate power, Gigabit Ethernet Link/ Activity, and QAM status, as well as the link-status for each channel group.

The QAM6 card's bottom-right LED represents the board's power (PWR) state, lighting up once all on-board power regulators report the "good" state, and going dark when power is removed from the chassis or when a problem is detected on one of the regulators.

The QAM6 card's middle-right LED represents the link and activity of the Gigabit Ethernet interface on the back of the card.

The QAM6 card's top-right LED represents the status of the QAM6 card. It is solidly-lit when the card is performing a software update. It is flashing if an over-temperature condition is detected on the card.

The QAM6 card's left LEDs represent the link-status for each of the 3 channel groupings.

To complete an upgrade of the FPGA firmware a power off reset is required. The current firmware version is listed under HW Version. It is currently 0.16 and rarely changes.

The 10/100 Ethernet Interface on the front can be used to manage the COM2000 System.



Figure 7- QAM6 Installation

The QAM6 board plugs into one of the two available card slots on the left side of the chassis. The COM360 chassis has one full and one partial card guide; the board is retained by the front panel screws, which MUST be installed.

Install the QAM6 Board as follows:

1. Remove the two screws on either side of the QAM board slot
2. Install the QAM6.
3. Tighten front panel retaining screws removed in step 2.
4. If installing a second QAM6 remove the cover plate from the COM36 chassis and repeat steps 3 and 4.

5 Pre-Installation

The COM2000 System is quite a bit different from the DIRECTV set-top box (STB) receiver traditionally used in these installations. This is because the COM1000 does not natively decode any audio or video, instead relying upon other devices in the system to decode and display the MPEG streams it produces. Furthermore, the COM2000 does not have any native user interface. Controlling and monitoring the COM2000 requires an internet enabled device such as a laptop computer. We recommend using the Chrome browser.

5.1 Training and Support

It is expected that every installer has completed the COM2000 training provided by Distributors and Technicolor. Before starting an installation, you should have the following resources available:

- Access to this manual.
- Contact information for the technical support department of your distributor.
- Technicolor website and support numbers
 - <http://www.technicolor.com/en/solutions-services/connected-home/commercial-video-solutions/library>
 - Toll Free (844) 893-2494
 - Email: mcssupport@technicolor.com

5.2 Required Tools

A successful installation is dependent on having the proper tools on the jobsite. Below is a list of recommended tools. Not listed are basic hand tools required for installation work.

- DIRECTV Advanced Installation Meter (AIM).
- Digital signal level meter
- Laptop computer and CAT5 cables
- #10 Torx driver

5.3 Pre-Installation Site Requirements

Site Survey

Prior to installation, it is recommended that a detailed site survey is conducted. Listed below are some key points to check and plan for during and after site survey

- ODU Location
 - Determine an area with clear line of site to the southern sky.
 - Determine distance from the dish to head end and plan for cable selection and routing appropriately. Route cable and grounding (electrode bond) according to DIRECTV and local requirements.
 - Determine mounting method.
- Headend Location
 - The headend should be located in a clean, climate controlled environment.
- Additional considerations
 - Access to grounding location per DIRECTV, National Electric Code (NEC) and local requirements.
 - Access to all distribution wiring closets.
 - Access to an internet connection.
- Distribution Networks
 - RF networks need to be tested to pass digital signal to industry standards. Care should be taken to inspect the system for old crimp style connectors, poor quality amplifiers, taps and splitters. Wall plate splices and TV jumpers should also be inspected and replaced as necessary.
 - Signal levels should be within industry specifications. 0-5dBmV with >38dB Modulation Error Rate (MER) at the TV.
 - IP Networks need to utilize multicast address schemes and be configured for Internet Group Management Protocol (IGMP).
- Existing Video Services
 - Careful consideration should be focused on any existing services that will remain on the distribution network.
 - It is recommended that you record the RF frequencies of all services on the network including:
 - Video on Demand
 - Private channels
 - Cable modem (CMTS)
 - Off air programming

5.4 Channel Lineup

Determine the RF and TV channel line-ups. If possible start RF channel lineup at ch 23 (super-band). This will eliminate possible signal ingress from VHF broadcast signals and keep the property signal out of the aeronautical frequencies in the 126 – 134 MHz range. Set the RF channel outputs on the QAM tab of the COM2000 web interface.

The COM2000 can modulate up to three high definition programs on one 6MHz QAM channel. It is a best practice not to combine higher bandwidth local, sports and premium channels on the same QAM channel.

Determine in advance what networks the customer will require on the system and the channel assignments for each.

5.5 External Video Sources

The COM2000 can modulate video sources from multiple sources. Each source needs to be an MPEG2 single transport IP stream and will require a QAM output channel assignment. Care should be taken in combining multiple digital video sources. In some cases placing non Pro:Idiom programming adjacent to Pro:Idiom programming in the channel ring could cause Pro:Idiom key loss due to Packet Identifier (PID) overlap. See Section 15 for more information on avoiding Pro:Idiom key loss.

5.6 TV Compatibility

The Technicolor COM2000 system outputs a MPEG2 transport stream containing the original encoded video stream as available from DIRECTV. For HD this format is MPEG4 (H.264) with AC3 audio; for SD, the format is MPEG2 with MPEG1 Layer II audio; and for UltraHD video, the format will be H.265. Any HD format will include an encryption scheme such as Pro:Idiom, Verimatrix or Samsung LYNK unless authorized by DIRECTV to operate in the clear. All TVs on the property must be capable of receiving and decrypting MPEG4 encrypted signal. If using standard definition programming without encryption, some residential TVs will not process the MPEG2 audio. If you are building a system for standard definition with residential TVs an Audio Transcoder will be required to provide AC3 audio.

It is highly recommended that the make and model of all TVs be recorded before starting the installation. Verify that all models compatible (for high definition systems).

Research and familiarize yourself with any required programming procedures.

Non-compatible TVs can be used with the Technicolor DCI401MCS set back box. (available Q4 2015)

5.7 Installation Guidelines

Here are a few guidelines to keep in mind when installing the COM2000 system that will minimize the potential problems that the system could be expected to encounter.

- The optimum RF levels at the input of a SWiM module are -30 to -50 dBm per transponder.
- The optimum RF input levels for the COM46 cards are -25 to -45 dBm per transponder.
- It is required that a DIRECTV AIM RF meter be used to verify all satellite signal levels and quality. All satellite transponders must pass the EIV test on the AIM meter.
- COM46 cards can only be connected to a SWiM module, they will not support a multi-switch.
- COM46 and COM46-FLX cards contain 8 tuners and must be supplied with a dedicated SWiM output.
- The COM2000 system is designed to operate properly in ambient environments of 104 °F (40°C) or less.
- The system will not be capable of streaming any video on any channel besides 100 until the COM46 cards have been authorized by DIRECTV. Channel 100 may be viewed by any TV by setting the security option to “none” from the Overview tab.
- The system integrator must provide a mapping of TV channels to COM46 slots and tuners.
- The COM2000 will generally be preconfigured, including the appropriate RF and IP connections to a QAM6 edge QAM device.
- Any necessary DIRECTV SWiM units should be supplied by the System Integrator.
- The COM2000 System is quite different from the stacked DIRECTV set-top box (STB) receivers traditionally used in L&I rack installations. This is because the COM2000 does not natively decode any audio or video, instead relying upon other devices in the system to decode and display the MPEG streams it produces. Furthermore, the COM2000 does not have a native user interface although it can be controlled and configured through the built in web server.
- Controlling and monitoring the COM2000 requires a device with an Ethernet connection and a web browser. We have found Chrome to be the best web browser to interface with the COM2000. The COM2000 only supports a direct wired Ethernet connection.

5.8 DIRECTV Activation

Like any other DIRECTV receiver, all COM46s require authorization from DIRECTV before they will function properly. Each COM46 receiver in each COM360 chassis should be authorized individually by the System Integrator. Without this authorization, the cards will not be able to stream video programming from the DIRECTV satellites.

In order to have each card authorized by DIRECTV, you will need to know both the Receiver ID (RID) and Conditional Access Module ID (CAM ID) numbers. In addition to being provided on the PairingInfo page, the RID and CAM ID are printed on the outside packaging of the COM46 box and on an informational sheet inside the system packaging. The information should be maintained by the system integrator.

Please take into account the following recommendations before calling in for card authorization. First, ensure that the system is fully installed and that the RF signals for each card are properly balanced. Next, tune each card you are requesting authorization for to channel 100, and confirm that each tuner correctly displays that channel. You should have the account number and the RID, CAM ID, and serial numbers for each card readily available at the time you call in.

Authorization of a COM46 card is identical to that of a set-top box. Simply boot the system up, verify that the system is successfully collecting guide information, and then call the required information into the DIRECTV call center.

At the time of launch, there is no reliable way to determine if a COM46 card is authorized without accessing the card's web interface. The COM46 cards evaluate their authorization status at the time a channel is tuned, and will retain that information as long as the card stays on. Therefore, it will be necessary to retune the cards once they have been authorized by DIRECTV.

If the desired programming has already been fully configured, this can be easily accomplished in a single step. Simply copy the current tuning table provided at the bottom of the TuneAll screen and paste it into the text field provided. At this point, you may make any changes necessary. Just click the Submit Query button when you are finished. The authorized cards should be able to stream the desired content. If they do not, check the CAM log for any new error messages.

Under normal circumstances, the COM46 cards in the COM2000 system should never lose their authorization. However, like a normal DIRECTV set-top box, if a card is left unconnected from the DIRECTV network for an extended period, it will lose its authorization.

6 Getting Started

6.1 Assembly

Carefully unpack and install the QAM6 and COM46 cards in the COM360 Chassis as shown in Figure 8. Be sure to line up the cards with the guides in the chassis.

A #10 Torx driver is required to secure the QAM6 in the COM360 chassis as shown in Figure 9.



Figure 8 - Installation of the QAM6



Figure 9 - Securing the QAM6 in the COM360

6.2 Setting up Multiple Chassis

For installations requiring more than one COM360 chassis each chassis will need to be assigned a unique chassis ID. The COM360 chassis has a default setting as chassis one. Chassis identification is configured via a dipswitch on the backplane circuit board. To access the switch you will need to remove the rear cover of the COM36 as shown in Figure 10. Take care not to damage the wiring that connects to the fans on the rear cover.

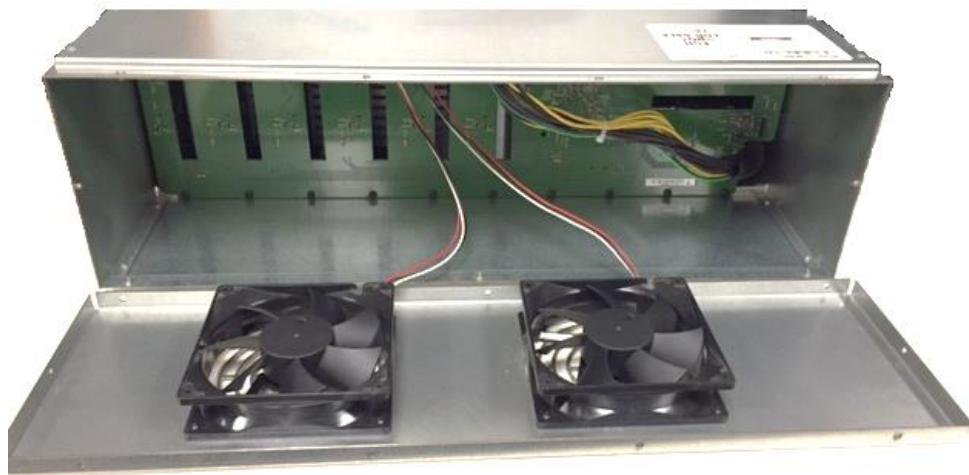


Figure 10 - COM36 Rear Panel Removal

The dipswitch to set the chassis number is in the top right corner of the COM360 backplane as shown in Figure 11. Dipswitches are 1-4 from the right to the left looking at the rear of the COM360. Note: Dipswitch numbers as shown in Figure 11 are added to the photo. They are not actually labeled on the COM360 chassis.

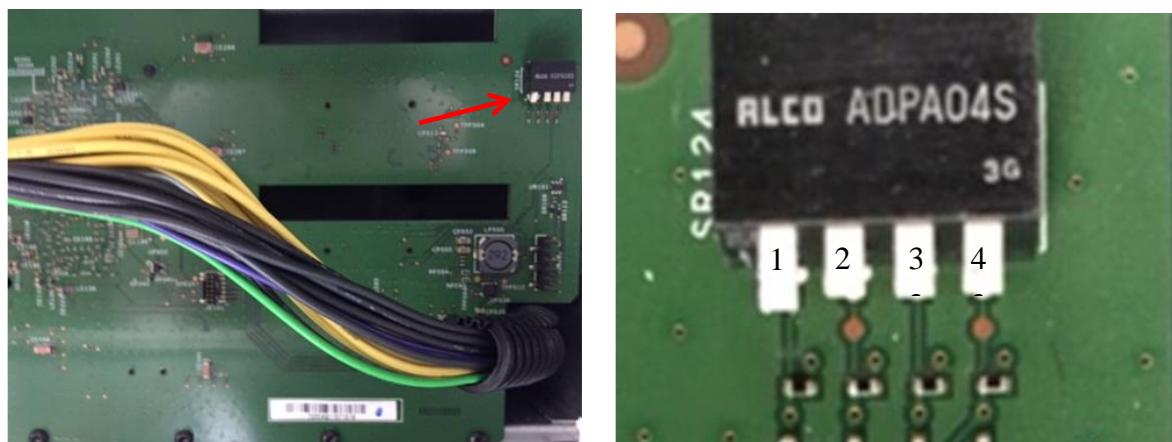


Figure 11 - Chassis ID Dipswitch

Set the chassis ID by changing the dipswitch settings as shown below in Figure 12.

The default IP address of each COM46 card in a system is determined by the chassis ID and slot number the card is installed in.

The formula for determining this address is $192.168.3.[1 + (\text{chassis ID} \times 16) + \text{slot number}]$.

Example for chassis one:

$$1 + (16 \times 1) + 1 = 18 \quad \text{IP address of chassis one slot one is } 192.168.3.18$$

Chassis ID	Switch 1	Switch 2	Switch 3	Switch 4	Default IP Slot 1
1	UP	DOWN	DOWN	DOWN	192.168.3.18
2	DOWN	UP	DOWN	DOWN	192.168.3.34
3	UP	UP	DOWN	DOWN	192.168.3.50
4	DOWN	DOWN	UP	DOWN	192.168.3.66
5	UP	DOWN	UP	DOWN	192.168.3.82
6	DOWN	UP	UP	DOWN	192.168.3.98
7	UP	UP	UP	DOWN	192.168.3.114
8	DOWN	DOWN	DOWN	UP	192.168.3.130
9	UP	DOWN	DOWN	UP	192.168.3.146
10	DOWN	UP	DOWN	UP	192.168.3.162
11	UP	UP	DOWN	UP	192.168.3.178
12	DOWN	DOWN	UP	UP	192.168.3.194
13	UP	DOWN	UP	UP	192.168.3.210
14	DOWN	UP	UP	UP	192.168.33.36

Figure 12 - Dipswitch Settings for Multiple Chassis

7 The COM2000 Web Interface



Figure 13 - COM2000 User Interface Introduction Page

Each COM46 card contains a basic web-based application that provides an easy means to control and configure the COM2000 system. This tool can be accessed by entering the IP address of one of the COM46 cards in the system into a web browser's address bar. Clicking on the Technicolor logo on the Introduction Page in Figure 13 will open the COM46 Overview page.

By default card one in chassis one is always 192.168.3.18.

To determine the IP address of the COM46 card in slot one refer to section 6.2 Setting Up Multiple Chassis. We suggest using Chrome browser.

7.1 The Overview Page

The Overview Page shown below in Figure 14 provides a streamlined method for initial configuration and quick status monitoring of the COM2000 system using a series of pulldown menus to configure each card. It shows the same status information carried on the Discover page as well as the encryption method being used by each channel and overall card status. The QAM summary displays the IP address and the base channels for each QAM group.

COM46-FLEX cards are designated with a grey fill and labeled FLX in the Status column. Note the COM46-FLEX is tuned to standard definition channels, Security is set to none, and programming from all 8 tuners is being sent to one QAM.

DIRECTV COM2000

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Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC 401](#), [QAM](#)

Sending MDNS
Refreshing...

QAM Summary

Chassis	IP	Alt IP	Base Ch 1	Base Ch 2	Base Ch 3
1	192.168.6.2	192.168.6.2	23	27	31
17	192.168.6.18	192.168.6.99	35	39	43

Submit

Display Mode QAM IP

SD Duplicates Show Hide

Chassis	Slot	Tuner	Security	Channel	Mode	Major.Minor / IP:Port	Bitrate	SNR	Strength	Status
1	1	Pro:Idiom	▼	6 WRTV	▼	QAM ▼ 23 ▼ . 1 ▼	5.5 Mbps	14	-22	OK
	2	Pro:Idiom	▼	8 WISH	▼	QAM ▼ 23 ▼ . 2 ▼	7.1 Mbps	14	-22	
	3	Pro:Idiom	▼	13 WTHR	▼	QAM ▼ 23 ▼ . 3 ▼	7.2 Mbps	14	-22	
	4	Pro:Idiom	▼	245 TNTHD	▼	QAM ▼ 24 ▼ . 1 ▼	4.6 Mbps	13	-24	
	5	Pro:Idiom	▼	204 HLNHD	▼	QAM ▼ 24 ▼ . 2 ▼	5.3 Mbps	15	-23	
	6	Pro:Idiom	▼	206 ESPNHD	▼	QAM ▼ 24 ▼ . 3 ▼	5.1 Mbps	13	-20	
	7	Pro:Idiom	▼	209 ESPN2HD	▼	QAM ▼ 25 ▼ . 1 ▼	3.7 Mbps	13	-21	
	8	Pro:Idiom	▼	264 BBCAHD	▼	QAM ▼ 25 ▼ . 2 ▼	5.7 Mbps	13	-23	
2	1	None	▼	6 WRTV	▼	QAM ▼ 26 ▼ . 1 ▼	1.9 Mbps	14	-24	FLX
	2	None	▼	8 WISH	▼	QAM ▼ 26 ▼ . 2 ▼	2.5 Mbps	14	-24	
	3	None	▼	13 WTHR	▼	QAM ▼ 26 ▼ . 3 ▼	3.0 Mbps	14	-26	
	4	None	▼	202 CNN	▼	QAM ▼ 26 ▼ . 4 ▼	1.9 Mbps	15	-27	
	5	None	▼	204 HLN	▼	QAM ▼ 26 ▼ . 5 ▼	1.2 Mbps	15	-27	
	6	None	▼	206 ESPN	▼	QAM ▼ 26 ▼ . 6 ▼	2.5 Mbps	15	-24	
	7	None	▼	209 ESPN2	▼	QAM ▼ 26 ▼ . 7 ▼	2.6 Mbps	15	-25	
	8	None	▼	218 Golf	▼	QAM ▼ 26 ▼ . 8 ▼	5.2 Mbps	15	-27	

Figure 14 - COM2000 Overview Page

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- **Hyperlinks** - The IP hyperlink(s) in the QAM Summary below the Command tabs will take you to the associated QAM tab. The hyperlinks in the Chassis, Slot, and Tuner columns allow you to collapse the display for the selection so that multiple cards and chassis can be more easily displayed.
- **Security** - Figure 15 shows the Security column dropdown which allows you to apply any of the supported security modes to the associated channel.

Options are:

- **None** - This setting removes all DRM and will only function on CH100 or standard definition channels. Removal of Pro:Idiom Encryption from HD channels must be authorized by DIRECTV.
- **Pro:Idiom** - This is the standard setting for HD, Pro:Idiom encrypted HD channels
- **Simulcrypt** - For us with Samsung Link DRM server
- **Transcode** - For use with Video Propulsion Floodgate MPEG2 Transcoder / QAM

Chassis	Slot	Tuner	Security	Channel	Mode	Major.Minor / IP:Port
1	1		None	284 SCIHD	QAM	32 . 1
	2		None	209 ESPN2HD	QAM	32 . 2
	3		Pro:Idiom Simulcrypt Transcode	204 HLNHD	QAM	33 . 1
	4		None	202 CNNHD	QAM	33 . 2
	5		None	212 NFLHD	QAM	33 . 3

Figure 15 – Encryption Settings

- **Channel** - Figure 16 shows the Channel dropdown feature. This allows you to assign a tuner to any channel carried in the guide, including channels that the account is not authorized to receive.

Chassis	Slot	Tuner	Security	Channel	Mode	Major.Minor	Bitrate
1	1	1	Pro.Idiom	621 FSP	QAM	33 . 1	0.1 Mbps
		2	Pro.Idiom	618 FS2	QAM	33 . 2	2.6 Mbps
		3	Pro.Idiom	618 FS2HD	QAM	33 . 3	5.1 Mbps
		4	Pro.Idiom	620 beINHD	QAM	40 . 1	7.3 Mbps
		5	Pro.Idiom	621 FSP	QAM	40 . 2	4.5 Mbps
		6	Pro.Idiom	622 FSPa	QAM	40 . 3	8.8 Mbps
		7	Pro.Idiom	623 FCS	QAM	41 . 1	7.1 Mbps
		8	Pro.Idiom	623-1 FCSDHD	QAM	41 . 2	9.1 Mbps
	2	1	Pro.Idiom	624 FOXD	QAM	41 . 3	12.8 Mbps
		2	Pro.Idiom	625 USN	QAM	36 . 1	4.1 Mbps
		3	Pro.Idiom	626 FCS	QAM	36 . 2	6.2 Mbps
		4	Pro.Idiom	628 NESN	QAM	36 . 3	4.1 Mbps
		5	Pro.Idiom	628 NESNHHD	QAM	37 . 1	7.0 Mbps
		6	Pro.Idiom	628-1 NSN+HD	QAM	37 . 2	9.0 Mbps
		7	Pro.Idiom	630 CSNE	QAM	35 . 2	8.4 Mbps
		8	Pro.Idiom	630 CSNEHD	QAM	35 . 3	8.6 Mbps

Figure 16 - Channel Drop Down Menu

- **Mode** - Figure 17 shows the dropdown options for QAM and IP output modes.

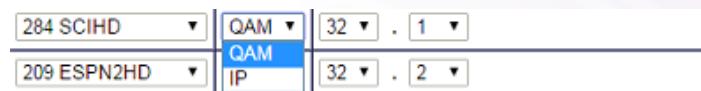


Figure 17 - Output Mode

- **Major.Minor / IP:Port** - Figure 18 below shows the Mode column. If QAM mode is selected this field selects the major and minor QAM channel to display the associated video on. The pulldown menu will automatically try to find the next available QAM channel detected in the network however it does not update the available channel list until the Submit button is pressed.

If IP mode is selected the field input is for the IP and port number assigned to each channel

Tuner	Security	Channel	Mode	Major.Minor / IP:Port	
1	None	284 SCIHD	QAM	32	. 1
2	None	209 ESPN2HD	QAM	32	. 2
3	None	204 HLNHD	QAM	33	. 1
4	None	202 CNNHD	QAM	33	. 2
5	None	212 NFLHD	QAM	33	. 3
6	None	208 ESPNUHD	IP	192	. 168 . 3 : 18 : 1005
7	None	None	IP	192	. 168 . 0 : 0 : 0
8	None	None	IP	192	. 168 . 0 : 0 : 0

Figure 18 - Major/Minor Ch or IP and Port Settings

- **Bitrate** - Figure 19 shows the Bitrate filed. It displays a snapshot of the bitrate associated with the selected QAM channel. If the destination IP is not a Technicolor QAM modulator card, this field will read 0.0 and will be highlighted in red.

Mode	Major.Minor / IP:Port	Bitrate
QAM	33 . 2	5.9 Mbps
QAM	33 . 3	7.5 Mbps
IP	192 . 168 . 3 . 18 : 1005	0.0 Mbps
IP	192 . 168 . 0 . 0 : 0	0.0 Mbps

Figure 19 - Bitrate Display

- **SNR** - Figure 20 shows the SNR and Signal Strength Display. The signal to noise ratio for the tuned channel. If the SNR is 10 or below, the block will be highlighted yellow.
- **Strength** - Displays the relative signal strength for the tuned channel. If the strength is -50 or below the block will be highlighted yellow.

Mode	Major.Minor / IP:Port	Bitrate	SNR	Strength
QAM	32 . 1	4.7 Mbps	10	-26
QAM	32 . 2	7.0 Mbps	13	-23

Figure 20 - SnR and Signal Strength

7.2 Discover Page

Most configurations on the COM2000 system can be done via the Overview page previously discussed. However, there are redundant controls in the Discover page in addition to controls for advanced features and troubleshooting.

This section will detail all the controls available from the Discover page. The COM46 card issues a discovery call for all other COM46 (and COM24) cards in the system, and then populates a table with some basic information on current tuning parameters and RF signal levels. Once this information is complete the Discover Web Page, showed in Figure 21 is displayed. This page shows a basic data summary that is also similar to the pages you will get by clicking on the Refresh, or Display hyperlinks at the top of any COM2000 web interface page.

Chassis	Slot	Tuner	QAM	Bitrate	Channel	SNR	Strength
1	1	1	QAM 33-1	1.3 Mbps	100 CINE	9	-23
		2	QAM 33-2	1.3 Mbps	100 CINE	9	-24
		3	QAM 33-3	1.8 Mbps	202 CNN	14	-28
		4	QAM 40-1	2.4 Mbps	278 DSC	14	-30
		5	QAM 40-2	8.6 Mbps	206 ESPNHD	13	-23
		6	QAM 40-3	6.4 Mbps	281 VEL	8	-23
		7	QAM 41-1	7.3 Mbps	264 BBCAHD	13	-20
		8	QAM 41-2	4.1 Mbps	312 HALLHD	11	-21
2	2	1	QAM 41-3	8.2 Mbps	232 COOKHD	15	-22
		2	QAM 36-1	7.7 Mbps	284 SCIHD	10	-29
		3	QAM 36-2	9.3 Mbps	212 NFLHD	11	-24
		4	QAM 36-3	7.1 Mbps	265 A&EHD	12	-24
		5	QAM 37-1	6.4 Mbps	278 DSCHD	10	-22
		6	QAM 37-2	6.2 Mbps	362 WEAHD	13	-19
		7	QAM 35-2	4.2 Mbps	245 TNTHD	9	-24
		8	QAM 35-3	5.3 Mbps	276 NGCHD	13	-21

Figure 21 - COM46 Discover Page

7.3 Explanation of Discover Page Fields

- **Chassis** - This field reports a unique identifier for the chassis. In systems that contain multiple chassis, this can be used to identify each card in the system. See Section 4.1 on how to assign unique identifiers to multiple chassis within a system.
- **Slot** - This field identifies the card's location within a chassis, numbered 1 through 6. If this field is grey, the slot number is a link to messages in the CAM Log.
- **Tuner** - There are eight entries per CardIP for this column. This represents the eight tuners available on each COM46 card.
- **QAM or IP Address** - If some of the programs are streaming to a QAM6, then "QAM" is displayed as the column header. If all signals are routed out of the system, then "IP Address" will display as the column header instead. If the card is sending video to a QAM6, this field shows a snapshot of the output QAM channel and QAM sub-channel number. If a card is streaming video to outside of the chassis, this field will contain the destination IP address. Both unicast and multicast addresses are supported.
- **Bitrate or Port** - If some of the programs are streaming to a QAM6, then "Bitrate" is displayed as the column header. If all signals are routed out of the system, then "Port" will display as the column header instead. If the card is sending video to a QAM6, this field shows the instantaneous bitrate of the channels being sent out of the QAM6. Otherwise this field contains the destination port associated with the destination IP address described above. You must have a unique port number for each individual channel you wish to stream.
- **Channel** - This field shows the Channel Name and the DIRECTV channel number you tune to on a typical DIRECTV tuner. This field is also a link that permits the user to change channels. If the smart card has not been authorized or paired then the channel will be highlighted in red.
- **SNR** - This field returns the Signal-to-Noise Ratio associated with the selected tuners. If the SNR is low, it will be highlighted in yellow and if the SNR is very low, it will be highlighted in red. For optimum performance of the COM2000, this value should be 11 or higher.
- **Strength** - This value provides a value corresponding to the internal Automatic Gain Control setting in the COM46. If the Strength is low, it will be highlighted in yellow and if the Strength is very low, it will be highlighted in red. For optimum performance of the COM2000, this value should be somewhere between -25 and -55.

7.4 The Tune Command

The Basic Tune screen shown in Figure 22 can be accessed by clicking the ChannelNumber link in the Channel column of the Discover page (see Figure 21.) You can also access the Basic Tune screen of any given COM46 card and tuner combination by clicking the channel name/number hyperlink in the Channel column on the Refresh or Display pages.

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Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC](#), [401](#), [QAM](#)

Channel Tune

Dest_IP_Address:	192.168.6.2
Dest_Port_Number:	179
Major_Number:	281 ***
<input type="button" value="Submit Query"/> <input type="button" value="Channel_Close"/>	

QamMajor:	40
QamMinor:	3
Major_Number:	281 ***
<input type="button" value="Submit Query"/> <input type="button" value="Channel_Close"/>	

Figure 22 - COM46 Basic Tune Screen

This page permits two different ways of tuning DIRECTV channels with Pro: Idiom encryption. The first way specifies the destination IP address and port along with the DIRECTV channel number. The second allows entry of a QAM channel, sub-channel and DIRECTV channel number

- **Dest_IP_Address** - In this field, you will enter the IP address of the device you wish to stream video content to (i.e. an edge QAM).
- **Dest_Port_Number** - This field represents the port of the IP address you wish to stream video to. Depending upon the destination, this value may not be freely chosen.
- **Major_Number** - This field is equivalent to the DIRECTV channel number you tune to on a typical DIRECTV tuner. The second way is used if a QAM6 is in the chassis. The QAM major and minor numbers are set along with the DIRECTV channel number. The IP address will be set to 192.168.6.(chassisId+1) and the port will be set the QAM_Index * 16 + QAM_subchannel.
- **QamMajor** - The QAM6 output QAM major channel number. This corresponds to the channel number from the North American Cable Television Frequency Plan (see EIA-542B or <http://www.jneuhau.com/fccindex/cablech.html>).

- **QamMinor** - The QAM6 output QAM minor channel number. This corresponds to the subchannel number (e.g., 2 in the channel number 13.2 or 13-2 is the sub-channel number).
- **Major_Number** - This field is equivalent to the DIRECTV channel number you tune to on a typical DIRECTV tuner.

7.5 Advanced Tune Screen

There are many different functions available under the heading of the Advanced Tune screen. Each of these functions will be detailed in the subsections that follow.

The Basic Tune page can be used to change the main tuning parameters of a channel. Additional tune parameters can be accessed by clicking the Advanced Edit hyperlink at the bottom of the Basic Tune screen, which brings one to the Advanced Tune screen shown below in Figure 23. Information identifying the tuner currently being tuned is displayed at the top of the web page below the command links.

DIRECTV COM2000

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Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SvsInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC](#), [401](#), [QAM](#)

Edit (Chassis=1, Slot=1, Tuner=6, IP=192.168.3.18)

Channel Tune

Dest_IP_Address:	192.168.6.2	OR Qam-Sub
Dest_Port_Number:	179	
Protocol_Type:	0 = UDP	▼
Channel_Object_ID:	4345215	
Major_Number:	281	***
Minor_Number:	65535	
Stream_ID:	111	
Security_Mode:	1 = Pro_Idiom	▼
Persistent:	1 = TRUE	▼
<input type="button" value="Submit Query"/> <input type="button" value="Channel_Close"/>		

Figure 23 - Advanced Tune Screen

A unique tuner can be identified by chassis number, slot number, tuner number, and IP Address.

- **Chassis** - This value shows the Chassis number of the COM360 that holds the COM46 card you are currently tuning.
- **Slot** - This value shows the Slot number within the COM360 chassis that holds the COM46 card you are currently tuning.
- **Tuner** - This value indicates which tuner on the COM46 card you are controlling.
- **IP** - This field shows the IP address of the COM46 card you are currently interacting with.

A detailed description of each advanced tuning field on the Advanced Edit page follows:

- **Dest_IP_Address** - In this field, you will enter the IP address of the device you wish to stream video content to (e.g. an edge QAM). The COM46 will stream to any valid unicast or multicast address.
- **Dest_Port_Number** - This field represents the port of the IP address you wish to stream video to. Depending upon the destination, this value may not be freely chosen. The default value is 0.
- **Protocol_Type** - This field is used to control whether the COM46 streams the data in UDP or RTP packet structures. The default value is UDP.
- **Channel_Object_ID** - This field is the data that the COM46 actually uses for tuning purposes. It will be automatically filled in when a valid DIRECTV channel number is entered into the “Major_Number” field. Before the card has been successfully tuned, the default value is 0.
- **Major_Number** - This field is equivalent to the DIRECTV channel number you tune to on a typical DIRECTV tuner. The default value is 0.
- **Minor_Number** - This field is automatically filled in by the COM46 card, with a default value of 65535. If the DIRECTV channel has a minor channel number then the Minor_Number value must be entered. Many DIRECTV channels have both high-definition and standard-definition channels with the same Major and Minor numbers. The COM46 will prefer the high-definition channels in this case. To prefer the standard-definition channels instead, add 100000 to the Minor_Number. In most cases, this would cause the Minor_Number to be 165535 if the standard-definition channel is desired. A COM46-FLX which has not been upgraded to HD will only allow tuning to standard-definition channels.

- **Stream_ID** - This field is optional, and allows a unique identifier to be applied to every video stream produced by the COM2000 system. The allowable values for this field are any whole number between 1 and 65535. The default value is 111. To enable a second audio stream set the Stream_ID to 54000.
- **Security_Mode** - Typically, this field will not need to be changed. The only settings most should be concerned with are:
 - None - Setting will only work on DIRECTV channel 100. This allows you to turn Pro: Idiom encryption off so that a standard HDTV or PC-based utility like VLC Media Player can be used for troubleshooting.
 - Pro_Idiom – This is the standard setting for HD Pro:Idiom encrypted channels.
 - Simulcrypt - The Simulcrypt mode is used with the Samsung LYNK© system.
 - Transcode – Transcode is to be used only with Video Propulsion Floodgate MPEG2 Edge QAM.
- **Persistent** - Setting this value to ‘1’ tells the COM46 to retain all channel and IP-destination settings in memory (i.e., data entered into the card is “persistent”). This eliminates the need to reprogram the COM46 cards after every power-cycle or reboot. Persistent is on by default (i.e., 1). It should be on for most installations. Otherwise, all settings will be lost in the event of a power interruption.

7.6 COM46 Informational Status

The information shown in Figure 24 below is one of the subsections available on the *Advanced Edit* page.

Info	
*Chassis_ID:	1
*Slot_ID:	1
*Tuner:	6
*Card_IP:	192.168.3.18
*Receiver_ID:	036624338228
*CAM_ID:	003805209016
*Network_ID:	15
*Frequency_Index:	8
*Authorized:	1
*Paired:	1
*Blackout:	0
*SW_Version:	ST03.02.08

Figure 24 - "Info" Section of the Advanced Edit Page

This section provides a selection of many key indicators to the operation of the COM46 card. It acts as a concise index to the characteristics of each individual COM46 card according to its status and user-defined settings.

Following is a brief explanation of each field shown above:

- **Chassis_ID** - This field represents which COM360 chassis the card resides in when there are multiple chassis in the system.
- **Slot_ID** - This field identifies the card's location within a chassis, numbered 1 through 6.
- **Tuner** - This field identifies the tuner's location on the COM46 card (1 through 8).
- **Card_IP** - This field shows the IP address of the COM46 card you are currently interacting with.
- **Receiver ID** - This field reports the DIRECTV Receiver ID, or RID. This value is the first of two parameters required to obtain authorization on the DIRECTV network.
- **CAM_ID** - This field reports the DIRECTV CAM ID. This value is the second of the two parameters required to obtain authorization on the DIRECTV network.
- **Network_ID** - This field displays the DIRECTV network of the currently tuned channel. This number correlates to a specific satellite, and can be used in conjunction with the Frequency Index" field below to determine whether the card is locked to the correct channel.

- **Frequency_Index** - This field reports the frequency index corresponding to the channel the tuner is currently set to. Frequency_Index is a 0 base value. Transponder #s on meters and IRD are 1 base. To determine the channel's transponder add 1 to the Frequency Index.
 - The table below in Figure 25 details the Network_ID and corresponding satellite.

Network_ID	Satellite
0	101
2	110
3	119
10-11	99
14-15	103

Network ID = 10	Satellite 99
Frequency Index= 135 +1	Transponder 136

Figure 25 - Network ID and Frequency Index

- **Authorized** - This field provides feedback on whether the card has been authorized within the DIRECTV network. The card needs to be paired and authorized in order to receive DIRECTV programming. A value of '1' means that the card has been successfully authorized; '0' means that it has not yet been authorized, or has lost its authorization.
- **Paired** - This field provides feedback on whether the smart card has been successfully paired with the COM46 card. The card needs to be paired and authorized in order to receive DIRECTV programming. A value of '1' means that the card has been successfully paired; '0' means that it has not yet been paired, or has lost its pairing.
- **Blackout** - This field can be used to determine whether DIRECTV has issued a blackout of the content on a particular channel. This is a good thing to investigate if the video suddenly stops playing on any channel, but it is particularly likely to happen with nationally televised sporting events. A value of '0' means that the channel should be functioning properly; '1' means that the programming on the selected channel is not currently available to you. TVs will display a blackout message on screen in the event of a blackout.
- **SW_Version** - This field reports the software version that currently resides in the COM46 card. All cards that have a similar web interface to the one described in this document will have a version number of at least ST03.02.21.

7.7 COM46 LED Control Feature

The information shown in Figure 26 below is one of the subsections available on the *Advanced Edit* page.

LED Control

Led State:

Figure 26 - LED Control

This section gives you the ability to assume control of the PWR LED temporarily. This feature can help you easily identify a specific card within a chassis if there is ever any doubt about which card you are accessing. A brief explanation of each field shown above is as follows:

LED_State – This field allows you to control the PWR LED. This may be used as a simple means to identify a particular card within a chassis at a remote location. The allowed values are:

- 0 = Off
- 1 = On
- 2 = Flashing

7.8 COM46 CAM Log Data

The information shown in Figure 27 below is one of the subsections available on the Advanced Edit page.

Read CAM log

Figure 27 - CAM Log Interface

This section gives you the ability to read the log files generated by any COM46 card's Conditional Access Module (CAM), also known as its smart card. The messages reported here match the ones that may be seen on a normal set-top box, and can be used to determine whether the card has been properly authorized and paired.

Under normal circumstances, an authorized card will produce a very short CAM log file that looks like the image shown in Figure 28 below.



If, however, there are issues with the card's authorization, you will see messages that look more like this:

```
0 0 0: CARD_INSERTED
1 9 727: 727 - Program Not Available in Your Area (Service Blacked
    Out) [GMT=Thu May 12 00:00:00 2011]
2 0 0: Can't view [GMT=Thu May 12 00:00:00 2011]
3 0 0: Blackout [GMT=Thu May 12 00:00:00 2011]
4 9 727: 727 - Program Not Available in Your Area (Service Blacked
    Out) [GMT=Thu May 12 00:00:00 2011]
5 0 0: Can't view [GMT=Thu May 12 00:00:00 2011]
6 0 0: Blackout [GMT=Thu May 12 00:00:00 2011]
7 9 727: 727 - Program Not Available in Your Area (Service Blacked
    Out) [GMT=Thu May 12 00:00:00 2011]
```

Figure 28 - Cam Log Report

The 3-digit values starting with a “7” are the DIRECTV support extension numbers associated with the error condition.

Other things that you may see reported here include messages about access card not being active, wrong or missing RID number, card not paired, and programming information for audio-only channels. Many commercial TVs won’t play audio-only channels.

There are a few fields as described below:

- **Refresh** - Refreshes this display.
- **Clear_CAM_Log** - Clears all current entries in that card’s CAM log.

7.9 COM46 Software Reset

The information shown in Figure 29 below is one of the subsections available on the Advanced Edit page.

Reset

Figure 29 - Reset Interface

This section allows you to initiate software reset on the card identified in the “CardIP” field. This is sometimes helpful in situations where a card has become non-responsive. Activating this feature is the equivalent to pushing the recessed reset button on the face of the COM46 card, and has a similar effect as pressing the small reset button on a traditional set-top box.

7.10 COM46 File Transfer Utility

The information shown in Figure 30 below is one of the subsections available on the Advanced Edit page.

File Transfer

Usage:	2 = SW_Upgrade ▼
Server_IP_Address:	0 = NA
Filename:	1 = MT
Mode:	2 = SW_Upgrade
<input type="button" value="Submit"/>	3 = Log
	4 = License
	5 = B
	6 = Flash_Image

User Config

Figure 30 - File Transfer Interface

Similar in function to the upgrade section found on the PairingInfo page, this section provides you with a method of transferring software updates and license files to or transferring log data from individual COM46 cards. See Section 11 for more information on upgrading your COM46 cards. Following is a brief explanation of each field shown above.

- **Usage** - This field is used to tell the COM46 which type of transfer to execute. Only four values are available for customer use (all others are for development purposes only):

1 = MT – This option allows you to upload the special MediaTune authorization and channel guide files. See COM2000 Technical Support - Mediatune Installation Folder on the Technicolor / MCS website for details.

2 = Software Upgrade – This option is used to update the COM46 software. In this case, the file is downloaded to the COM46 card displayed in the browser's URL field.

3 = Log – This option tells the COM46 to transfer its log file to the destination entered in the “IP_Address” field (i.e., log file is uploaded to PC).

4=License – This option uploads the XML license file that enables advanced features on the COM46 such as the HD upgrade for the COM46-FLX.

Options above 5 & 6 are not enabled for field use.

- **Server_IP_Address** - This field tells the COM46 card where to retrieve the software update or license file or where to send the log file, based upon the “Usage” setting above. The default value for this field is 192.168.1.254.
- **Filename** - This value entered in this field tells the COM46 which file to download (in the case of software updates and license files), or what name you want to give the log file being transferred from the card.
- **Mode** - This field is used to tell the COM46 card which file-transfer protocol to use for the file transfers. The supported modes are TFTP (option ‘0’) and FTP (option ‘1’), allowing you to select the mode that best works with the software you use for the transfer. The default setting is 0. The card will automatically reset after completing an upgrade.

7.11 COM46 User Configuration Options

The information shown in Figure 31 below is one of the subsections available on the Advanced Edit page.

User Config

WARNING: Changing the settings in this section may cause the card to be unable to communicate. Please record all settings for future reference.

The screenshot shows a configuration interface for a COM46 card. On the left, there is a list of configuration parameters with their current values:

- IP_Config: 0 = Default
- Base_IP: (empty)
- Subnet: (empty)
- Gateway: (empty)
- DNS_IP: (empty)
- Time_To_Live: 3
- Log_IP: 192.168.3.158
- Log_Level: (empty)
- UtilConfig: (empty)

Below the list is a "Submit" button. To the right of the list, there is a note: "Recommended: 255.255.0.0. Warning: You may lose communication with the card." At the bottom right, there is some small, illegible text.

Figure 31 - User Config Interface

This section gives you the ability to customize select features of the COM46 cards to better suit your application. The cards actually support a few more features than shown here, but the two most useful features have been made available here. You have the ability to set the IP address the card uses or to change the mechanism the card uses to obtain IP addresses. You can also control and configure the sending of log data to a PC or other monitoring mechanism via the Ethernet.

Following is a brief explanation of each field shown above:

- **IP_Config** - This field allows for one of 3 methods of IP address assignments to be chosen. The default IP_Config setting is 0. Which sets the card one in chassis one to 192.168.3.18. See Section 6.2 Setting up Multiple Chassis.

0 = Default - In this mode the IP address is assigned to the card based on the chassis ID and slot the card is currently in. The formula for this address is 192.168.3.[1 + (chassis ID X 16) + slot number]

Example: chassis ID = 1 slot = 1 Default IP address = 192.168.3.(1 + 16 + 1) = **192.168.3.18**

Example: chassis ID = 1 slot = 6 Default IP address = 192.168.3.(1 + 16 + 6) = **192.168.3.23**

Example: chassis ID = 2 slot = 1 Default IP address = 192.168.3.(1 + 32 + 1) = **192.168.3.34**

Example: chassis ID = 2 slot = 6 Default IP address = 192.168.3.(1 + 32 + 6) = **192.168.3.39**

In the default IP mode the *Base_IP* and the *Gateway* fields are ignored. The *Subnet* field is also ignored but the *Subnet* mask is set to 255.255.0.0 and is applied.

1 = DHCP_Persistent - In this mode all IP address information Base_IP, Subnet and Gateway are taken from the DHCP lease that the DHCP server issues to the card and is stored in non-volatile memory.

4 = Fixed - In this mode the user sets the Base_IP, Subnet and Gateway fields. All fields MUST be set. A Gateway MUST be defined regardless of it being there or not for this mode. Once you set the card IP you must reboot the card.

8 = No Change - This setting does not actually represent a separate mode, but rather acts as a way to tell the COM46 card that you would like it to continue using whatever mode it is currently using. For example, you could use this selection to tell a card that is already using Fixed mode that you want it to start using a different IP address by selecting this option and entering a different value into the “Base_IP” field.

- **Base_IP** - In the Default mode this field will display the IP address of the card. In the DHCP_Persistent mode this field will display the last address stored in non-volatile memory. In the Fixed mode this field is where you would enter the IP address you wish to assign to that card.
- **Subnet** - This field allows you to give a subnet mask of your choosing to the COM46 card. This field is only applied in the Fixed mode.
- **Gateway** - This field allows you to set a default gateway of your choosing for the COM46 card. This field is only applied in the Fixed mode and must be set when using that mode.
- **Time-to-Live** - Time to Live field in IP protocol header.
- **Log_IP** - This field allows you to direct the COM46 card to send its log files to an external destination automatically. This is very useful for monitoring the health of the system over an extended period. After entering the IP address of the destination, the log files will start being forwarded to this address after a short delay. You may then run a system-logging utility like Kiwi on the destination computer to capture this information. Once the Log IP is set you must reboot the card.
- **Log_Level** - This field allows you to define the level of detail that will be captured in the resulting log files. Due to the complexity of this setting, it is strongly advised that it be left blank unless someone from support has asked to change the value.
- **UtilConfig** - This field is for development purposes only, and should be left blank unless you have been asked to modify the value by someone from technical support.

7.12 COM46 “Direct Tune” Feature

The information shown in Figure 32 below is one of the subsections available on the Advanced Edit page. This section gives you a method to force a tuner to a particular satellite and transponder pair. This ability can especially useful when attempting to track and isolate RF problems with the COM2000 system. The data required to perform this operation can be gathered from the basic “Tune” interface shown in above.

A brief explanation of each field follows:

Direct Tune

Tuner_Index:	<input type="text" value="6"/>
Network_ID:	<input type="text" value="15"/>
Frequency_Index:	<input type="text" value="8"/>
<input type="button" value="Submit Query"/>	

Figure 32 - Direct Tune Interface

- **Tuner_Index** - This field allows you to direct an individual tuner to tune to a specific network ID and Frequency_Index.
- **Network_ID** - This field displays the DIRECTV network of the currently tuned channel. This number correlates to a specific satellite, and can be used in conjunction with the “Frequency_Index” field below to determine whether the card is locked to the correct channel version.
- **Frequency_Index** - This field displays the DIRECTV frequency index of the currently tuned channel. This number correlates to a specific transponder, and can be used in conjunction with the “Network_ID” field above to determine whether the card is locked to the correct channel.

7.13 Remote Access Feature

Advanced feature set not yet released.

Remote Access

Remote Access Server:	<input type="text"/>	remote.mcs.technicolor.com
COM46 Access Name:	<input type="text"/>	distributor:dealer:installer:site NO SPACES
Network Drive IP:	<input type="text"/>	
<input type="button" value="Submit"/>		

Figure 33 - Remote Access Feature

7.14 Using the VidPlay Feature

The VidPlay feature will stream video files from a NAS portable hard drive similar to a Western Digital My Cloud. Enter the IP:Port information and the name of the files to be played.

VidPlay

Vidplay: ip:port file1 file2

Figure 34 - Vid Play

7.15 Using the COM46 “Simulcrypt” Feature

The information shown in Figure 35 below describes how to enable the use of the COM46 with a Simulcrypt compliant encryption system such as Samsung’s LYNK© DRM system.

Simulcrypt

SimulcryptIP: Will be copied to all cards in the chassis
Port:
ChassisBitmap:

Figure 35 - Simulcrypt

- **SimulcryptIP** - This is the IP address of the Simulcrypt (LYNK© as of April 2014) server. In LYNK enabled systems this IP address will point to the COM46 card that has been configured as the key server for the system or to the external LYNK key server provided by the distributor.
- **Port** - This is the IP port of the server that will be looking for requests from the COM46 for exchanging encryption information.
- **ChassisBitmap** - This bit field can be used to allow an external LYNK key server to send EMMs to multiple chassis. A one would be set for each chassis address to be supplied with key messages. E.g. if a system has two chassis, configured as chassis 1 and 3, the ‘ChassisBitmap’ field would be set to 0xa.

7.16 Using the COM46 REST Feature

REST feature send SOAP messages to a remote server for status monitoring via a Representational State Transfer (REST) protocol. This feature requires a remote server able to “catch” and store the REST messages. Contact Technicolor for more information.

REST

REST Enable:	0 = FALSE ▾
EventURL:	(119 char. max.)
HeartBeatURL:	(119 char. max.)
EventTag:	0
RepeatPeriod:	0
Hold-Off Period:	0
HeartBeatPeriod:	0
<input type="button" value="Submit"/>	

Figure 36 - REST

7.17 Displaying COM2000 Status

By clicking the Display hyperlink at the top of any COM2000 web interface page, you can see the information last obtained from a Discover or Refresh with the signal status of all cards in the system as shown in Figure 37 below.

When used in conjunction with the Refresh commands, it simply filters the table so that all discovered COM46 cards are shown at the top of the table and removes any system status messages that may appear when running the previously covered functions.

DIRECTV COM2000 

Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Svslog](#), [Lock](#), [ATSC](#), [401](#), [QAM](#)



Chassis	Slot	Tuner	QAM	Bitrate	Channel	SNR	Strength
1	1	1	QAM 33-1	1.1 Mbps	100 CINE	9	-23
		2	QAM 33-2	1.2 Mbps	100 CINE	9	-24
		3	QAM 33-3	8.1 Mbps	202 CNNHD	8	-26
		4	QAM 40-1	5.8 Mbps	278 DSCHD	9	-29
		5	QAM 40-2	10.3 Mbps	206 ESPNHD	12	-23
		6	QAM 40-3	6.0 Mbps	281 VEL	8	-24
		7	QAM 41-1	6.0 Mbps	264 BBCAHD	12	-20
		8	QAM 41-2	5.7 Mbps	312 HALLHD	10	-21

Figure 37 - COM2000 Display Page

7.18 Pairing Info

By clicking the *PairingInfo* hyperlink at the top of any COM2000 web interface page, you can quickly evaluate the authorization status of all cards in the system. In the example shown in Figure 38, card 6 is activated but not paired with the CAM card. A follow up call to DIRECTV activation will be required.

This page also provides direct access to a card's internal syslog and CAM log and the ability to upgrade multiple cards. These can be reached by clicking the hyperlinks that represent the card's IP address and CAM_ID, as can be seen below in Figure 38.

The screenshot shows the 'Pairing Info' page for a DIRECTV COM2000 system. At the top, there are navigation links: Overview, Discover, PairingInfo, TuneAll, Help, Refresh, Display, SysInfo, HealthInfo, EPG, Syslog, Lock, ATSC, 401, QAM. Below this is a table listing six cards across six slots in chassis 1. The table columns are: Chassis, Slot, CardIP, RID, CAM_ID, Serial_Number, Authorized, Paired, SW_Version, Up_Time, and Upgrade. Card 6 is highlighted with a red background in the 'Paired' column. Below the table is a 'Software Upgrade' section with fields for Usage (set to 2 = SW_Upgrade), Server_IP_Address (192.168.1.254), Filename, Mode (set to 0 = TFTP), and a Submit button. At the bottom, there is a 'Browser Upload' section for TFTP server files, showing current files and a file upload form.

Chassis	Slot	CardIP	RID	CAM_ID	Serial_Number	Authorized	Paired	SW_Version	Up_Time	Upgrade
1	1	192.168.3.18	036624338004	003805104613	2097317490	1	1	ST03.02.21	3d:7h	<input type="button" value=""/>
	2	192.168.3.19	036624337857	003805102781	2097317328	1	1	ST03.02.21	3d:7h	<input type="button" value=""/>
	3	192.168.3.20	036624337972	003805104605	2097318085	1	1	ST03.02.21	3d:7h	<input type="button" value=""/>
	4	192.168.3.21	036624338582	003805104886	-1	1	1	ST03.02.21	3d:7h	<input type="button" value=""/>
	5	192.168.3.22	036624336222	002094945876	-1		1	ST03.02.21	3d:7h	<input type="button" value=""/>
	6	192.168.3.23	036624337345	003805104910	0		1	0	ST03.02.21	3d:7h

Software Upgrade:

Usage: 2 = SW_Upgrade

Server_IP_Address: 192.168.1.254

Filename:

Mode: 0 = TFTP

Submit

Browser Upload

TFTP server at 192.168.3.19 current files:

Upload a file to the TFTP server at 192.168.3.19

Choose File No file chosen Upload

Figure 38 - COM2000 Pairing Info Page

Following is a detailed list of information available on the *PairingInfo* page.

- **Chassis** - This field reports a unique identifier for the chassis. In systems that contain multiple chassis, this can be used to identify each card in the system. See Section 4.1 on how to assign unique identifiers to multiple chassis within a system.
- **Slot** - This field identifies the card's location within a chassis, numbered 1 through 6.
- **CardIP** - This field shows the IP address of the COM46 card that resides in the chassis and slot combination to its left. This field is also a link to see the Syslog for that card.

- **RID** - This field reports the DIRECTV Receiver ID, or RID. This value is the first of two parameters required to obtain authorization on the DIRECTV network.
- **CAM_ID** - This field reports the DIRECTV CAM ID. This value is the second parameter required to obtain authorization on the DIRECTV network. You can click on the hyperlink in this column to be taken directly to that card's CAM Log (see Section 6.2.4 for more information on reading a card's CAM log).
- **Serial_Number** – This field contains the unique electronic serial number of the board assigned at the time of manufacture.
- **Authorized** – This field reports whether the COM46 card's CAM has been authorized. A value of '1' indicates that the card has been authorized, thereby enabling the card to receive DIRECTV programming. A value of '0' indicates that the card has not been authorized.
- **Paired** – This field reports the pairing status of the CAM card. In order to be capable of receiving an authorization to the DIRECTV network, the RID and CAM data must first be paired. If this has not happened, then the card cannot be authorized until the pairing is resolved. A value of '1' indicates that the RID and CAM are successfully paired; a value of '0' indicates that they are not.
- **SW_Version** – This field reports the software version that currently resides on the COM46 card. All cards that have a similar web interface to the one described in this document will have a version number of at least ST03.02.21.
- **Up_Time** – This field gives an indication of how much time has elapsed since the card was last rebooted or powered up.
- **Upgrade** – By checking this box for a particular card, you will make each of the fields at the bottom of the screen active for that card. This allows you to upgrade multiple cards at a time.

Figure 39 below shows in detail the upgrade section available on the PairingInfo page.

<p>Software Upgrade:</p> <p>Usage: 2 = SW_Upgrade</p> <p>Server_IP_Address: 192.168.3.19</p> <p>Filename: COM46_ST03.02.21.bin</p> <p>Mode: 0 = TFTP</p> <p><input type="button" value="Submit"/></p> <p>Browser Upload</p> <p>TFTP server at 192.168.3.19 current files: 9785344 COM46_ST03.02.21.bin</p> <p>Upload a file to the TFTP server at 192.168.3.19 <input type="button" value="Choose File"/> No file chosen <input type="button" value="Upload"/></p>	<p>Software Upgrade:</p> <p>Usage: 2 = SW_Upgrade</p> <p>Server_IP_Address: 192.168.3.19</p> <p>Filename: COM46_ST03.02.21.bin</p> <p>Mode: 0 = Set_Log_IP 1 = MT 2 = SW_Upgrade 3 = Log 4 = License 5 = B 6 = Flash_Image 7 = KeyRenewal</p> <p><input type="button" value="Submit"/></p> <p>Browser Upload</p> <p>TFTP server at 192.168.3.19 current files: 9785344 COM46_ST03.02.21.bin</p> <p>Upload a file to the TFTP server at 192.168.3.19 <input type="button" value="Choose File"/> No file chosen <input type="button" value="Upload"/></p>
---	---

Figure 39 - COM46 Multi Card Upgrade

Following is a brief description of the relevant fields on this page:

- **Usage** - This field allows you to select which type of file transfer you wish to undertake for a particular card. The available options are shown below. It should be noted that when selecting any option other than '2', the card will appear to go through the usual software update cycle, but that it will revert to the current build of code once it has rebooted.

0 = Set_Log_IP – This option allows you to identify the IP address to which you wish to send COM46 logging for monitoring by a syslog utility.

1= MT – This option allows upload of Mediatune channel files.

2= SW_Upgrade – This is one of two means of updating the software in a COM46 card.

3= Log – This option allows you to copy a COM46 card's internal log files to a PC.

4= License – This option allows you to load various software licenses to enable new modes and features in the COM46. One example might be upgrading the COM46-FLX to HD mode (only with prior authorization from DIRECTV)

7 = KeyRenewal – This option will send a Pro:Idiom key renewal to any TV tuned to a RF channel on the card selected.

Note: Options 5 AND 6 are not available to users and are for development purposes only.

- **Server_IP Address** - This field gives the IP address of the server from which Filename: will be uploaded. When doing a Mode 2 upgrade, this field can be the address of another COM46 card to which a SW update has already been uploaded. See the Browser Upload description and Section 7 for details.
- **Filename** - The name of the SW update binary or license file to upload.
- **Browser Upload** - To eliminate the need for a 3rd party TFTP server, a COM46 can now act as a TFTP server for other cards in the system but the file to be sent must first be uploaded to the COM46 to be used.

The Browser Upload field allows you to upload the selected file to the card whose IP address is shown below the Browser Upload heading from the web interface. The Choose File and Upload buttons are used to find and upload the desired file(s) from the browser.

7.19 Tune all Command

The information shown in Figure 40 below is the result of clicking the TuneAll hyperlink at the top of the COM2000 web interface page.

The screenshot shows the 'Tune All' configuration page. At the top, there's a header with the 'DIRECTV COM2000' logo and a 'technicolor' logo with a rainbow bar. Below the header, a navigation bar lists commands: Overview, Discover, PairingInfo, TuneAll, Help, Refresh, Display, SysInfo, HealthInfo, EPG, Syslog, Lock, ATSC, 401, QAM. A large text area contains the 'Tune All' command:

```
Chassis-Slot-Tuner, IP_Dest:Port, MajorNum-MinorNum-Mode;
5-2-1, 192.168.100.4:1234, 287-65535-1;
0-0-0, 192.168.100.4:1235, 284-65535-1; //use any tuner
287sd -> 50-1 //QAM24 mode
284hd -> 50-2 //QAM24 mode
```

Below this is a large empty text input field with a 'Submit' button at the bottom. At the bottom of the page, there's a section titled 'Current Tuning Table' containing a long list of tuning entries:

```
1-1-1, 192.168.6.2:161, 284-65535-0;
1-1-2, 192.168.6.2:162, 209-65535-0;
1-1-3, 192.168.6.2:177, 204-65535-0;
1-1-4, 192.168.6.2:178, 202-65535-0;
1-1-5, 192.168.6.2:179, 212-65535-0;
1-1-6, 192.168.3.18:1805, 208-65535-0;
1-2-1, 192.168.6.2:193, 6-65535-1;
1-2-2, 192.168.6.2:194, 5-65535-1;
1-2-3, 192.168.6.2:195, 13-65535-1;
1-2-4, 192.168.6.10:17, 202-65535-1;
1-2-5, 192.168.6.10:18, 204-65535-1;
1-2-6, 192.168.6.10:19, 206-65535-1;
1-2-7, 192.168.6.10:33, 209-65535-1;
1-2-8, 192.168.6.10:34, 212-65535-1;
1-3-1, 192.168.6.10:35, 220-65535-1;
1-3-2, 192.168.6.10:49, 229-65535-1;
1-3-3, 192.168.6.10:50, 230-65535-1;
1-3-4, 192.168.6.10:51, 231-65535-1;
1-3-5, 192.168.6.10:65, 232-65535-1;
1-3-6, 192.168.6.10:66, 236-65535-1;
1-3-7, 192.168.6.10:67, 237-65535-1;
1-3-8, 192.168.6.10:81, 241-65535-1;
1-4-1, 192.168.6.10:82, 242-65535-1;
```

Figure 40 - COM46 Tune All

This section provides a practical way to configure an entire COM2000 system with minimal effort. In order to use this feature, you can start by copying and pasting the information provided at the bottom of the browser page (below the Submit Query button) either directly into the text field provided or into your text editor of choice, and then modifying it as indicated by the guide comments located above the text field. Examples are provided below to help you understand how to utilize this feature.

Note: Saving a copy of the tuning table for your entire system in the form of a text file is recommended, just in case the settings are not fully restored after a system reset.

The lines in the tuning table take the following form (see Section 1.1 for more on tuning):

Chassis-Slot-Tuner, IP_Address:Port_Number, Major_Number-Minor_Number-Security_Mode;

The sample line below indicates the 1st tuner of a card residing in Slot #4 of Chassis #2. It is targeting Port 301 of the device residing at the IP address 192.168.4.245, and tuned to the HD broadcast of channel 242 with Pro:Idiom encryption set.

```
2-4-1, 192.168.4.245:301, 242-65535-1;
```

Upon initial system startup, your table might look something like this:

```
Current Tuning Table
1-1-1, 192.168.0.0:0, 0-0-0;
1-1-2, 192.168.0.0:0, 0-0-0;
1-1-3, 192.168.0.0:0, 0-0-0;
1-1-4, 192.168.0.0:0, 0-0-0;
1-1-5, 192.168.0.0:0, 0-0-0;
1-1-6, 192.168.0.0:0, 0-0-0;
1-1-7, 192.168.0.0:0, 0-0-0;
1-1-8, 192.168.0.0:0, 0-0-0;
```

After modifying the data to meet your system needs, it might look something like this:

```
Current Tuning Table
1-1-1, 192.168.4.245:6401, 3-65535-1;
1-1-2, 192.168.4.245:6402, 10-65535-1;
1-1-3, 192.168.4.245:6403, 29-65535-1;
1-1-4, 192.168.4.245:6657, 6-65535-1;
1-1-5, 192.168.4.245:6658, 17-65535-1;
1-1-6, 192.168.4.245:6659, 259-65535-1;
1-1-7, 192.168.4.245:6913, 209-65535-1;
1-1-8, 192.168.4.245:6914, 276-65535-1;
```

After editing the tuning table, you simply need to copy and paste this information into the large field provided by the TuneAll command, and then click Submit Query.

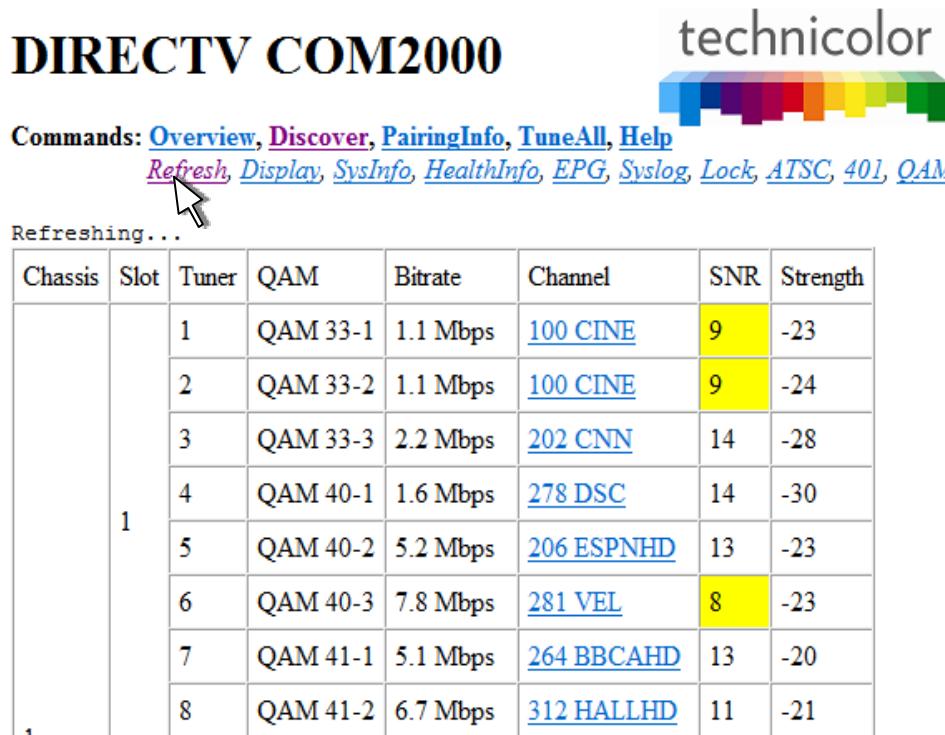
If you are using a QAM6 Card, you can also use the syntax of Channel[hd|sd] -> QamMajor-QamMinor

For example, to tune the first unused tuner to the HD Science channel so that will it will be QAM modulated at channel 50-1 use:

284hd -> 50-1

7.20 Refreshing the COM2000 Display

Figure 41 below is the result obtained by clicking the Refresh link at the top of any COM2000 web interface page. Please note that this table is filled in with data obtained during execution of the Discover command. If some of the values appears to be wrong or empty after submitting an entry, simply perform a Refresh to update this screen.



The screenshot shows the 'DIRECTV COM2000' web interface. At the top, there's a navigation bar with links: Overview, Discover, PairingInfo, TuneAll, Help, Refresh, Display, SysInfo, HealthInfo, EPG, Syslog, Lock, ATSC, 401, QAM. Below the navigation is a heading 'Refreshing...'. The main content is a table with the following data:

Chassis	Slot	Tuner	QAM	Bitrate	Channel	SNR	Strength
1	1	1	QAM 33-1	1.1 Mbps	100 CINE	9	-23
		2	QAM 33-2	1.1 Mbps	100 CINE	9	-24
		3	QAM 33-3	2.2 Mbps	202 CNN	14	-28
		4	QAM 40-1	1.6 Mbps	278 DSC	14	-30
		5	QAM 40-2	5.2 Mbps	206 ESPNHD	13	-23
		6	QAM 40-3	7.8 Mbps	281 VEL	8	-23
		7	QAM 41-1	5.1 Mbps	264 BBCAHD	13	-20
		8	QAM 41-2	6.7 Mbps	312 HALLHD	11	-21

Figure 41 - COM2000 Refresh

7.21 SysInfo

By clicking the SysInfo hyperlink at the top of any COM2000 web interface page, you will access the page shown below. This table gives you the ability to identify a number of different unique identifiers for every COM46 card as well as to identify which card in the chassis, if any, has been assigned the generation of the Electronic Program Guide (EPG.)



Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC](#), [401](#), [QAM](#)

Chassis	Slot	CardIP	EPG	MAC_Address	Features
1	1	192.168.3.18	EPG	c4:27:95:d5:9a:4c	ClearHD NT IP HD Transcode
1	2	192.168.3.19		c4:27:95:d5:9a:49	HD

Figure 42 - COM46 Sys Info Page

Following is a detailed list of the information available on the SysInfo (System Info) page.

- **Chassis** - This field reports a unique identifier for the chassis. In systems that contain multiple chassis, this can be used to identify each card in the system.

Slot – This field identifies the card's location within a chassis, numbered 1 through 6. **CardIP** – his field shows the IP address of the COM46 card that resides in the chassis and slot combination to its left.

EPG

This field shows whether the card identified is generating EPG data.

MAC_Address

This value is loaded during the manufacturing process and is unique to every COM46 card. Every IP-enabled device contains a similar address, which is used to ensure that all Ethernet traffic is routed to the correct destinations.

Features – This field displays the licensed operational features for each card.

HD

Card is licensed to deliver Pro:Idiom encrypted programming.

MT

Mediatune

IP

Licenses card for IP output in the absence of a QAM6.

Transcode

Authorizes card for use with Video Propulsion Floodgate MPEG2 Edge QAM. (Requires DIRECTV authorization)

Clear HD

Allows HD programming to be output in clear QAM (requires DIRECTV authorization)

7.22 HealthInfo

By clicking the *HealthInfo* hyperlink at the top of any COM2000 web interface page, you will access the page shown below in Figure 43. The data available here gives you an indication of the overall health of the COM2000 system, and can be used to identify potential problem areas at a glance.

Chassis	Slot	CardIP	Card_Temperature	IC_Temperature	PS0 Health	PS1 Health	Fan0 Health	Fan1 Health
1	1	192.168.3.18	NA	59	NA	NA	OK	OK
1	2	192.168.3.19	NA	63	NA	NA	OK	OK
1	3	192.168.3.20	NA	63	NA	NA	OK	OK
1	4	192.168.3.21	NA	58	NA	NA	OK	OK
1	5	192.168.3.22	NA	58	NA	NA	OK	OK
1	6	192.168.3.23	NA	59	NA	NA	OK	OK

Figure 43 - COM2000 Health Info Page

Following is a detailed list of the information available on the HealthInfo page.

Chassis – This field reports a unique identifier for the chassis. In systems that contain multiple chassis, this can be used to identify each card in the system.

Slot – This field identifies the card's location within a chassis, numbered 1 through 12.

CardIP – This field shows the IP address of the COM46 card that resides in the chassis and slot combination to its left.

Card_Temperature – Deprecated in the COM46.

IC_Temperature – This field reports the internal temperature of the main processor chip on the COM46 card. An elevated temperature here and nowhere else could mean that this chip is defective.

PS 0 & 1 Health – Deprecated. These fields will always report N/A in a COM46.

Fan0 Health – This field reports the health for Fan 0. If the fan is connected and operating properly, the value should return “OK”. If there is a problem the value will return “Fault”.

Fan1 Health – This field reports the health for Fan 1. If the fan is connected and operating properly, the value should return “OK”. If there is a problem the value will return “Fault”.

7.23 Syslogs

Syslog Overview

The system log file for the COM 2000 system recorded Simple Object Access Protocol (SOAP) messages related to the performance of the cards. Much of the data in the logs is not relevant to the cards performance. To guide a system operator through the log entry interpretation Technicolor has changed key log entry errors to red font.

The information shown below is the result of clicking the Syslog hyperlink at the top of any COM2000 web interface page. Note that the syslog will only show the last 500 lines of messages from the card you are currently logged into.

DIRECTV COM2000 technicolor



Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC](#), [401](#), [QAM](#)

```
Syslog:  
Jul 14 16:10:52 buildroot user.notice syslog: a: M0count(361648,361903,367594,361359,361817,97612,0,0)  
Jul 14 16:11:53 buildroot user.notice syslog: a: M0count(362049,362304,367995,361760,362217,98015,0,0)  
Jul 14 16:12:53 buildroot user.notice syslog: a: M0count(362450,362705,368396,362161,362619,98414,0,0)  
Jul 14 16:13:53 buildroot user.notice syslog: a: M0count(362851,363106,368797,362562,363020,98814,0,0)  
Jul 14 16:14:53 buildroot user.notice syslog: a: M0count(363252,363508,369198,362963,363421,99216,0,0)  
Jul 14 16:15:54 buildroot user.notice syslog: a: M0count(363653,363909,369599,363364,363822,99617,0,0)  
Jul 14 16:16:54 buildroot user.notice syslog: a: Status: RID=036624338004 CAM_ID=003805104613 Chassis=1  
Jul 14 16:16:54 buildroot user.notice syslog: a: M0count(364055,364311,370001,363766,364224,100019,0,0)  
Jul 14 16:17:55 buildroot user.notice syslog: a: M0count(364457,364712,370402,364167,364625,100420,0,0)  
Jul 14 16:18:55 buildroot user.notice syslog: a: M0count(364857,365113,370803,364568,365026,100821,0,0)  
Jul 14 16:19:55 buildroot user.notice syslog: a: M0count(365259,365514,371205,364970,365427,101223,0,0)  
Jul 14 16:20:56 buildroot user.notice syslog: a: M0count(365660,365916,371606,365371,365829,101624,0,0)  
Jul 14 16:21:56 buildroot user.notice syslog: a: M0count(366061,366317,372007,365772,366230,102025,0,0)  
Jul 14 16:22:56 buildroot user.notice syslog: a: M0count(366463,366718,372409,366174,366632,102427,0,0)  
Jul 14 16:23:57 buildroot user.notice syslog: a: M0count(366864,367120,372810,366575,367033,102828,0,0)  
Jul 14 16:24:57 buildroot user.notice syslog: a: M0count(367265,367520,373211,366976,367433,103229,0,0)  
Jul 14 16:25:57 buildroot user.notice syslog: a: M0count(367665,367921,373612,367377,367835,103630,0,0)  
Jul 14 16:26:57 buildroot user.notice syslog: a: Status: RID=036624338004 CAM_ID=003805104613 Chassis=1  
Jul 14 16:26:58 buildroot user.notice syslog: a: M0count(368067,368322,374014,367778,368236,104031,0,0)  
Jul 14 16:27:58 buildroot user.notice syslog: a: M0count(368468,368724,374414,368179,368637,104432,0,0)  
Jul 14 16:28:58 buildroot user.notice syslog: a: M0count(368869,369125,374815,368580,369038,104833,0,0)  
Jul 14 16:29:59 buildroot user.notice syslog: a: M0count(369270,369526,375216,368982,369439,105235,0,0)  
Jul 14 16:30:59 buildroot user.notice syslog: a: M0count(369672,369927,375618,369383,369840,105636,0,0)  
Jul 14 16:31:59 buildroot user.notice syslog: a: M0count(370073,370326,376019,369784,370242,106037,0,0)  
Jul 14 16:33:00 buildroot user.notice syslog: a: M0count(370474,370730,376420,370185,370643,106438,0,0)  
Jul 14 16:34:00 buildroot user.notice syslog: a: M0count(370875,371131,376821,370586,371044,106839,0,0)  
Jul 14 16:34:20 buildroot user.err syslog: a: _SWM_ReadFtm(): RF-MICRO poll timeout!  
Jul 14 16:34:20 buildroot user.err syslog: a: _SWM.GetResponse(): SWM_ReadFtm() failed  
Jul 14 16:34:20 buildroot user.err syslog: a: _SWM_GetMyResponse(): SWM_GetResponse(0) failed  
Jul 14 16:34:20 buildroot user.err syslog: a: SWM_PingStatus(): SWM_GetMyResponse() failed  
Jul 14 16:34:20 buildroot user.warn syslog: a: _STREAM_SwmCheckStatus(): swmStatus = 0x2!  
Jul 14 16:34:20 buildroot user.err syslog: s: SoapSwmError(): !!! SWM error !!!  
Jul 14 16:34:20 buildroot user.notice syslog: a: SWM_Tick(): NAD bit cleared  
Jul 14 16:34:21 buildroot user.notice syslog: a: _SWM_ProcessResponse(): SWM connection restored  
Jul 14 16:34:21 buildroot user.notice syslog: a: _STREAM_SwmCheckStatus(): SWM OK  
Jul 14 16:35:01 buildroot user.notice syslog: a: M0count(371278,371534,377225,370989,371447,107242,0,0)  
Jul 14 16:36:01 buildroot user.notice syslog: a: M0count(371679,371935,377625,371390,371848,107643,0,0)
```

Figure 44 - Syslog Example

Figure 44 above shows a SWiM error occurred and cleared in less than two seconds.

In addition to clicking the Syslog hyperlink at the top of any COM2000 web interface page, the syslog data may also be accessed directly from the PairingInfo screen as discussed in by clicking directly on the hyperlinks for each card's IP address. If you are experiencing problems with the COM2000 system a quick check of the SYSLOG can alert you to problems. Contact your distributor or Technicolor support for further assistance.

8 Electronic Program Guide and PSIP

8.1 EPG Overview

Each COM46 card gives you access to an integrated Electronic Program Guide (EPG) that can be used to create a user-defined guide channel of all programming offered at your location. The setup is done through the same web interface as is used for the normal system setup. The guide can be expanded to include all channels being offered at the property, whether the source is the COM2000, an analog SMATV system, or over-the-air signals.

Another feature of the COM2000 EPG is the ability to upload and playback welcome screen images that will play direct from the COM46 card.

See section 6.5 for details on creation of Welcome Screen images.

There are some important items to note when working with the EPG:

The EPG information can only be contained within a single card. You cannot access your EPG settings when logging in from any other card. Therefore, it is important to keep track of which card contains your guide information. It is also recommended to keep a text file containing the EPG listing in case you lose access to that particular card.

The SysInfo page will show ‘EPG’ in the EPG field if a card is transmitting the EPG channel. In the example below in **Error! Reference source not found.** the EPG is running on card one in chassis one. The card IP address is 192.168.3.18.



Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC](#), [401](#), [QAM](#)

Chassis	Slot	CardIP	EPG	MAC_Address	Features
1	1	192.168.3.18	EPG	c4:27:95:d5:9a:4c	
1	2	192.168.3.19		c4:27:95:d5:9a:49	HD
1	3	192.168.3.20		c4:27:95:d5:9a:58	HD
1	4	192.168.3.21		ff:ff:ff:ff:ff:ff	HD
1	5	192.168.3.22		ff:ff:ff:ff:ff:ff	HD
1	6	192.168.3.23		00:00:00:00:00:00	HD

The EPG is created in such a way that it provides the viewer with what appears to be an auto-scrolling channel listing. It is essentially a dynamic MPEG video stream made up of still images of the current programming. It moves down the list of assigned channels every 2.5 seconds, creating a constant cycle, showing nine channels at a time. As such, the guide is not interactive, so the viewer must manually tune to their channel of choice.

If the number of channels in the EPG fits in one screen (nine or less) the channel listing will not scroll. This permits the installer to have multiple cards generating a different EPG channel listing nine channels each. This will create the user experience that channeling up or down will page up or down nine channels in the guide.

The EPG can also convert the DIRECTV guide information into PSIP guide information that is decodable by many televisions. PSIP permits the channel number to be remapped, the channel name can be displayed, the current time displayed, and the current and next program titles displayed.

To generate PSIP guide information, the last two numbers for each channel must list the QAM6 chassis number and QAM6 destination port number. This information is automatically filled in when EpgLoad is clicked. To disable PSIP guide generation for a channel, set the port number to -1. If the DestIP is a valid IP address but the DestPort is 0, then the EPG channel is disabled but PSIP guide generation is still enabled. This makes it possible to have one card provide PSIP data and a separate card provide guide only.

Different TVs may interpret and display PSIP data differently. It is recommended to test PSIP operations prior to installation.

It is possible to add non-DIRECTV channels to the EPG. This is done by adding an entry where instead of a DIRECTV channel number, the capital letter 'N' appears followed by the channel name, and program information separated by underscore characters.

For example:

➤ 10-1 NLobby_The_lobby_channel 1 17

Each channel in the EPG is comprised of a still image and it can take up to 10 seconds to produce the image for every channel being offered when the EPG is first loaded. For example, a location offering a list of 18 channels can expect to wait up to 3 minutes for a first-time EPG configuration.

Due to the combination of the auto-scroll programming and the constant addition of new channels, you can expect the EPG to exhibit some odd behavior during the initial image creation. It may appear to skip around at random, but it can be expected to settle back into a normal operational state once it has finished generating all the necessary images.

The EPG is a video-only channel, and you cannot set audio to play in the background.

8.2 Getting Started with EPG

In order to access the EPG setup screen shown in Figure 45 below, simply click the *EPG* hyperlink at the top of any COM2000 web interface page.

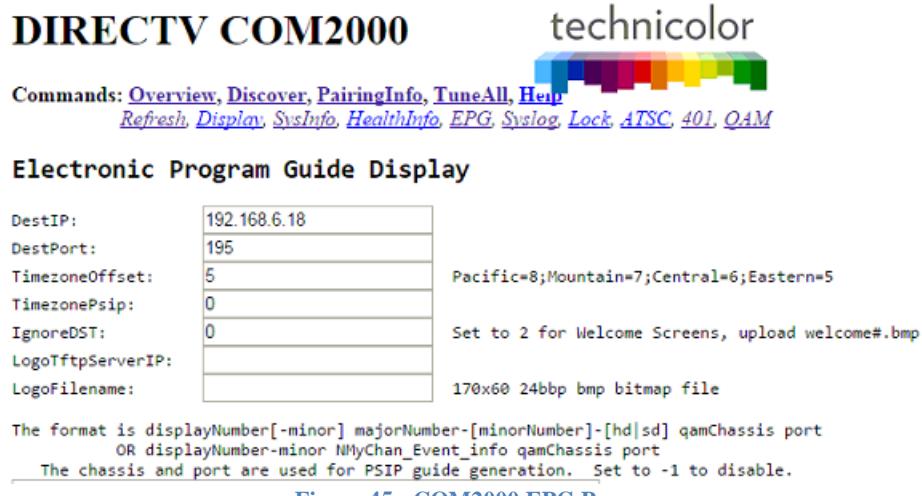


Figure 45 - COM2000 EPG Page

Following is a brief explanation of each field available on the *EPG* page as shown above:

DestIP

This field represents the IP address of the device you wish to send the EPG data to. In a typical installation, this will be the address of the edge QAM device. The default value is 0.0.0.0. Typically this will be the IP address of the QAM6 card you are going to use for the EPG channel. In this example it is the second QAM on chassis 1, 192.168.2.18

Note: the default value of 0.0.0.0 can be entered at any time to disable the EPG channel.

DestPort

This field represents the port number that is to be used to map the EPG to a specific QAM channel. The default value is 0.

TimezoneOffset

This field is used to tell the COM46 to shift the guide data by the appropriate amount of time to account for the property's time zone. Example values can be seen to the right of the field. The default value is 0.

TimezonePsip

This field allows DCI401 boxes to align with TVs using PSIP. Most TVs have a time zone setting, the DCI401 is based on GMT. Offset for GMT to synchronize a TV using a DCI 401 to a direct tuning TV. The same values are used as in the Timezone Offset field.

IgnoreDST

This field is used to tell the COM46 to ignore Daylight Savings Time, if needed. This is accomplished by entering a value of ‘1’ here. The default value is 0. If you are setting up the Home screen feature set this field to 2.

LogoTftpServerIP

This field is used to tell the COM46 where to find the custom logo for the property. This will be the IP address of the PC containing the TFTP server.

LogoFileName

This field is used to tell the COM46 the name of the file that is to be used for the logo.

The EPG’s channel lineup is created in the large textbox on the lower half of the screen, using the following format:

displayNumber majorNumber-[minorNumber]-[hd|sd] QAMchassis port

displayNumber

This is the TV channel that the viewer will find the program on. majorNumber – This is the same as the “Major_Number” field in the Channel Tune interface.

minorNumber

This is the same as the “Minor_Number” field in the Channel Tune interface. Please note that on submission, the EPG will default to ‘65535’ if this value is not provided.

hd|sd

This tells the guide whether to pull the data for the HD or the SD version of a particular channel. The default behavior for the COM2000 is to look for HD channels, so this setting allows you to add SD channels to the EPG if needed. Please note that on submission, the EPG will default to ‘hd’ if this value is not provided.

QAMchassis

This tells the guide which chassis the QAM6 is in so that it knows the QAM6's IP address for sending PSIP guide data. If not using PSIP this field can be set to -1.

Port – This tells the guide which QAM6 UDP port is being used for sending PSIP guide data. If not using PSIP this field can be set to -1.

Examples:

10 501-65535-hd → TV channel 10 carries HBOHD (from COM2000)

23 209-65535-hd → TV channel 23 carries ESPN2HD (from COM2000)

45 202-65535-sd → TV channel 45 carries CNN (from SMATV or COM2000)

37 8-65535-hd → TV channel 37 carries local channel 8 (from OTA, SMATV, or COM2000)

2-1 NLocal_Program_Info 1 71 → Non-DIRECTV channel (channel name Local)

Note: The actual content could come from the COM2000, a separate analog SMATV system, or even from on-air, as long as the channel is available in DIRECTV's lineup.

The first time you access the EPG page, it will be blank. Note that, as mentioned previously, this page applies to the card that you are currently logged in to, and that an EPG can only exist on one card. If you have previously completed an EPG configuration and instead see a blank page like the one shown above, you are probably logged in to the wrong COM46 card. After a successful configuration, the screen should look similar to the one shown below in Figure 46.



DIRECTV COM2000

Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC](#), [401](#), [QAM](#)

EpgLoad!

Electronic Program Guide Display

DestIP:	192.168.6.2	
DestPort:	68	
TimezoneOffset:	5	Pacific=8;Mountain=7;Central=6;Eastern=5
IgnoreDST:	0	
LogoTftpServerIP:		
LogoFilename:	170x60 24bbp bmp bitmap file The format is displayNumber[-minor] majorNumber-[minorNumber]-[hd sd] qamChassis port OR displayNumber-minor NMyChan_Event_info qamChassis port The chassis and port are used for PSIP guide generation. Set to -1 to disable.	
<pre>33-1 100-65535-sd 1 65 33-2 100-65535-sd 1 66 33-3 202-65535-hd 1 67 35-2 245-65535-hd 1 98 35-3 276-65535-hd 1 99 36-1 284-65535-hd 1 113 36-2 212-65535-hd 1 114 36-3 265-65535-hd 1 115 37-1 278-65535-hd 1 129 37-2 362-65535-hd 1 130 40-1 278-65535-hd 1 177 40-2 206-65535-hd 1 178 40-3 281-65535-hd 1 179 41-1 264-65535-hd 1 193 41-2 312-65535-hd 1 194 41-3 232-65535-hd 1 195</pre>		

Submit Query **EpgLoad** <- Load currently playing channels.

EpgDisable

Figure 46 - COM2000 EPG Page (Configured)

8.3 Configuring the EPG

The screen shown in Figure 47 below is the result of clicking the EpgLoad button located at the bottom of the EPG screen. Doing this provides a convenient starting point for building an EPG for your system. To set a custom channel map change the RF channels listed to the preferred channel ring.

DIRECTV COM2000 technicolor

Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC](#), [401](#), [QAM](#)

Electronic Program Guide Display

DestIP:	192.168.6.2	
DestPort:	68	
TimezoneOffset:	5	Pacific=8;Mountain=7;Central=6;Eastern=5
IgnoreDST:	0	
LogoTftpServerIP:		
LogoFilename:	170x60 24bbp bmp bitmap file	
The format is displayNumber[-minor] majorNumber-[minorNumber]-[hd sd] qamChassis port OR displayNumber-minor NMyChan_Event_info qamChassis port		
The chassis and port are used for PSIP guide generation. Set to -1 to disable.		
<pre>33-1 621-65535-sd 1 65 33-2 100-65535-sd 1 66 33-3 202-65535-hd 1 67 35-2 245-65535-hd 1 98 35-3 276-65535-hd 1 99 36-1 284-65535-hd 1 113 36-2 212-65535-hd 1 114 36-3 265-65535-hd 1 115 37-1 278-65535-hd 1 129 37-2 362-65535-hd 1 130 40-1 278-65535-hd 1 177 40-2 206-65535-hd 1 178 40-3 281-65535-hd 1 179 41-1 264-65535-hd 1 193 41-2 312-65535-hd 1 194 41-3 232-65535-hd 1 195</pre>		

<- Load currently playing channels.

Figure 47 - COM46 EPG Load Result

The results shown on this page contain the programming information for all COM46 cards in your system based on the current tuning table. The function assigns channel information starting from the first tuner on the leftmost card in the lowest-numbered chassis and steps up one channel for every successive tuner. This information will automatically be loaded into the appropriate text field the next time you visit the EPG page.

In order to customize the EPG to match the property's lineup, you will need to go back to the main EPG screen by clicking the EPG link at the top of the page. From this screen, you will need to tell the COM46 card where to send the EPG data (a QAM6, for instance), define a time zone

offset, and modify the lineup as needed. You may also upload a logo for the property that will be displayed in the upper right corner of the EPG.

When modifying the EPG channel lineup, the channels can be entered in any order, as the COM46 card will automatically sort them by channel number when it builds the guide. As with the tuning table on the TuneAll page, you may edit the EPG information in its text field on the page, but it is recommended that you make all changes in a separate text editor and save a copy of the text file for easy retrieval in the case of any information loss.

Example:

The first line of text is:

33-1 621-65535-sd 1 65

RF channel 33-1 is playing DIRECTV channel 621 on QAM6 #1 Port 65

Changing the channel designation will show the channel as mapped and will send PSIP information to the TV.

2-0 621-65535 –sd-1-65

Now DIRECTV channel 621 will be distributed through the RF network on ch 33-1, but the EPG data will display CH 621 information as playing on channel 2. PSIP will instruct the TV to look for programming on 33-1 when CH 2 is selected.

Once you are finished entering all of the information necessary to build your EPG, simply click the “Submit Query” button at the bottom of the screen. Doing so will provide you with a screen that reports all of the data the COM46 card has been sent. This screen will look similar to the resulting screen after clicking the EPGLoad button. Once the EPG has had enough time to configure, the resulting guide channel should look like Figure 48 below.

Mon 7/12	2:00p	2:30p	3:00p
24 USAHD	White Collar [HD]	White Collar [HD]	>
27 OXGN	Roseanne	Roseanne	Roseanne
28 DSCHD	Overhaulin' [HD]	American Chopper	>
30 APLHD	Animal Cops Philadelphia [HD]	Animal Cop... [HD]	>
32 AMC	< Cold Mountain		>
41 HISTHD	How Bruce Lee Changed the World [HD]		>
45 CNEDHD	Scooby-Doo in Where's My Mummy?		
50 COMHD	The Daily... [HD]	The Colbert... [HD]	My Boss's... [HD]
57 SPKEHD	The Unit [HD]		Walker, Texas...

Figure 48 - Guide Channel

8.4 Logo upload

The COM46 has a built-in facility for superimposing a property's logo into the upper right corner of the EPG. Should the System Operator express an interest in providing such a logo, it is entirely up to the property to employ someone to do so. It is recommended that you work with someone in either the property's Branding or Corporate Identity department or with a graphics professional in order to obtain an image that is in the proper format to be added to the EPG.

In order to work properly with the EPG, the logo must be saved as a 24-bit bitmap (*.bmp) file, and can be no larger than 170x60 pixels in size (170 pixels wide and 60 pixels long). In addition, the image's background can be made to render as transparent by changing the color to magenta (RGB values of 251-0-255). An example of this can be found in Figure 49 below.

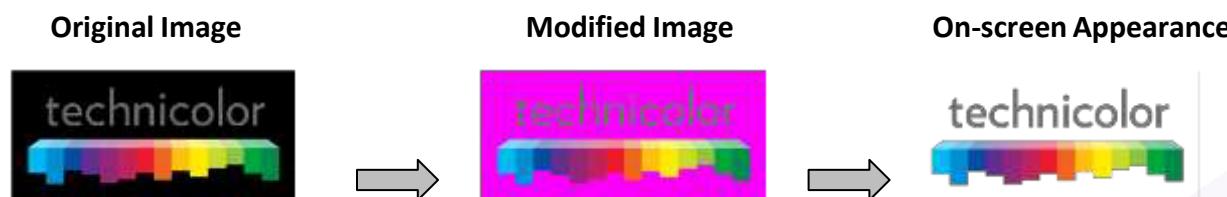


Figure 49 - EPG Logo Creation

Once the image has been properly uploaded by using the “LogoTftpServerIP” and “LogoFileName” fields on the EPG page, you should see the logo appear in the upper right corner of the guide channel screen, as can be seen in Figure 50 below.

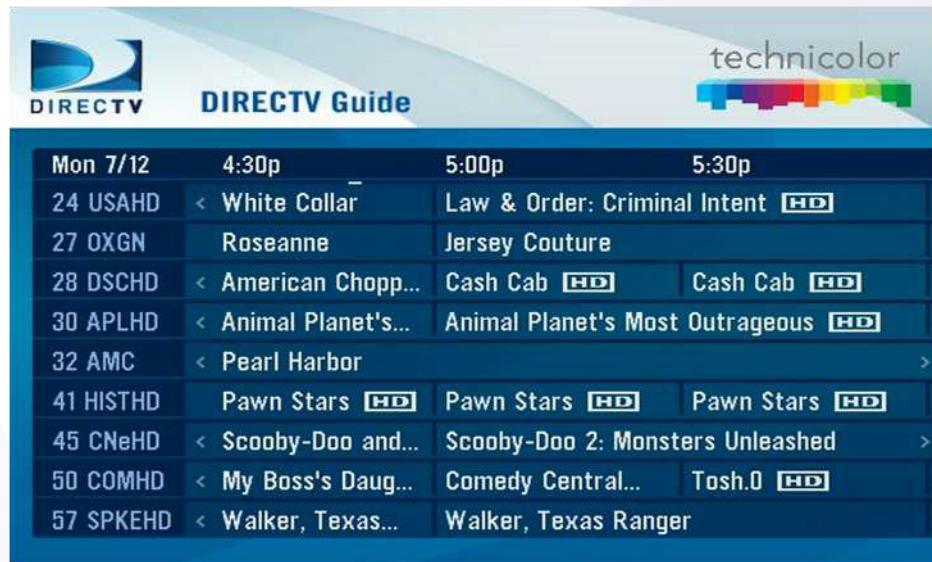


Figure 50 - Guide Channel with Custom Logo

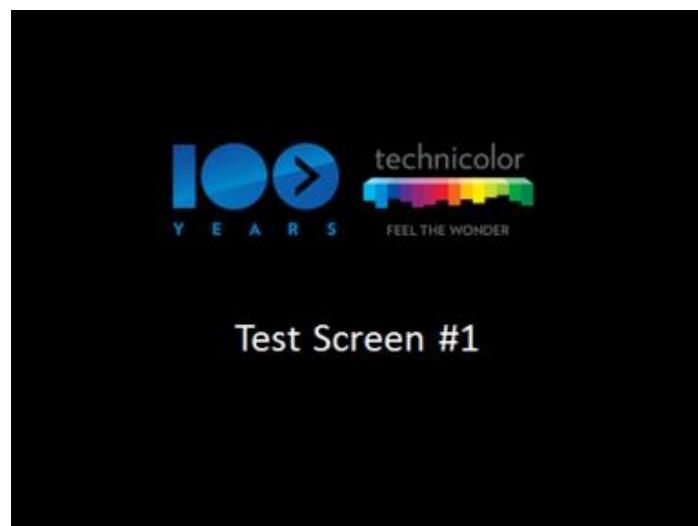
9 Welcome Screen

The welcome screen feature allows the creation and playback of up to 10 static images on a QAM channel. Each channel will use the EPG function on a card not currently being used for EPG. The images will change approximately every 15 seconds. EPG on each COM 46 card can send an image to a different QAM port.

9.1 Image creation

Welcome screens need to be formatted as 24 bit 720x480 bitmaps.

For the purpose of this exercise, we will use PowerPoint to create a screen and Paint to size the file.



Save the PPT as “welcome1” (all lower case with no spaces) as a Device Independent Bitmap (*.bmp), as shown in Figure 51 below.

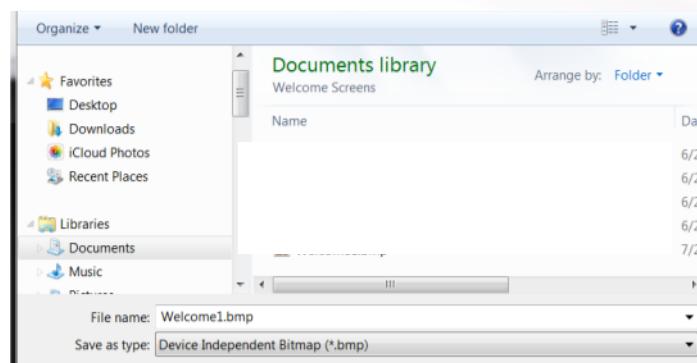
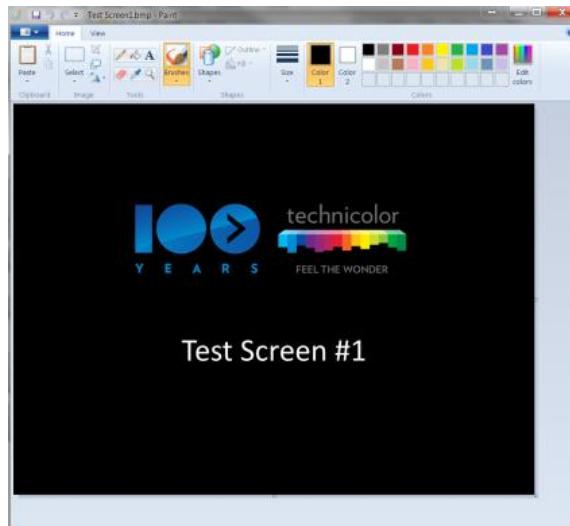


Figure 51 - Welcome Screen Image Creation

Next open the file in Microsoft Paint.



Use the Resize and Skew feature to set the image to 720X480 as shown in Figure 52.

1. Select Resize by Pixels
2. Set Horizontal to 720
3. Set Vertical to 480
4. Uncheck Maintain Aspect Ratio
5. Click "OK"

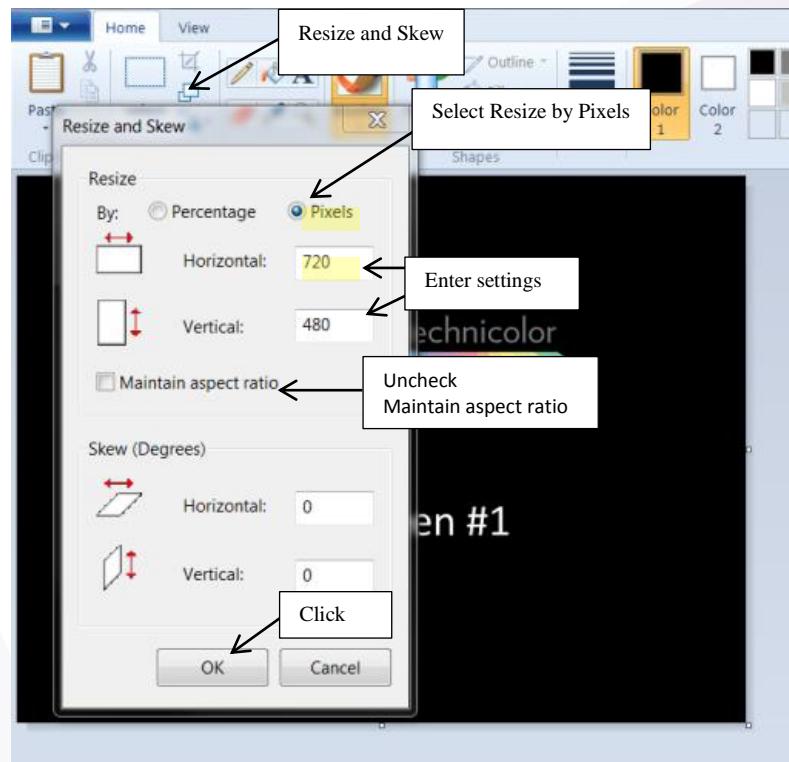


Figure 52 - Using Microsoft Paint to size welcome screen

Image will resize to correct format as shown in Figure 53.

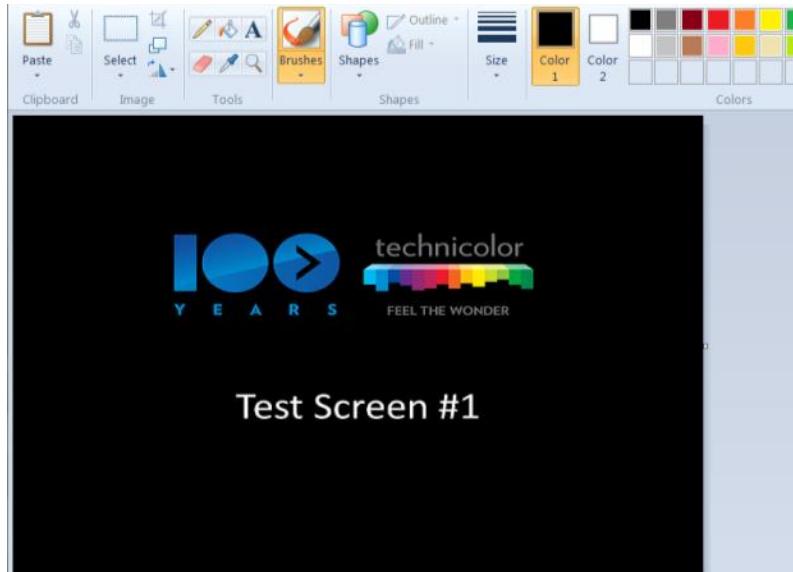


Figure 53 - Correctly Sized Welcome Screen Image

Save file!!!

Repeat the above procedure to create multiple screens, welcome2, welcome3, etc. Note file names must be lower case with no spaces.

9.2 Uploading Welcome screens to COM 2000

Determine Card to use:

Card must be running 03.02.21 software.

Log into a card *not* currently running EPG. You can verify from the *SysInfo* Tab as shown in Figure 54.

DIRECTV COM2000 

Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC](#), [401](#), [QAM](#)

Chassis	Slot	CardIP	EPG	MAC_Address	Features
1	1	192.168.3.18		c4:27:95:d5:9a:4c	MT IP HD
1	2	192.168.3.19	EPG	c4:27:95:d5:9a:49	ClearHD IP HD Transcode
1	3	192.168.3.20		c4:27:95:d5:9a:58	ClearHD IP HD Transcode

Figure 54 - Determine Card to use for Welcome Screen

Figure 55 shows the Browser Upload function. Upload file to the card FTP from the Pairing Info tab.

Software Upgrade:
Usage: 2 = SW_Upgrade ▼
Server_IP_Address: 192.168.3.20
Filename: welcome1.bmp
Mode: 0 = TFTP ▼

Browser Upload
TFTP server at 192.168.3.20 current files:
1036854 welcome1.bmp
Upload a file to the TFTP server at 192.168.3.20
 No file chosen

Figure 55 – Upload Welcome Screen Files to internal TFTP

Select EPG tab

1. Enter the IP address and port# of the QAM you want to use to stream the welcome screen.
2. Enter 2 in the ignore DST field.
3. Enter the IP address of card you are using for FTP
4. Enter the file name you uploaded.
5. Click Submit.
6. Reboot the COM46. When the reboot is complete the card's EPG page will look similar to Figure 56.

Electronic Program Guide Display

DestIP:	192.168.6.18
DestPort:	196
TimezoneOffset:	0
TimezonePsip:	0
IgnoreDST:	2
LogoTftpServerIP:	192.168.3.20
LogoFilename:	Welcome1.bmp

Pacific=8;Mountain=7;Central=6;Eastern=5
Set to 2 for Welcome Screens, upload welcome#.bmp
170x60 24bbp bmp bitmap file

The format is displayNumber[-minor] majorNumber-[minorNumber]-[hd|sd] qamChassis port
OR displayNumber-minor NMyChan_Event_info qamChassis port
The chassis and port are used for PSIP guide generation. Set to -1 to disable.

<- Load currently playing channels.

Figure 56 - Upload Welcome Screen Image to EPG

If you are using PSIP or would like the welcome screen displayed in the EPG log into the card running EPG and add the channel to the EPG information as shown in Figure 57.

Electronic Program Guide Display

DestIP:	192.168.6.2
DestPort:	196
TimezoneOffset:	5
TimezonePsip:	0
IgnoreDST:	0
LogoTftpServerIP:	
LogoFilename:	170x60 24bbp bmp bitmap file

The format is displayNumber[-minor] majorNumber-[minorNumber]-[hd|sd] qamChassis port
OR displayNumber-minor NMyChan_Event_info qamChassis port
The chassis and port are used for PSIP guide generation. Set to -1 to disable.

1-0 NWELCOME_WELCOME_SCREEN 9 195
2-0 NGUIDE 1 196
3-0 NMNT3_MEDIATUNE_TV3 1 145
4-0 NMNT1_MEDIATUNE_TV1 1 129
5-0 NMNT2_MEDIATUNE_TV2 1 130
6-1 6-65535-hd -1 17
6-2 NHTSN_HTSN -1 17
6-3 NLAFF_CLASSIC_COMEDY -1 17
8-1 8-65535-hd -1 33
8-2 NLWS_LOCAL_WEATHER -1 -1
8-3 NRADAR_LOCAL_WEATHER_RADAR -1 33
13-1 13-65535-hd -1 49
13-2 NC0ZITV_CLASSIC_TV -1 49
13-3 NMeTV_OLDIES_TV -1 49
20-1 20-65535-hd -1 65
20-2 NWFYI2_PBS2 -1 65
20-3 NWFYI3_PBS3 -1 65
23-1 23-65535-hd -1 81
23-2 NBOUNCE_CLASSIC_TV -1 81
29-1 4-65535-hd -1 113
29-2 NWTTK4.2_WTTK4.2 -1 113
104-0 4-65535-hd 1 161
106-0 6-65535-hd 1 162
108-0 8-65535-hd 1 163

<- Load currently playing channels.

Figure 57 - Adding Welcome Screen to EPG and PSIP

You can verify the screens are streaming by checking for data on the corresponding QAM port as shown in Figure 58 below.

Mega-Bits Per Second

	PortBase	Chan	-1	-2	-3	-4	total
Qam1	16	35	5.3	8.0	5.9	0.2	19.4
Qam2	32	36	8.7	11.0	8.0	0.2	27.9
Qam3	48	37	6.4	5.8	8.4	0.2	20.8
Qam4	64	38	4.2	4.9	7.8	0.3	17.1
Qam5	80	39	10.5	4.5	10.5	0.2	25.8
Qam6	96	40	7.9	5.4	3.3	0.2	16.8
Qam7	112	41	6.5	15.0	6.5	0.3	28.2
Qam8	128	42	9.9	6.4	5.3	0.3	21.9
Qam9	144	43	3.2	9.6	5.0	0.2	17.9
Qam10	160	44	0.0	0.0	0.0	0.1	0.1
Qam11	176	45	0.0	0.0	0.0	0.1	0.1
Qam12	192	46	0.0	0.0	0.5	0.1	0.5
Total							196.5

Figure 58 - Verify Welcome screen is streaming

Your Welcome screen should now be playing on the TV. Screens scroll every 15 seconds.



To disable the Welcome screens set the DST field to 0.

Click Submit.

Reboot card.

10 QAM6

10.1 QAM6 Overview

The QAM6 card is an Edge QAM that is installed directly into a COM360 chassis. It connects to the COM46 cards via a GigE connection on the back edge of the card.

The board provides 12 QAM modulators in addition to the front 100 mbps Ethernet port, which can be used to manage the COM2000 system.

Each QAM channel can carry up to 3 HD or 8 SD video channels. When shipped from the factory the QAM6 boards will only permit six QAM carriers to be active at a time. To increase the number of QAM carriers, additional SWQAM2 licenses must be purchased from your distributor and downloaded to the QAM6. Each license enables 2 more QAM carriers per board up to a total of 12 carriers.

A COM360 chassis fully populated with COM46 receivers (48 channels total) requires 16 QAM channels (3 HD channels per QAM). This requires 2 QAM6 modulators (12 QAMS) plus 2 additional SWQAM2 upgrade licenses. Additional SWQAM2 upgrades can be purchased for a maximum of 24 QAM channels. These can be utilized for additional services such as ATSC-8, or externally sourced video streams.

A front view of the QAM6 can be seen in Figure 59 below in figure.

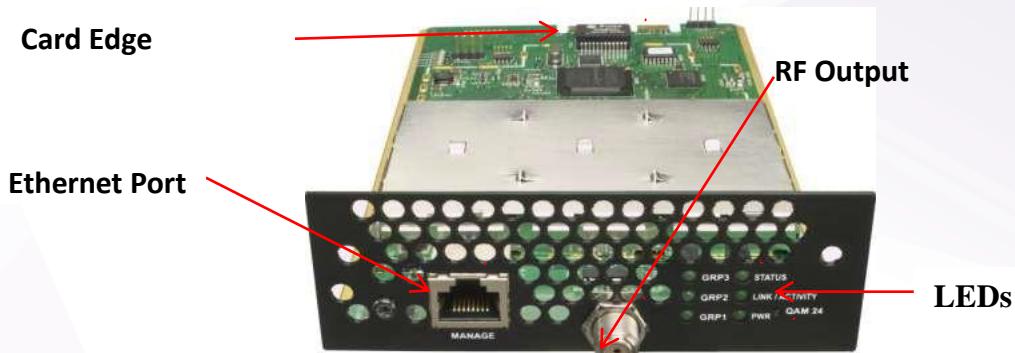


Figure 59- QAM6

10.2 QAM6 Settings and Configuration

The QAM6 card is controlled by any of the COM46 cards via Ethernet. The QAM6 card has a fixed IP address = 192.168.6.“Chassis ID” + 1. An arbitrary alternate address can be assigned. QAM output channels have a destination port of QAM Channel *16 + subchannel number.

The screen in Figure 60 shows the status of each channel. The RF groups are labeled Qam1-Qam12.

Each RF channel can have up to 8 subchannels or programs. If a subchannel is active, its bit rate will be shown. Bitrates are static snapshots.

The lower portion of the screen controls the RF output configuration and provides SW upgrade capability.

12 RF output channels are defined in 3 groups of 4.

Each group of 4 is in a fixed channel sequence starting with the base channel. Each group’s base channel can be set according to the North American Cable Television Frequency plan.

Each RF channel can be individually turned on or off.

Each channel must be frequency adjacent and within the same band per the North American Cable Television Frequency Plan.

See

EIA standard EIA-542B

or

<http://www.jneuhau.com/fccindex/cablech.html>

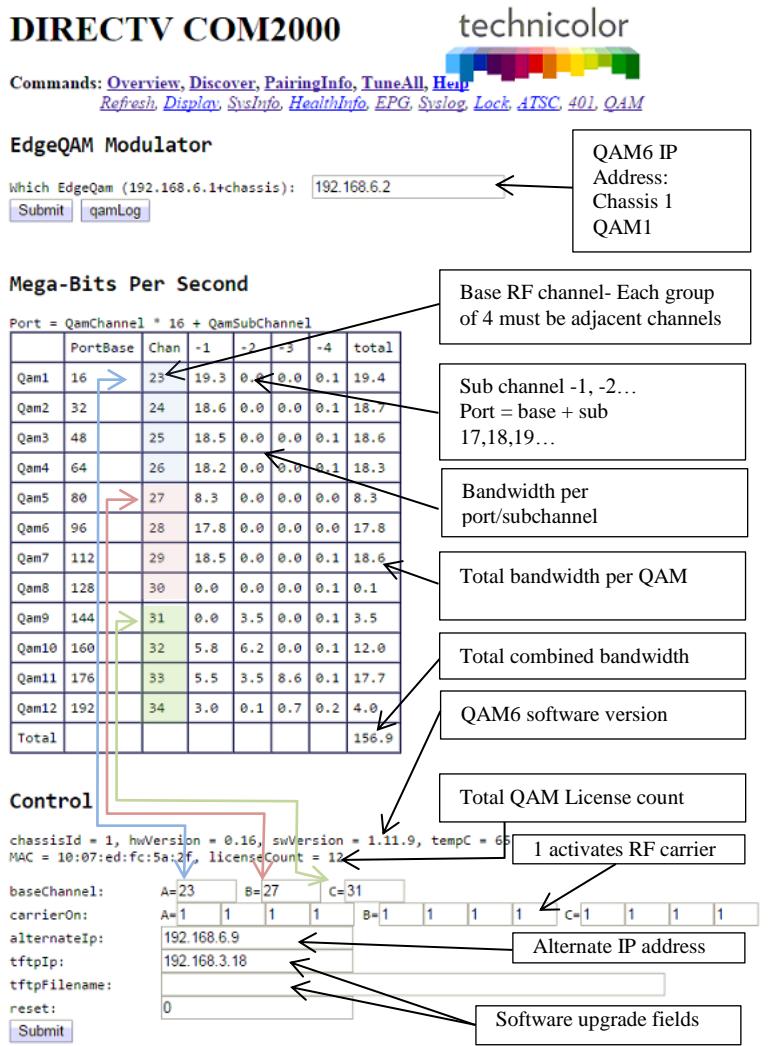


Figure 60 - QAM6 Command Screen

Below is an explanation of the fields in the lower Control portion of the QAM6 screen shown in Figure 60:

baseChannel - This field sets the base cable channel number for each of the 3 banks of 4 carriers.

carrierOn - This field allows you to enable or disable individual carriers in the bank of 12.

alternateIp - This field will configure the QAM6 to have a second IP address. This IP address can be a multicast IP address. However, the QAM6 does not notify a managed switch that it wants this multicast IP address via IGMP.

tftpIP - This address field sets the address of the file server for SW upgrades.

tftpFilename - This field sets the filename of the new SW image.

Reset - This field executes a SW reset of the QAM6. It is almost user transparent but will create a brief video glitch on the channels it is modulating.

Application Notes:

- The QAM6 supports an emergency broadcast override. If a video stream is sent to port 25600 it will override all of the channels.
- Some QAM6 boards have an RF spur that can interfere with analog television channels. The spur is 1176 MHz minus the desired center RF frequency for each group of four channels. For channels 23 through 94 this means that the spur will be at $(1086 - 6 * \text{channel})$ MHz Change the frequency plan to minimize the impact of the RF spurs.

10.3 QAM LOG

When troubleshooting QAM6 issues, click on the QAM Log button to see the QAM6 system log. This log is mainly for Technicolor technical analysis but a short summary is:

A = Arp reply

bad(#) = Discarded # number of unexpected Ethernet packets.

C = Command and control message received

c## = Continuity counter error. May indicate multiple channels to same port. PMT## = PMT changed on a channel

T = PCR discontinuity

An example of a normal QAM log is shown below in Figure 61.

```
Getting log
MTb1 A PMTb0 PMTb2 AAAAAAA PMTb1 AAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AA
AAAAAA PMTb1 AAAAA ignore(00000200) AAA PMTb1 AAACCCAAAAA PMTb1 AAAAAAAA PMTb1
PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1
b1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PAT PMTb1 PAT AAAAAAAA PMTb1 AA ign
ore(00000200) AAAA PMTb1 AAAAAAAA PMTb1 AAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAA PMTb1
AAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAA
AAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 PMta1 PMta2 PMta0 PMT90 PMTb0 PM
Tb2 PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 ignore(00
00200) AAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 A
AAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA
PMTb1 AAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAA
A ignore(00000201) A PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAAAA PM
Tb1 AAAAAAAA PMTb1 AAAAAAAA PMTb1 AAAAAC
```

Figure 61 - QAM Log Example

11 Software Upgrade Procedures

When you first receive your COM2000 system, your distributor should have already installed the most recent software on every COM46 card and QAM6. However, since we work to continuously improve the software associated with the system, you may find it useful to stay up-to-date as future versions are released. Please check www.technicolor.com/mcs for the latest software for your system.

Note: The latest software releases covered in this manual are:

- COM46 - ST03.02.21
- QAM6 – QAM24_01.11.09

The following sections will explain in detail the upgrade options that were touched upon earlier within the file transfer utility located under the *Tune* command and on the *PairingInfo* page.

11.1 Preparing for a Software Upgrade

Technicolor will at times releases new versions of software for the COM46 and QAM6 products. Notifications are sent to product distributors with release notes. New software may address performance enhancements and provide new features. It is recommended that the first step in any troubleshooting process is to update the components to the latest software version. Contact your distributor or Technicolor Support for the latest software version. Upon receipt save the file in a known location on a computer to be used for service purposes. In most cases the software will need to reside on a local machine networked to the COM2000. If you have a VPN route to the system a remote computer should work to transfer the software to the COM46 TFP.

There are several different mechanisms available for upgrading the software in the COM2000. Before proceeding any further, it is recommended that you first visit Section 5.2.1 on setting up your network connections. If you are planning to use an external TFTP or FTP server review Sections 5.1.5 and 5.3 on using FTP/TFTP and configuring your server in order to ensure that everything is properly configured to perform this operation. Otherwise, one of the COM46s in the system can be configured as a TFTP server.

11.2 Using the COM46 as a TFTP server

A COM46 in the chassis can be configured to act as a local sever for SW and license upgrades using the Browser Upload feature in the Pairing Info page as shown in figure 58 below.

To upload a new software version, use the Choose File button to find the firmware file on the host system or enter the filename into the field.

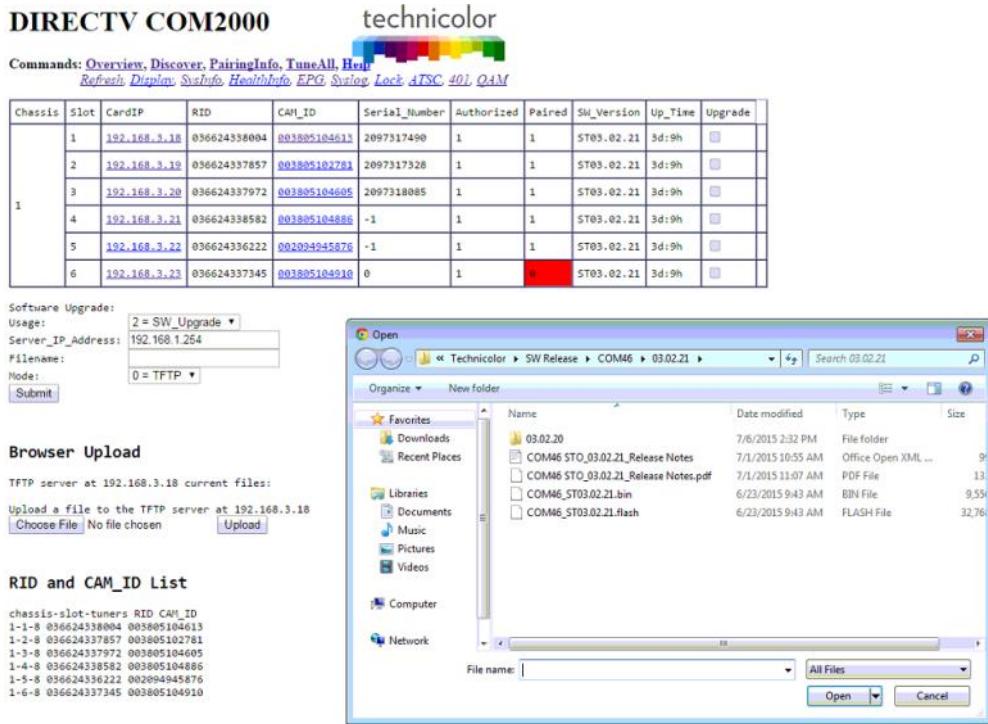


Figure 62 - COM46 Multi Card Upgrade

Then press Upload to store the file locally on the COM46.

If the upload is successful, the filename will appear under the line “TFTP server at xxx.xxx.xxx.xxx current files:” As shown in figure 59 below.

Once the selected file has been uploaded, the rest of the update procedure is the same as with the COM24/COM1000 as described in [Section 10](#).

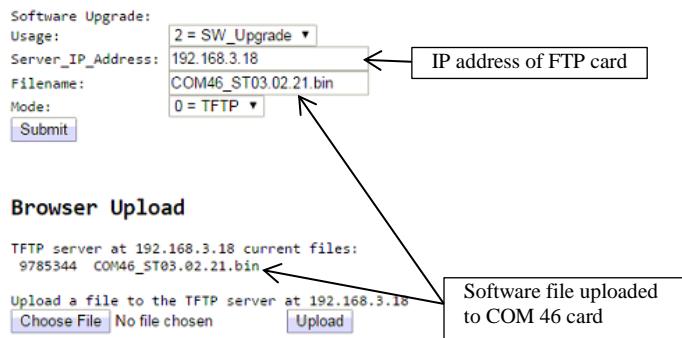


Figure 63 - COM46 Software Upload

11.3 Performing Software Upgrades

DO NOT turn off power or unplug a card that is updating its SW image. Your card may become unrecoverable

This section will guide you through the procedure for upgrading your COM46 cards. There are two different ways you can go about doing this. The first method is a single-card upgrade, which requires the use of the file transfer utility located on the Advanced Edit page (see Section 6.2.6). The second and preferred method is a multi-card upgrade, the controls for which are located at the bottom of the PairingInfo page.

Use the following settings for both methods:

The “Usage” option should be on ‘2 = SW_Upgrade’.

The ‘Server_IP_Address’ will be the device that contains the upgrade file (your PC, file server, or COM46 card).

The “Filename” will be the name of the upgrade file (e.g. COM46_ST03.02.21.bin”). It is recommended that you retain the original filename of the update file you have been issued to avoid confusion later on.

The mode determines whether the card tries to contact a FTP or TFTP server.

To use the single card upgrade method, go to the File Transfer section of the Advanced Tune page. See Figure 64 below.

Enter the IP address of the server and filename of the new image as indicated above and press the Submit button.

The same method can be used to enter a license file on a single card for an SD to HD upgrade or other feature upgrade (see Section 7.4) only the Usage field should be set to ‘4 = License’.

Upgrading a COM46-FLX to a COM46 requires DIRECTV authorization.

File Transfer

Usage:	2 = SW_Upgrade
Server_IP_Address:	192.168.3.200
Filename:	COM46_ST03.02.21.bir
Mode:	0 = TFTP
<input type="button" value="Submit"/>	

Figure 64 - Advanced Edit File Transfer

If one desires to update all of the COM46 cards in a chassis (multi-card upgrade method), then all upgrade fields would be checked as shown in Figure 61 below.

Chassis	Slot	CardIP	RID	CAM_ID	Serial_Number	Authorized	Paired	SW_Version	Up_Time	Upgrade
1	1	192.168.3.18	036624338004	003805104613	2097317490	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	2	192.168.3.19	036624337857	003805102781	2097317328	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	3	192.168.3.20	036624337972	003805104605	2097318085	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	4	192.168.3.21	036624338582	003805104886	-1	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	5	192.168.3.22	036624336222	002094945876	-1	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	6	192.168.3.23	036624337345	003805104910	0		1	0	ST03.02.21	4d:11h

Figure 65 - Multi Card COM46 SW Update

The results of the upgrade in Figure 61 are shown below in Figure 62.

```

Doing Software Upgrade
IP_Address=(192.168.3.18)
Usage=2
Filename=(COM46_ST03.02.08.bin)
1-6: http://192.168.3.23:8080
1-2: http://192.168.3.19:8080
1-3: http://192.168.3.20:8080
1-5: http://192.168.3.22:8080
1-1: http://192.168.3.18:8080
  
```

Figure 66 - Multi Card Upgrade Results

Once the software has loaded the card will reboot. Click on the Discover tab and then the Pairing info tab. The new software version number will be displayed in SW_Version column of the Pairing info table.

11.4 Upgrading a COM46-FLX from SD to HD

Upgrading the COM46-FLX from SD only to HD requires prior authorization from DIRECTV.

Once an upgrade license has been authorized, it is applied using the same method as the SW upgrade described above.

In Figure 67 the filename will be the name of the license file, e.g. “APLAB2.dat”, and the Usage mode will be ‘4 = License’. Note that a single file can contain licenses for all cards in a chassis, or multiple chassis’ if linked together, and can be uploaded to multiple cards in the same way the multicard SW upgrade is.

Once a key has been successfully accepted by a COM46-FLX card it will be capable of receiving HD programming.

The screenshot shows the DIRECTV COM2000 management interface. At the top, there's a navigation bar with links like Overview, Discover, PairingInfo, TuneAll, Help, Refresh, Display, SysInfo, HealthInfo, EPG, Syslog, Lock, ATSC, 401, QAM. Below the navigation is a table titled "DIRECTV COM2000" showing card details:

Chassis	Slot	CardIP	RID	CAM_ID	Serial_Number	Authorized	Paired	SW_Version	Up_Time	Upgrade
1	1	192.168.3.18	036624338004	003805104613	2097317490	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	2	192.168.3.19	036624337857	003805102781	2097317328	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	3	192.168.3.20	036624337972	003805104605	2097318085	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	4	192.168.3.21	036624338582	003805104886	-1	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	5	192.168.3.22	036624336222	002094945876	-1	1	1	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>
	6	192.168.3.23	036624337345	003805104910	0	1	0	ST03.02.21	4d:11h	<input checked="" type="checkbox"/>

Below the table is a "Software Upgrade:" section with the following fields:

Usage:	<input type="text" value="4 = License"/>
Server_IP_Address:	<input type="text" value="192.168.3.18"/>
Filename:	<input type="text" value="APLAB2.dat"/>
Mode:	<input type="text" value="0 = TFTP"/>

A "Submit" button is located at the bottom of this section.

At the bottom of the page, there's a "Browser Upload" section with a "Choose File" button and an "Upload" button.

Figure 67 - Applying a License File to Enable Features

11.5 Upgrading QAM6 Software

Upgrading the software for the QAM6 is similar to updating the firmware for the COM46 and except for the following differences:

- QAM6 upgrade is TFTP only. Ftp is not available.
- Only one QAM6 can be updated at a time.
- QAM6 does not automatically reset after the new software is downloaded. It must be manually reset by powering down the chassis or removing the QAM6 from the chassis.

To perform the QAM6 software update upload the software file to a COM46 TFTP as shown in section 11.2.

Software Upgrade:
Usage: 2 = SW_Upgrade
Server_IP_Address: 192.168.3.18
Filename: QAM24_01.11.09.img ← copy
Mode: 0 = TFTP
Submit

Browser Upload
TFTP server at 192.168.3.18 current files:
1796120 QAM24_01.11.09.img
Upload a file to the TFTP server at 192.168.3.18
Choose File No file chosen Upload

Figure 68 - Upload QAM6 Software

Copy the file name then access the QAM command as shown below in figure 61.

Paste the file name into the tftpFilename field as shown in Figure 69. It is recommended that you retain the original filename of the update file you have been issued to avoid confusion later on.

The “tftpIP” will be the IP address of the COM46 card used to upload the file.

Control

```
chassisId = 1, hwVersion = 0.16, swVersion = 1.11.9, tempC = 65
MAC = 10:07:ed:fc:5a:2f, licenseCount = 12
```

baseChannel:	A=23	B=27	C=31									
carrierOn:	A=1	1	1	1	B=1	1	1	1	c=1	1	1	1
alternateIp:	192.168.6.9											
tftpIp:	192.168.3.18 ← IP address of COM 46											
tftpFilename:	QAM24_01.11.09.img											
reset:	0 ← Paste file name											
Submit												

Figure 69 - QAM6 Software Upgrade

Figure 70 shows the results of starting a QAM6 software upgrade.



Figure 70 - QAM6 Software Upgrade Results

11.6 QAM6 Reset

The reset field only causes a soft reset. The card needs a hard reset after the new SW is loaded. Once the software has loaded an internal blue light in the QAM6 will flash on and off as shown in Figure 71, indicating that the card has completed the download. Reset the QAM6 by removing power from the chassis or removing the QAM6 from the chassis and reinserting it. ***Do not reset the QAM6 until the blue light flashes!***



Figure 71 - QAM6 Reset After Software Upgrade

12 Modulation of External Video Sources

12.1 Overview

The COM2000 system is capable of modulating any MPEG2 variable bit rate (VBR) media source from an IP stream.

Each source must be assigned to an open QAM6 IP and port number.

QAM6 cards must be licensed for the appropriate number of QAM outputs to facilitate FTG channels plus additional video sources. Media will be distributed on the RF channel assigned to that port.

Care must be used not to exceed the 38.8 Mbps capacity of the QAM. You target bitrate should be less than 30Mbps to allow headroom for bandwidth peaks in the VBR transport stream.

All networking gear needs to pass gigabit Ethernet (GiGE) bandwidth.

12.2 Source Options

There are many options for video sources. Keep in mind that some video sources may require special licensing to be displayed in a public place. Consult with your company's legal counsel before modulating any commercially available content such as CDs, DVDs, or any programming recorded from commercially distributed sources.

Some options for video sources include:

- Network Attached Storage (NAS) drives – NAS drives similar to the Western Digital My Cloud drive will store MPEG2 VBR media with the capability of assigning an IP destination IP.
- Video Servers – Video Servers such as the ZyCast HDIP-930 will convert media from HDMI or Component Video sources to an IP stream which can be directed to the COM2000 QAM6 card.
- PC Based Media – Video programs similar to VLC can route video streams to an IP destination. This can be very useful for locally generated marketing media that needs to be changed on a regular basis. Media files can be created on a USB drive and loaded on a local machine.
- Emergency Alert Systems – Emergency Alert Systems (EAS) can be pointed to the QAM IP and port. Any stream sent to port 25600 will be duplicated on all QAM RF outputs. When the data on port 25600 stops the QAM will broadcast the original content intended for each port.

Note: Contact Technicolor support for EAS on systems with multiple QAM6 cards.

13 Diagnostics

When it comes to troubleshooting your COM2000 system, the COM46 card has a few built-in mechanisms that can assist you. Each of these can be very helpful in diagnosing general issues associated with system status and card connections that will be covered in the following sections.

13.1 Indicator Lights

The nine indicator lights the COM46 & COM46-FLX faceplate have multiple functionalities. In addition to providing a manual toggling ability of the Tuner 9 LED by utilizing the LED controls on the Tune page the lights also exhibit a set of predefined behaviors for several conditions.

In recognizing the behaviors associated with the three indicator lights, you must first familiarize yourself with the three possible LED states. Figure 68 below names and describes them, and provides a color by which the states will be defined in the following sections.

	On	The LED emits a steady green light.
	Off	The LED is not lit at all.
	Flash	The LED exhibits an on-off pattern once a second.

Figure 72 - LED States

13.2 Power Supply Issues

Unless a COM46 card has intentionally been removed from the COM360 chassis, the “PWR” light on every card in the system should be lit. If none of the COM46 LEDs on a chassis are lit, the power supply has likely been disrupted.

Check for the following:

- The AC cords on each module are completely attached and plugged in.
- Both modules are locked in place.
- The power supply fans are running.

If the above conditions have all been met and you still do not see any LEDs lit, there is probably an issue with your system.

More commonly, you may see unlit LEDs on one or multiple COM46 cards, but not the whole chassis. Things to check for when this situation occurs:

- All COM46 cards are fully aligned in their grooves.
- All COM46 cards are properly connected to their receivers on the back panel.
- All thumbscrews are tightened completely.

If any COM46 cards remain unlit after ensuring that all of these conditions have been met, there may be something wrong with the cards.

13.3 System Startup

It is important to understand the behaviors associated with the execution of normal procedures before you can effectively diagnose any card issues. This section covers the sequence of events that occur in a COM2000 system at boot-up.

The COM46 card goes through four steps at startup:

- 1) Self test This includes SWiM channel lock.
- 2) IP Initialization (obtain IP address, establish network connectivity)
- 3) DIRECTV Program Guide acquisition
- 4) Channel acquisition and video streaming

The COM46 cards take between 2 and 3 minutes to reach a fully functional state after a reboot or power-up. The status of the card can be tracked during this time by observing the behavior of the LEDs.

Normal LED behavior during startup is listed below in Figure 73.

LED Behavior										State	Approx. duration
1	2	3	4	5	6	7	8	9			Note
ON	OFF	ON	Initialization		10 sec						
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	Boot image verification		1 sec
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	Image execute		1 sec
ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	Kernel decompress		1 sec
-	-	-	-	-	-	-	-	FLASH	Searching for guide data		2 -3 min
ON	ON	ON	ON	ON	ON	ON	ON	ON	Tuners locked, video streaming		

Figure 73- LED Startup and Operational Behavior

Note: It is normal for the Tuner LEDs to turn on and off during guide acquisition as they register with the SWiM. If a Tuner LED (other than 9) is flashing, the tuner is locked to a transport but is unable to stream video. Check the configuration settings.

If the guide acquisition state lasts longer than expected without the Tuner LEDs turning on, then the system is probably having difficulty acquiring the APG (Advance Program Guide). In this case, it is recommended that the installer verify proper and healthy RF levels being fed into the RF Distribution panel. The card may appear to “forget” its old settings during this time, but they should reappear once the situation has been remedied.

Upon successful boot-up, a COM46 will revert to its previously configured channel lineup. The lineup is specified either by the external control server (if applicable) or automatically from the cards themselves if the persistence setting was left enabled when the system was configured (persistence is enabled by default).

13.4 Normal Operation

When operating under normal circumstances, there are a few characteristics you can expect to see in LED behavior.

The PWR LED should always be lit. If the PWR LED is not lit and the chassis is powered, check the COM46 for proper installation in the chassis.

During rainstorms or other conditions that may obstruct satellite communications, the receiver may lose contact and be unable to receive guide data. At this point, the 9th (guide) tuner LED will start flashing, and the other tuner LEDs may go dark.

A Tuner LED can exhibit one of three behaviors.

- 1) A tuner which is locked on to a signal and streaming video to a valid IP destination will be in the ON state. The COM46 cards will maintain a lock on the signal at all times if the signal strength and quality is within specifications (-25 to - 55 dBm per transponder) and the connection between the COM46 and the SWiM module is working correctly.
- 2) An intermittently flashing Tuner LED indicates that the tuner is either having problems locking to a satellite or it cannot stream video. Failure to lock to a signal usually indicates a fault in the RF plant upstream or a problem in the communications link between the SWiM and the COM46. Failure to stream video is likely to occur when you are trying to tune to a channel that DIRECTV provides and you are capable of receiving, but you have not purchased the content streaming on that channel.
- 3) A tuner whose LED is off is not locked onto anything. This most likely indicates that the tuner is not set to stream anything. It could also mean that the card could not find the channel specified, in which case you should check for the following:
 - The channel is one that DIRECTV actually provides.
 - You have entered the channel number correctly.
 - You are authorized to receive the channel.

If, after having reviewed the above checklist, the tuner LEDs are not lit when they are expected to be, or if the 9th tuner LED begins flashing at a regular rate it is an indication that the card has detected a problem. The remaining lit LEDs will display the code associated with the problem.

13.5 Software Upgrade

During a COM46 software upgrade sequence the card will upload the new image from the IP address set in the ‘Server_IP_Address’ field for a software upgrade.

The new SW image is then tested to verify it is a valid COM46 image and finally written to the card’s flash memory. Normal operation of the cards continues during this part of the upgrade although the LEDs will begin to flash the “SW Upgrade” message pattern while the flash is being reprogrammed.

DO NOT turn off power or unplug a card that is updating its SW image. YOU WILL create a doorstop.

During the upgrade process, the status can be determined by evaluating the LED states according to figure 70 below.

LED Behavior										State	Approx. duration
1	2	3	4	5	6	7	8	9			Note
ON	ON	ON	ON	ON	ON	ON	ON	ON	Tuners locked, video streaming		
OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	FLASH	Flash programming	2 – 3 min	
ON	OFF	ON	Initialization	10 sec							

See Startup Behavior **Table 4**

Figure 74 - LED Behavior during Software Upgrade

Note: The PWR LED may flash briefly at the start and/or end of the upgrade.

If you see a behavior not described above in conjunction with a failure to complete the update, it may be an indication that something has gone wrong with the update. You should check that you are following each of these guidelines before attempting another update.

- All system/PC connections are functioning correctly.
- The Software has been correctly uploaded to a COM46 card’s TFTP utility.
- The TFTP server is running on the PC handling the update.
- The TFTP server is fully configured and pointing to the folder containing the update.

- You have entered the correct destination IP for the PC handling the update.
- You have correctly entered the update file name.
- The directory path and filename do not exceed the maximum limit of 200 characters.

13.6 Network Connectivity Indicators

There are two Ethernet jacks on the face of the COM360. Each has two green LEDs above the connector socket. The left hand one indicates whether video is flowing from the card (activity). The right hand one indicates whether the Ethernet port is actively linked with another (link). Refer to Figure 75 below for an illustration of these LEDs.



Figure 75 - Network Connectivity LEDs

When utilizing the Ethernet port on the face of the COM360 chassis, the “Activity” indicator should be flashing multiple times a second, and the “Link” indicator should always be steadily lit under normal operating circumstances.

If the “Activity” indicator is dark or only flashing slowly but the “Link” light is on, then the system is not transferring video data. If the COM46 Tuner LEDs appear locked, then the card should be reset. Resetting the card can be done via the front panel reset button, or via the “Reset” function under the Tune link on the web interface.

If the indicator lights exhibit some unexpected behavior that is not described above and you have already tried resetting the cards, please contact your distributor for assistance with troubleshooting the system.

14 Troubleshooting

The most common problems encountered with the COM2000 systems are due to poor RF signal conditions or to bad or loose connections.

Before moving on to detailed troubleshooting of any problem, you should check the following:

- All necessary connections (power supply, Ethernet, and coaxial cables) are fully plugged or screwed in.
- All cards are fully inserted
- Proper RF signal levels are available at the inputs to the system.
 - A DIRECTV AIM meter must be used to test signal quality. An EIV test must return a fully passing result on all transponders.
- Once you have ensured that all RF parameters are correct, try retuning and/or rebooting any problematic cards.

If the problem persists, look over the following tips and review the appendices before contacting your distributor.

14.1 Testing Video without Pro:Idiom Encryption

Standard definition content can be streamed from the COM46 with no Pro:Idiom encryption. This may be useful when troubleshooting.

To set up a standard definition non-Pro:Idiom stream navigate to the Overview page and select “none” in the security column and tune to an standard definition channel. If the card is not authorized to receive DIRECTV content, yet connected to a SWiM input, channel 100 or 200 can be used.

You may also stream to a PC running VLC. Set the IP output of the tuner to the IP address of your PC plus a port # (XXX.XXX.XXX.XXX:port#. Enter @udp:port number into the VLC streaming video source. (See Figure XX below)

Remember, standard definition channels are a different satellite feed and authorization from high definition. A tuner that streams a channel in standard definition but not in high definition is probably experiencing an issue with authorization or poor satellite signal.

VLC Media Player. Select “Media” from the main menu, and then select “Open Network Stream” from the dropdown menu that appears as shown in Figure 76 below.

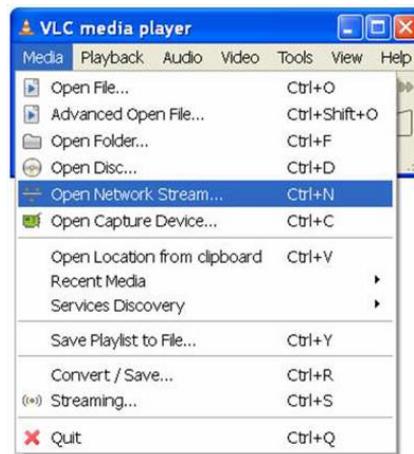


Figure 76 - VLC Open Network Stream

In the new window shown in Figure 77, set the network URL to something like “`udp://@:17`”, where “`udp`” stands for the UDP protocol, “`@`” stands for your PC, and 17 is the port number. The “`//`” and “`:`” are delimiters. Set the “Port” field to the value you were asked to note earlier during setup.

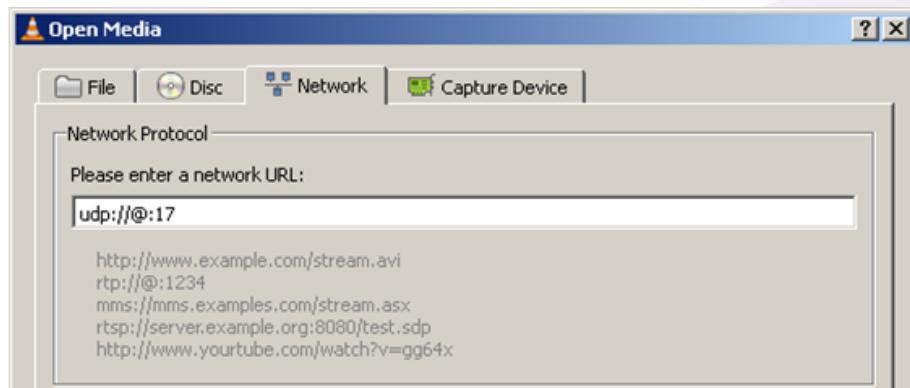


Figure 77 - Opening a Network Stream in VLC

If you have set up all your connections as directed, VLC Media Player should start streaming video output from channel 100. The resulting screen should look similar to the one shown in Figure 78.



Figure 78 - Streaming Video with VLC

14.2 Fixing an Unresponsive Card

If, in the event of a catastrophic power fail or other “glitch” event during software updates , the COM46 card becomes unresponsive. It is possible to reprogram the card with a working copy of the flash image. The TFTP server described in this manual, Tftpd32, also contains a BOOTP server. If a COM46 boots and find it does not have a valid application image resident in flash, will attempt to find an image using the BOOTP protocol. If it finds a BOOTP server on the network with a valid operating image it will download the image and reprogram the flash so that at the next reboot it will recover full operating capabilities.

Figure 79 shows how to enable BOOTP in Tftpd32 the Current Directory field should have the name of the directory in which the application image is stored. The Server interface field should have the IP address of the host machine on which the image directory resides. When these fields are correct, press the ‘Settings’ button and select the ‘DHCP’ tab.

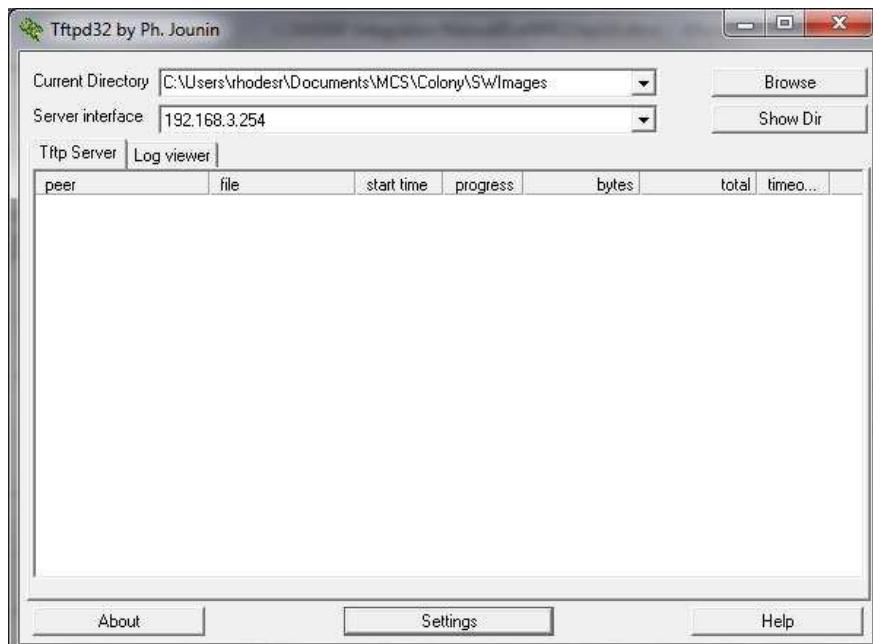


Figure 79 - TFTP Main Page

In the DHCP settings tab, enter the filename of the application image in the ‘Boot File’ field and click OK.

Next make sure that the DHCP option is checked in the ‘GLOBAL’ tab and hit OK. The Tftpd32 application will need to be restarted after making these changes.
Refer to Figure 80 below.

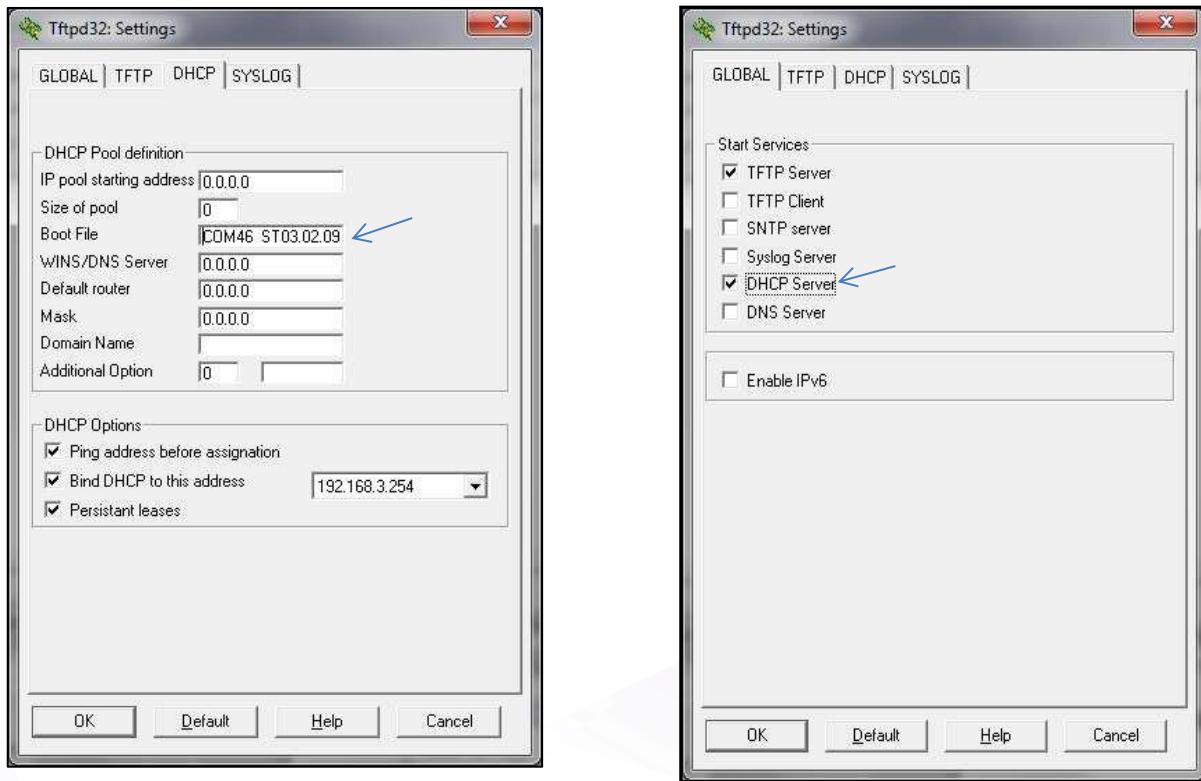


Figure 80 - Enabling TFTP BOOTP Server

Once the BOOTP option is enabled the next reboot of the COM46 whose image has been erased should cause it to download a valid image, reprogram itself, and reboot.

15 Preventing Pro:Idiom Key Loss

There are two mechanisms which may cause Pro:Idiom key loss in some commercial television sets that have been identified to us by LG

Unapproved mapping or remapping of PIDs

- Off air (OA) ATSC receivers may use PIDs which conflict with PIDs in use in Pro:Idiom licensed systems.
- External EdgeQAMs may map or remap PIDs in violation of the Pro:Idiom (P:I) licensing agreement.
- Other unapproved digital video equipment may also use PIDs which conflict with P:I licensed equipment.

TV set power on sequencing design problems

- A very small number of TV set models are known to have power up sequencing issues that cause the Pro:Idiom licensed decryptors to operate improperly. The manufacturers of these sets have taken strong corrective action measures to update them. Contact your specific set's manufacturer for details.

15.1 PID Mapping at the COM46 Receiver

Pro:Idiom PIDs are in a protected range

Channel 1 AUDIO PID = 0x30	Channel 2
VIDEO PID = 0x27	VIDEO PID = 0x27
AUDIO PID = 0x30	AUDIO PID = 0x30
Pro:Idiom PID = 0x105A	AUDIO PID = 0x31
	Pro:Idiom PID = 0x105A

PID remapping at the edgeQAM

Pro:Idiom PIDs have been remapped and overlap with Audio PIDs on other channels

Channel 1	Channel 2
VIDEO PID = 0x13	VIDEO PID = 0x13
AUDIO PID = 0x18	AUDIO PID = 0x18
Pro:Idiom PID = 0x1A	AUDIO PID = 0x1A
	Pro:Idiom PID = 0x1A

15.2 Best Practices to Avoid Key Loss

ATSC off air signals in the RF system can cause Pro:Idiom key loss if not mapped correctly. When a TV switches from an off air channel to a Pro:Idiom channel the tuner may try and sent the second audio programing (SAP) PIDS to the Pro:Idiom decryption circuits. This may cause the TV to loss it's Pro:Idiom keys.

- Broadcast off air (OA) channels **MUST NOT** be placed adjacent to P:I protected channels in the channel map. It does not matter where the physical channels are located, only whether they are mapped to adjacent channels in the TV lineup.
- A non-P:I, non-off air channel **MUST** be placed in the channel map between any broadcast channel and a Pro:Idiom protected channel.
- The COM2000 EPG, Home Screen or locally inserted channels makes a good buffer. Analog SMATV channels can also be used as buffers.

Channel map in Figure 81 below show improper mapping of channels with off air and Pro:Idiom programming on adjacent channels

QAM plant channel	Analog plant channel	Channel map channel	Station	Satellite/Air Ch	Signal Type
21-1		4	WFOR-4 CBS	22 / 4.1	HD OA
22-3		5	WTVJ-6 NBC	31 / 6.1	HD OA
23-3		6	WSVN-7 FOX	7 / 7.1	HD OA
24-3		7	WPLG-10 ABC	10 / 10.1	HD OA
25-3		8	WSFL-39 CW	19 / 39.1	HD OA
26-3		9	WPBT-2 PBS	20 / 17.1	HD OA
27-3		10	WLTV-23 Univision	23 / 23.1	HD OA
28-3		11	WSCV-51 Telemundo	51 / 51.1	HD OA
29-1		12	A & E	265	DTV HD P:I
		2	AMC	254	DTV SD Analog
29-2		14	Animal Planet	282	DTV HD P:I
		3	Bloomberg	353	DTV SD Analog
30-1		16	Bravo	237	DTV HD P:I
		4	Cartoon Network	296	DTV SD Analog
30-2		18	CNBC	355	DTV HD P:I
31-1		19	CNN	202	DTV HD P:I
		6	Comedy Central	249	DTV SD Analog
31-2		21	Discovery Channel	278	DTV HD P:I
		7	E! Entertainment	236	DTV SD Analog
31-3		23	COM1000 EPG		SD
32-1		24	ESPN	206	DTV HD P:I
32-2		25	ESPN 2	209	DTV HD P:I

Figure 81- Improper mapping of off air channels

Channel map in Figure 82 below shows correct lineup with analog or non Pro:Idiom channels between off air and Pro:Idiom programming.

QAM plant channel	Analog plant channel	Channel map channel	Station	Satellite/Air Ch	Signal Type
21-1		4	WFOR-4 CBS	22 / 4.1	HD OA
22-3		5	WTVJ-6 NBC	31 / 6.1	HD OA
23-3		6	WSVN-7 FOX	7 / 7.1	HD OA
24-3		7	WPLG-10 ABC	10 / 10.1	HD OA
25-3		8	WSFL-39 CW	19 / 39.1	HD OA
26-3		9	WPBT-2 PBS	20 / 17.1	HD OA
27-3		10	WLTV-23 Univision	23 / 23.1	HD OA
28-3		11	WSCV-51 Telemundo	51 / 51.1	HD OA
31-3		12	COM1000 EPG		SD
29-1		13	A & E	265	DTV HD P:I
	2	13	AMC	254	DTV SD Analog
29-2		14	Animal Planet	282	DTV HD P:I
	3	15	Bloomberg	353	DTV SD Analog
30-1		16	Bravo	237	DTV HD P:I
	4	17	Cartoon Network	296	DTV SD Analog
30-2		18	CNBC	355	DTV HD P:I
31-1		19	CNN	202	DTV HD P:I
	6	21	Comedy Central	249	DTV SD Analog
31-2		22	Discovery Channel	278	DTV HD P:I
32-1		23	ESPN	206	DTV HD P:I
32-2		24	ESPN 2	209	DTV HD P:I
	7	25	E! Entertainment	236	DTV SD Analog

Figure 82 - Correct Channel Mapping to Prevent P.I. Key Loss

15.3 EdgeQAM PID remapping

A number of edgeQAM products have been designed specifically to work in Pro:Idiom systems and are known to correctly manage Pro:Idiom Key Management message PIDs including but not limited to Technicolor's QAM6 and Video Propulsion's Floodgate. Check with other manufacturers regarding their equipment.

Two other commonly used edgeQAMs from Harmonic Lightwave, the NSG9116 and the NSG9000, are known to employ PID remapping schemes which can create issues in distribution networks using Pro:Idiom if not configured properly. The port mapping method which, while it is not strictly within the Pro:Idiom guidelines, does avoid PID reuse which has been shown to break P:I keys.

- When using Harmonic edgeQAMs in the paradigm mode the position of the UDP port in the list of ports available for a given channel sets the first digit of the PID value.
- If you pick the first available UDP port value for a given channel all the PID values will start with one, if you pick the second available port value all the PID values will start with two, etc.

- Reuse of the same PID value is a major contributing factor in key loss and should be avoided when mapping out the IP and port scheme used to send the data to the QAM.
- DO NOT USE THE FIRST TWO UDP PORTS AVAILABLE OVER AND OVER AGAIN. Channels that are set up this way will have PID values 10, 13, 18 and 19 or 20, 23, 28 and 29 associated with them.

Figure 83 shows a Harmonic QAM setup with incorrect PID remapping

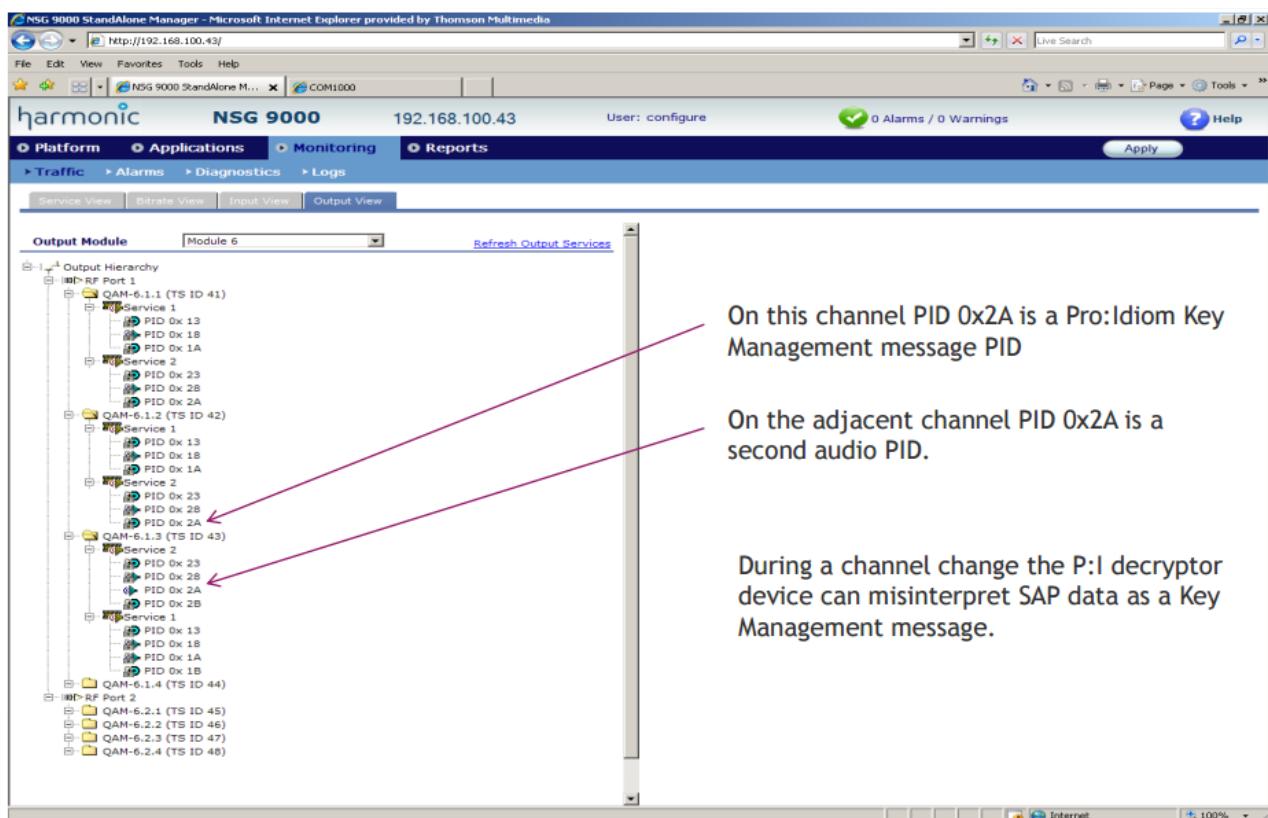


Figure 83 - Harmonic Setup with Incorrect PID Mapping

Figure 84 shows correct PID mapping on a Harmonic QAM

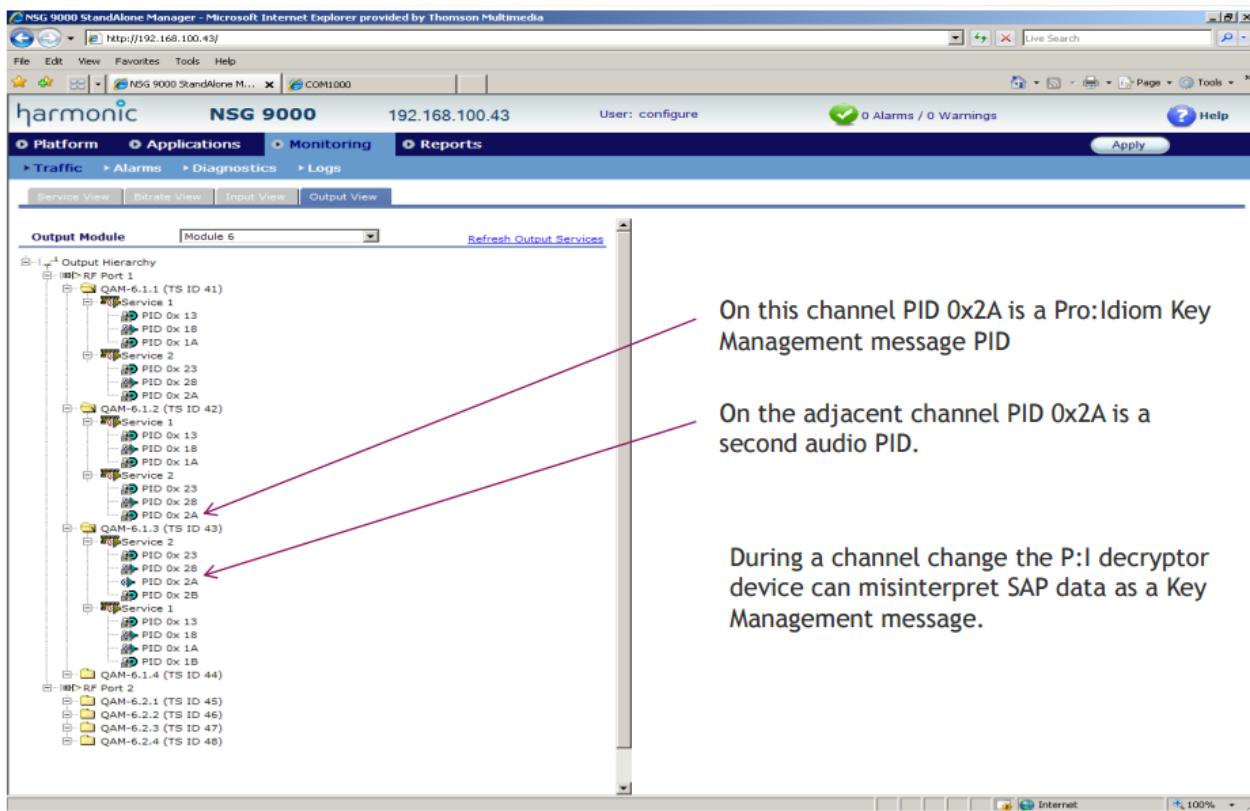


Figure 84 - Correct PID Remapping

Contact your distributor or the Edge QAM manufacturer for further support.

16 Technicolor ATSC-8 Users Guide



16.1 Introduction

This document describes the process and procedures for integrating the ATSC-8 product with the COM2000 digital head-end system. The ATSC-8, available from Technicolor, will allow for the reception of over-the-air broadcasts of digital broadcasts and output of this content over an Internet Protocol (IP) output. Used in combination with a COM2000 system containing a QAM6 EdgeQAM, this IP output can be modulated over a digital QAM network in combination with DIRECTV premium programming if COM46 or COM46-FLX receivers are used.

16.2 Over-the-Air Broadcasts

ATSC replaced NTSC broadcasts in the US in 2009 and is the primary transmission for local digital broadcasts of major network stations. ATSC signals use the same 6MHz bandwidth as analog NTSC television channels, but are able to provide many programs within this digital broadcast contained on sub-channels. For instance, many broadcasters will have a main channel located in the .1 sub-channel, and provide other secondary channels on .2 and .3 sub-channels. Terrestrial broadcasters use an 8VSB modulation to carry 19.39Mbit/s, typically containing MPEG2 encoded content.

16.3 Advantages of ATSC Broadcast Channels

- ATSC broadcasts don't require any content protection to be added when they are re-broadcast in a local cable environment. This allows providers to deliver HD programming "in-the-clear" to TVs. Combined with the COM24-FLX card providing DIRECTV SD programming, also "in-the-clear", an entire channel ring could be set up with mixed HD and SD programming.
- ATSC broadcasts are available for free in nearly every US city and only require a simple antenna to receive. To see if ATSC broadcasts are available in your area, you can visit <http://dtv.gov/stationlist.htm> and search on your zip code.
- Most major local networks broadcast a second or third local channel which contains important weather related content, local sports, and secondary programming of value to that local market. These secondary channels are not typically available on satellite or cable broadcasts.

16.4 Getting Started

Antenna Selection

Installation of the ATSC8 is assumed to be done by trained installers with a strong understanding of off-air antenna and distribution systems. For reference some information is offered below:

Some issues to consider when planning an installation and selecting an antenna:

Determine local off air channels

There are multiple web sites which will provide information on available OTA channels by market.

FCC Reception Maps: <http://transition.fcc.gov/mb/engineering/dtvmaps/>
Antennaweb.org <http://www.antennaweb.org/default.aspx>

Note RF transmission frequencies of OTA signals.

Many markets still use VHF frequencies. Determine what frequencies you will be using and select an antenna(s) accordingly.

16.5 Site Survey

Factors to consider:

- Distance from the transmission tower(s)
 - Close proximity to a transmission tower does not always guarantee good reception.
- Large buildings, mountains, or large bodies of water may create multipath interference.
- Multiple transmission towers will probably require multiple antennas.
- Use industry standard practices for spacing and combining of signals.
- National and local grounding / bonding requirements and lightning protection.

Never work with an antenna near overhead electrical lines or if thundershowers are forecast.

Determine available channels

- As part of the site survey connect a TV to an antenna and auto-program in off air mode. The TV will lock onto all available channels.
- Monitor all channels you plan on using to verify consistent signal quality.

Document all channel information in a workbook file similar to the one below:

QAM PORT	PLUS 256	VIR CH	OTA RF	CALL SIGN	NETWORK	TUNER IP-TUNER#	HOTEL DIST CH
		6-1	25	WRTV	ABC		6-1
		6-2	25	HTSN	Local Sports		6-2
		6-3	25	LWN	Living Well		6-3
		8-1	9	WISH	Independent		8-1
		8-2	9	LWS	Local Weather		8-2
		8-3	9	RADAR	Weather Radar		8-3
		13-1	13	WTRD	NBC		13-1
		13-2	13	COZI	Independent		13-2
		13-3	13	MeTV			13-3
		20-1	21	WFYI 1	PBS1		20-1
		20-2	21	WFYI 2	PBS2		20-2
		20-3	21	WFYI CR	PBS3		20-3
		23-1	23	WNDY	MNT		23-1
		23-2	23	BOUNCE			23-2
		29-1	29	WTTK	CBS		29-1
		29-2	29	WTTK 4	Independent		29-2
		59-1	45	WXIN	FOX		59-1
		59-2	45	ANTENNA	Antenna TV		59-2
		59-3	45	THIS	This TV		59-3

16.6 ATSC-8 Programming

The ATSC-8 can be programmed in one of two fashions:

1. Each tuner can generate one off-air channel that can be mapped using the COM2000 EPG / PSIP functions.

Pros	Cons
Channels can be mapped in the EPG and PSIP information will reflect channel mapping. Two channels per QAM 8 channels = 4 QAMS	Maximum of 8 channels can be used.

2. Each tuner can pass an off-air channel with all sub-channels and PSIP information. This prevents mapping, the channels will need to be in the lineup on their virtual off air channel.

Pros	Cons
All sub-channels for each RF channel are displayed.	Each RF channel with all sub-channels occupies a QAM. 8 RF channels = 8 QAMS.
Larger channel lineup. Each OTA RF channel will pass all sub channels to hotel lineup. Local weather radar, foreign language channels, local sports etc.	PSIP information is passed through the system requiring the channels to remain on the virtual numbers on the OTA channel.
A COM 2000 with 48 channels will use 16 QAMS for DIRECTV. Leaving 8 QAMS for OTA.	
Map the DIRECTV channels to their DIRECT channel assignment. Giving the user the familiar DIRECTV experience. CNN 202 ESPN 206	
Off air channels that are common with DIRECTV can be mapped to the same channel in the guide.	
Additional local OTAs can be programmed in the guide and location only. (no guide data)	

The ATSC-8 comes packaged with the following:

- ATSC-8
- Power supply cord
- 4 x 6-foot Ethernet cables

16.7 ATSC-8 Installation

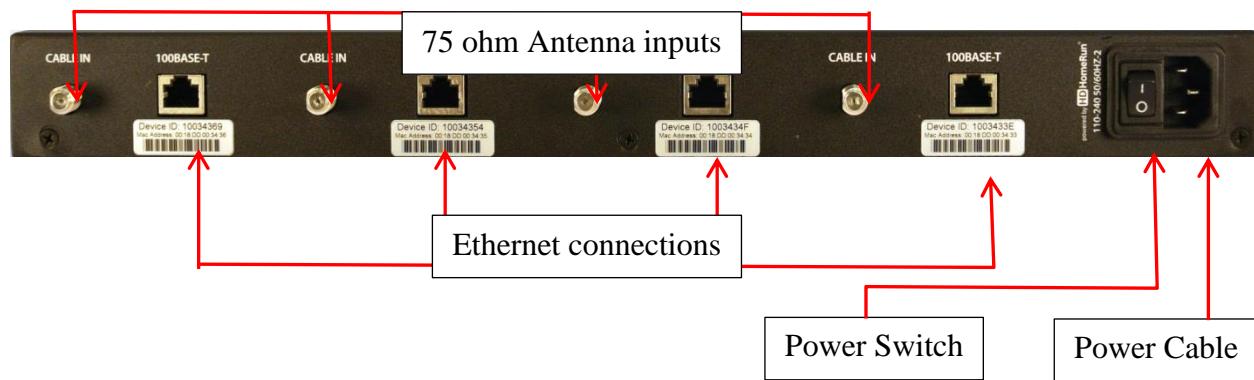


Figure 85 - ATSC-8 Back Panel



Figure 86 - ATSC-8 Front panel

Front LED Indicators

A	Power/Network – 4	1.	Tuner 1	2.	Tuner 2
B	Power/Network – 3	3.	Tuner 3	4.	Tuner 4
C	Power/Network – 2	5.	Tuner 5	6.	Tuner 6
D	Power/Network – 1	7.	Tuner 7	8.	Tuner 8

Power/Network LED:

- Green: The ATSC-8 is powered on and connected to the network.
- Flashing Green: The ATSC-8 is powered on and working to obtain an IP address from the network. If the PC is connected directly to the ATSC-8, then the light will continue to blink until the PC makes contact with the ATSC-8.
- Red: Powered on, No Network Link.

Tuner LED:

- Off: The tuner is not in use.
- Green: The tuner is in use, tuned to a channel, and streaming data.
- Flashing: The tuner is reserved for use, but is not actively streaming data.

16.8 Connection to the COM2000

Mounting

The ATSC-8 is rack mountable and can be easily mounted in the same location as the COM2000 system. It is recommended that at least 1RU of space be left between the ATSC-8, the COM2000, and any other components so that each component will receive good air-flow in the mounting location.

Connecting an Antenna

The ATSC-8 has 4 RF connectors for inputting antenna signals to the 4 dual tuners. Connect the antenna input into a 2 GHz 4-way splitter with the outputs of the splitter going to each of the RF connectors on the ATSC-8. In some locations an amplifier may be required between the antenna and splitter for best reception.

Connecting the Network

The ATSC-8 has 4 Ethernet connectors for outputting the IP video streams. Connect each of the 4 Ethernet connectors to an external Gigabit Switch with at least 5 open ports. Connect the 5th port from the 5-port gigabit switch to one of the two Gigabit Ethernet ports on the COM360 chassis.

Refer to Figure 89 for connection details

NOTE: ATSC channels typically have much higher bitrates than DIRECTV HD channels with data rates around 14-18 Mbits/s. In order to send 8 channels to the QAM6, the Gigabit Ethernet-1 port must be used to insure that the data is received.

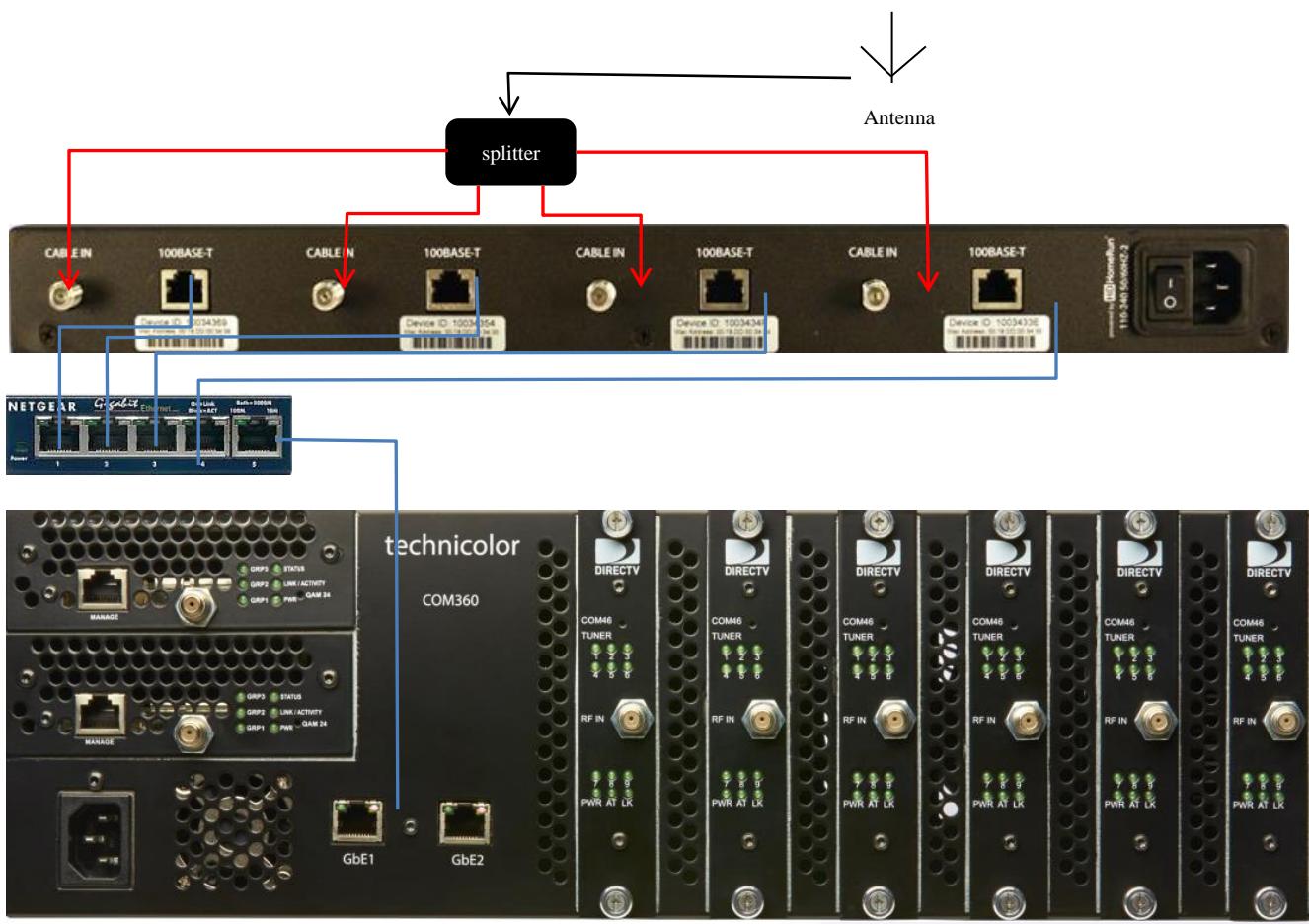


Figure 89 - ATSC Connection Diagram

16.9 Check / Update the ATSC-8 firmware version

Note: COM46 software must be set to version 3.2.19 or newer.

Internal to the ATSC-8 are 4 tuner modules. To properly interact with the with the COM2000 interface the firmware should always be set to version 20120405. The firmware and the HDHomeRun software utility required to update the firmware are available on the Technicolor After Market Support web site, or through your distributor. Install the utility and save the firmware to a folder on your PC.

16.10 HDHomeRun Tech Configuration Utility

Upon opening the HDHomeRun software will search for, and discover the active devices. They are listed by MAC address in the Device View tab.

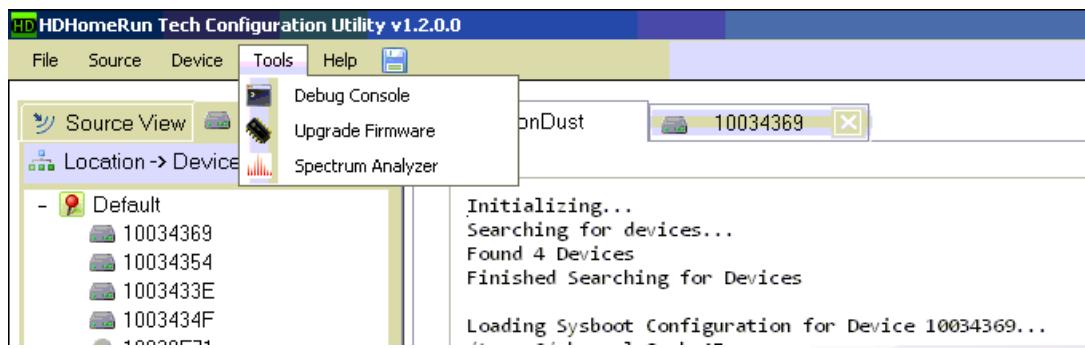


Figure 90 - HDHomeRun Tech Configuration Utility

From the Tools menu select Upgrade Firmware.

Click the Select button and navigate to the location of the HDHomeRun firmware.

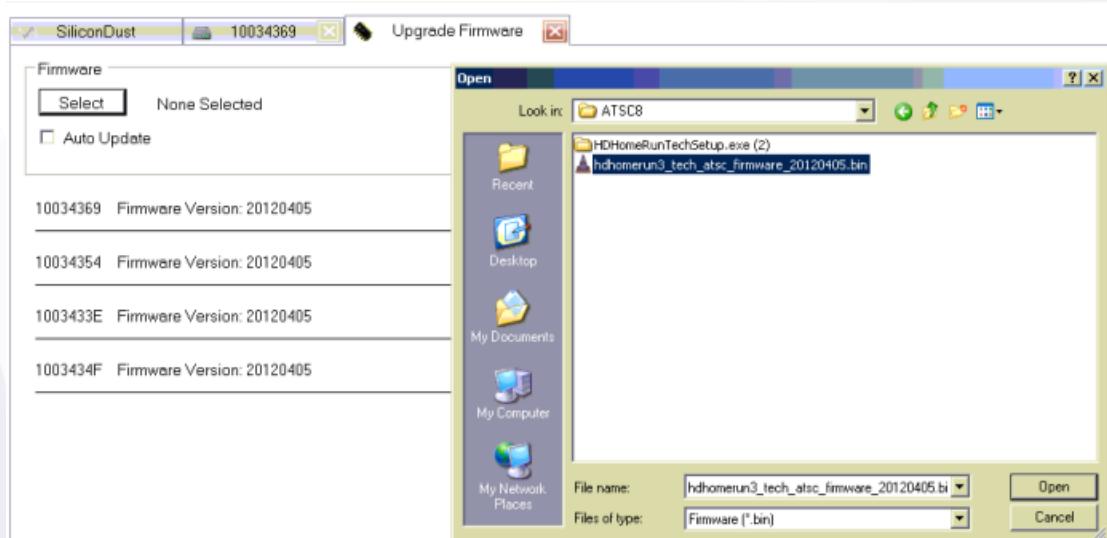


Figure 91 - HDHomeRun Upgrade Firmware Tab

Click Open and the firmware will load into the HDHomeRun utility as shown in figure 86 below:

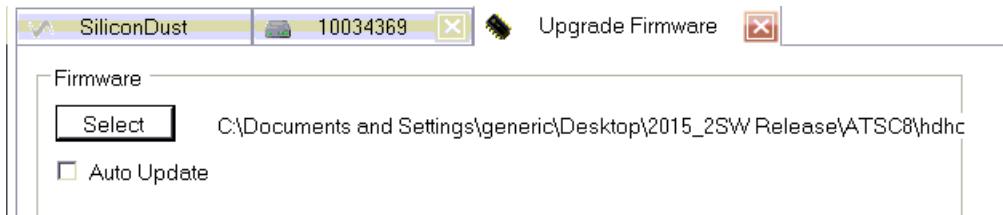


Figure 87 - Loading firmware in teh HDHomeRun Utility

Click on the Flash button next to each tuner. When successfully completed the Firmware version will be displayed as shown in figure 87 below:

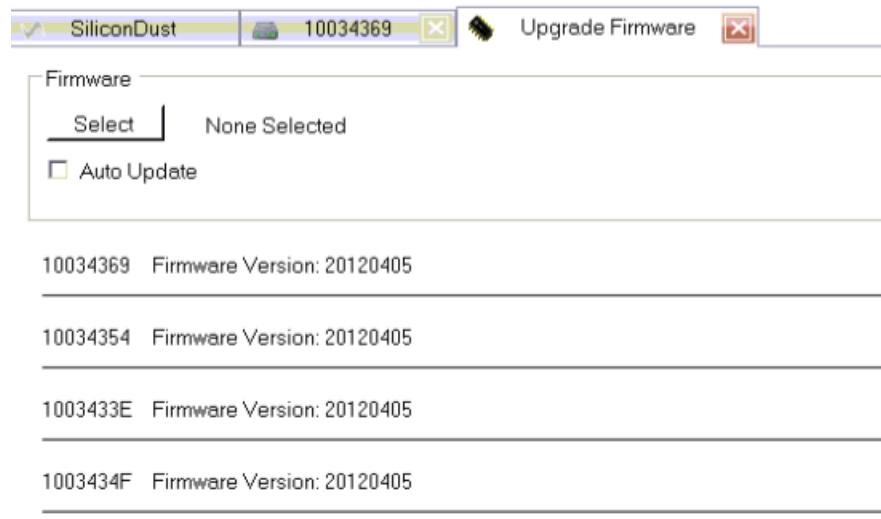


Figure 93 - HDHomeRun Firmware Load

16.11 Configuring the ATSC-8

The ATSC-8 is fully controlled and commanded by the COM2000. From the COM2000 interface, to access the ATSC control, select the ATSC tab as shown in Figure .



Figure 94 - Accessing the ATSC Tab

16.12 Discover the IP Addresses of the ATSC Tuner Modules

When the ATSC-8 is shipped from Technicolor, it will be in DHCP mode and expect to get assigned an IP address from a router. Since our connection diagrams and common installation practices do not include a router or DHCP server, the IP addresses may not be assigned. The ATSC-8 will also generate an Auto-IP address such that a PC connected directly to the unit without a router can communicate to the device.

Each ATSC-8 has 4 tuning modules containing 2 tuners each. Each Tuning module can have two unique IP addresses, so in total, the ATSC-8 will have 8 unique IP addresses (two for each tuning module). When first connecting to the ATSC-8 or to see what the IP addresses of the tuners are, you can press the DISCOVER button on the bottom of the ATSC page. Figure displays the result from a Discover inquiry. One address for each module is the Auto-IP address assigned by the module itself, the other can be Auto-IP, static or assigned by DHCP.

Commands: [Overview](#), [Discover](#), [PairingInfo](#), [TuneAll](#), [Help](#)
[Refresh](#), [Display](#), [SysInfo](#), [HealthInfo](#), [EPG](#), [Syslog](#), [Lock](#), [ATSC](#), [J01](#), [QAM](#)

```
AtscDiscover
Found 192.168.4.8
Found 192.168.4.7
Found 192.168.4.6
Found 192.168.4.9
Found 169.254.164.40
Found 169.254.244.79
Found 169.254.86.190
Found 169.254.227.4
```

Figure 95 - ATSC tuner discovery

Figure shows that 8 total IP addresses were found, and since each of the 4 tuner modules has 2 possible IP addresses, the 2 addresses are displayed.

16.13 Changing the IP Addresses of the Tuners

You may change the IP addresses of the tuners to a range within the same IP configuration of the COM2000 by using the SET button on the ATSC page. You must first type in the base number for the assignment, then hit the SET button. For instance, if you'd like the IP addresses to be in a range starting at 192.168.3.50, then use 192.168.3.50 as the base address. See Figure below.

To discover ATSC boards and set their IP address:

Base IP address:

With the following result:

```
AtscDiscover
Changing 192.168.4.8 to 192.168.3.50
Changing 192.168.4.7 to 192.168.3.51
Changing 192.168.4.6 to 192.168.3.52
Changing 192.168.4.9 to 192.168.3.53
Changing 169.254.164.40 to 192.168.3.54
Changing 169.254.244.79 to 192.168.3.55
Changing 169.254.86.190 to 192.168.3.56
Changing 169.254.227.4 to 192.168.3.57
```

Figure 97 - Changing Tuner IP addresses

From our previous discovery, we showed both the known IP addresses and the AutoIP addresses for each of the 4 addressable tuners in the ATSC-8. When making the requested IP address change, each device receives 2 commands to change the IP with the second command resulting in the change. As shown in Figure , the 4 tuners will have an IP address of 192.168.3.54, 192.168.3.55, 192.168.3.56 and 192.168.3.57. You can verify by again using the DISCOVER button from the ATSC page. **Note that although the above screen shows the AutoIP addresses being changed, in fact they are not. A new DISCOVER command will show only the variable addresses that have actually been changed.*

```
AtscDiscover
Found 192.168.3.56
Found 192.168.3.57
Found 192.168.3.55
Found 192.168.3.54
Found 169.254.163.13
Found 169.254.155.146
Found 169.254.172.243
Found 169.254.191.207
```

New IPs

Figure 99 - ATSC Discover

16.14 Loading Data from the Tuners

From the factory, the ATSC-8 tuners will not be tuned to any channels or streaming any data, however you may have a unit set up which has already been tuned and you'd like to see what each tuner is playing.

As shown in Figure , from the ATSC page, you can click the LOAD button to have the device send a report back to the COM2000 interface to see what the current configuration is set to. Once you have run the load function, return to the ATSC page to see the results.

ATSC

See <http://dtv.gov/stationlist.htm>

Usage: HomeRun_IP Tuner_Index RF_Index Major.Minor Dest_IP Dest_Port
192.168.2.1 0 21 20.1 192.168.6.9 17
If the Major.Minor is '0.0' then all subchannels are acquired, but then
add 256 to the QAM24 port and the QAM channel can't be shared.
Set RF_Index to -1 to close the tuner.

```
192.168.3.54 0 9 8.1 192.168.6.2 35
192.168.3.54 1 9 8.2 192.168.6.2 51
192.168.3.57 0 25 6.1 192.168.6.2 17
192.168.3.57 1 25 6.2 192.168.6.2 18
192.168.3.55 0 13 13.1 192.168.6.2 67
192.168.3.55 1 13 13.3 192.168.6.2 83
192.168.3.56 0 21 20.1 192.168.6.2 99
192.168.3.56 1 45 59.1 192.168.6.2 115
```

Figure 100 - ATSC Load Function

Figure above shows which tuner is tuned to each RF frequency, as well as which QAM IP address and port number each channel has been assigned.

16.15 Changing the Tuning Table

The tuning table can easily be changed by creating or editing the command lines for each of the 8 available tuners. You can verify frequencies and virtual channel numbers in your specific area by using the <http://dtv.gov/stationlist.htm> website. Note that some channels will be on the same frequency as the virtual channel number, but most channel numbers will have a different frequency listing. For example, channel 8 in Indianapolis, is actually broadcast on channel 9.

Each listing in the tune table will need all the required fields entered. Figure 101 below is an entry along with a description of what each field contains.

192.168.3.54 0 9 8.1 192.168.6.2 35

192.168.3.54 = IP address of the tuner to be set.

0 = Tuner index. There are 2 tuners per IP address, so this is either 0 or 1.

9 = Actual RF channel number of the broadcasting station.

8.1 = Virtual channel number and program stream desired.

192.168.6.2 = IP Address of the QAM to output the tuned channel.

35 = Port number of the QAM corresponding to the desired QAM channel which will carry the tuned ATSC channel.

Figure 101 - ATSC Tune Table

Once you have developed a tune table which will work in your area with the appropriate data entered for each of the tuners you need in your system, press the SAVE button, then the RUN button to make this active on the ATSC-8. You should see this change immediately if properly connected to a QAM.

16.16 QUERY Command

The ATSC-8 is able to Query the tuned channels once they have been set up so you can view the signal strength of each frequency. This could be especially helpful if you aren't seeing channels that you'd expect to or need to adjust your input antenna.

```
Log:  
192.168.3.54 0 0  
ch=auto:9 lock=none ss=20 (-48dBmV) snq=0 (0.0dB) seq=0 bps=0 pps=0  
none  
  
192.168.3.54 1 0  
ch=auto:9 lock=none ss=22 (-47dBmV) snq=0 (0.0dB) seq=0 bps=0 pps=0  
none  
  
Lock = none  
  
192.168.3.57 0 0  
ch=auto:25 lock=8vsb ss=80 (-12dBmV) snq=76 (23.4dB) seq=100 bps=19394080 pps=1249  
3: 6.1 WRTV-HD  
4: 6.2 HTSN  
5: 6.3 LWN  
tsid=0x045F  
  
Signal Strength      SnR      Signal Quality %      Bit & Packet Rate  
  
192.168.3.57 1 0  
ch=auto:25 lock=8vsb ss=80 (-12dBmV) snq=71 (22.0dB) seq=100 bps=19394080 pps=262  
3: 6.1 WRTV-HD  
4: 6.2 HTSN  
5: 6.3 LWN  
tsid=0x045F
```

Figure 88 - Query Command Results

In Figure above you can see the following:

Channel 9 is not tuned (lock=none)

Channel 25 is tuned and showing details of all the programming available on that digital channel.

You can see:

- Signal Strength (ss)
- Signal to Noise Quotient (snq)
- Signal Quality (seq)
- Bit and Packet rates (bps & pps)

16.17 Adding PSIP Data for ATSC-8 Channels

For many COM2000 users, adding PSIP data to change the virtual channel number and to include program data is a vital part of the COM2000 deployment. For more examples and configurations regarding PSIP and EPG, please see the EPG section 8.

From the EPG page, entering the following data from the examples above will give you the expected results.

Since DIRECTV program data typically only exists for “major” channels broadcast over ATSC, the PSIP program data can only be applied to these channels.

Figure below shows an example where the minor channels are given program names such as WTHR_Local_Weather. No program data can be provided for these minor channels via the Technicolor PSIP interface.

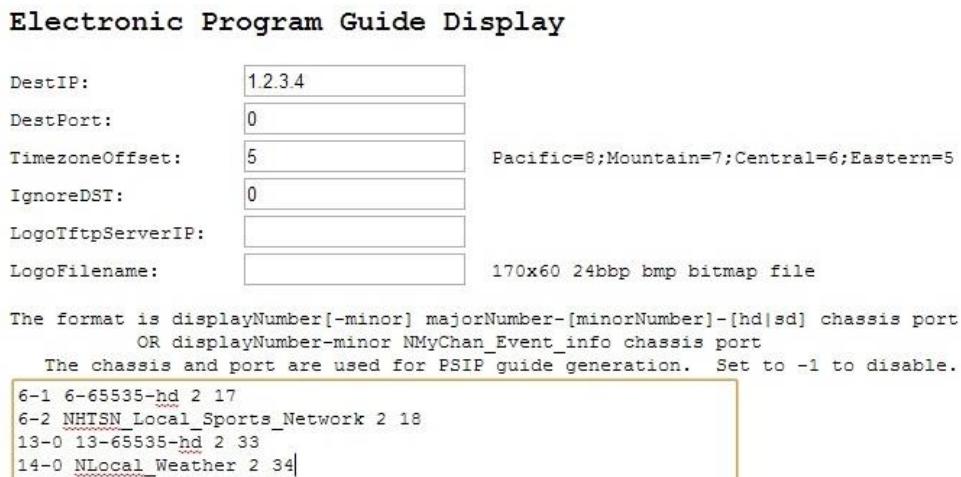


Figure 103 - EPG and PSIP Programming

Channel 6-1 which was being sent to the QAM on port 17 would be available on the RF frequency the QAM is configured to. In our example, this happens to be 30.1. We desire to have channel 6.1 displayed on the TV on channel 6.1, so the above example will create this virtual channel for port 17, as well as add the PSIP data from DIRECTV channel 6, which in Indianapolis is the same channel.

Channel 6.2 is unable to be associated with PSIP data, however, the virtual channel data can be set so rather than on channel 30.2, the ATSC program can be tuned at virtual channel 6.2.

By using the 1.2.3.4 in the DestIP field, only PSIP is being generated and there will be no EPG created.

If EPG is desired as well as PSIP, the QAM IP and port number can be inserted in the DestIP and DestPort fields respectfully.

17 Addendums

17.1 Open Software Notification

The software of this product may contain certain open source software modules, which are subject to Open Source Software license terms (see <https://opensource.org/osd> for definition). Such Open Source Software components and/or versions may change in the future versions of the software product.

A list of the Open Source Software used or provided as embedded into the current software of the product and their corresponding licenses and version number are, to the extent required by applicable terms, available on Technicolor's website at the following address:

<http://www.technicolor.com/en/hi/minisites/open-software>

or at another address as Technicolor may provide from time to time.

If and where applicable, depending on the terms of the applicable Open Source Software licenses, the source code of the Open Source Software is available for free upon request. For avoidance of doubt, Open Source Software is only licensed by the original owner of the Open Source Software under the terms set forth in the designated Open Source License.