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<th>Revision</th>
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<tr>
<td>Draft1</td>
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<td>Added QAM20 section</td>
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<td>Doug Strachota</td>
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<td>Document review</td>
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<td>Draft3</td>
<td>11/21/19</td>
<td>Angelo Peruch</td>
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# Definitions

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<th>Definition</th>
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<tbody>
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<td>Admin PC</td>
<td>A PC is required for initial setup and configuration. It is highly recommended to set up remote access to the COM3000 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 COM3000 system VPN router set up for remote access via a Virtual Private Network.</td>
</tr>
<tr>
<td>ATSC</td>
<td>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. <a href="http://atsc.org/">http://atsc.org/</a></td>
</tr>
<tr>
<td>ATSC-8</td>
<td>This is a device previously provided by Technicolor to provide ATSC off air television signals to the COM3000. It is configured and controlled through the COM3000 web interface. Depending on configuration it can deliver 8 program channels or 8 complete ATSC8 broadcasts including all sub channels in the carrier.</td>
</tr>
<tr>
<td>COM3000</td>
<td>This describes the Technicolor system consisting of a COM400 chassis, COM51 or COM51A cards and QAM20 modulators. Replaced previous product COM2000.</td>
</tr>
<tr>
<td>COM51 &amp; COM51A Receiver Cards</td>
<td>Receiver cards for the COM3000 system. Replaced previous product version COM46 / Com46A.</td>
</tr>
<tr>
<td>COM400 Chassis</td>
<td>This device houses the COM51 and QAM20 components in a COM3000 system. All video traffic is routed through the two 10 Gigabit and two 1 Gigabit Ethernet (GbE) ports on the front of the chassis and to the QAM20 slots. System management and control can be done by connecting a computer to any of the ethernet ports on the front panel. Replaced previous product version COM360.</td>
</tr>
<tr>
<td>QAM20</td>
<td>A circuit board that installs in the upper left side of a COM400 Chassis. It converts the COM51’s IP-packetized streams to QAM-modulated RF for distribution throughout a property. The board provides up to 16 QAM carriers and is software upgradeable in groups of two QAMS for a maximum of 48 QAM carriers.</td>
</tr>
<tr>
<td>SWQAM2</td>
<td>The SWQAM2 is a software key that will enable 2 QAM channels per key on a QAM20 card. By purchasing 3 SWQAM2 keys a QAM20 can be expanded to 12 QAM channels.</td>
</tr>
<tr>
<td>DSWiM 30</td>
<td>AT&amp;T / DIRECTV SWM. One DSWiM 30 will provide signal to a COM51 card when tuning more than 8 channels.</td>
</tr>
<tr>
<td>EAS</td>
<td>Emergency Alert Systems can be interfaced with the COM3000 to stream emergency notifications to all QAM channels. Similar to this a local message can be created and played via a PC and VLC or a ZyCast Media Server. <a href="https://www.fcc.gov/encyclopedia/emergency-alert-system-eas">https://www.fcc.gov/encyclopedia/emergency-alert-system-eas</a></td>
</tr>
<tr>
<td>Edge QAM</td>
<td>In a typical installation, the COM51 cards will be configured to stream to a QAM20 modulator.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>GIGe</td>
<td>Gigabit Ethernet High speed Ethernet standard for transmitting data at one gigabit per second. All switches in the GIGe (video) network must be rated to pass this level of traffic.</td>
</tr>
<tr>
<td>IGMP</td>
<td>Internet Group Management Protocol. Used by Ethernet Switches and end devices to manage multicast video on IP networks.</td>
</tr>
<tr>
<td>HD</td>
<td>High Definition</td>
</tr>
<tr>
<td>Hot-swappable</td>
<td>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.</td>
</tr>
<tr>
<td>MPEG</td>
<td>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 AT&amp;T / DIRECTV HD signals are MPEG4 contained in a MPEG2 transport stream. 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. <a href="http://mpeg.chiariglione.org/">http://mpeg.chiariglione.org/</a></td>
</tr>
<tr>
<td>PID</td>
<td>Packet Identification. A 13-bit field in the header of every 188-byte MPEG2 transport packet.</td>
</tr>
<tr>
<td>Pro:Idiom</td>
<td>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. <a href="http://www.zenith.com/wp-content/uploads/2013/05/ProIdiom_Overview_2010-10-08.pdf">http://www.zenith.com/wp-content/uploads/2013/05/ProIdiom_Overview_2010-10-08.pdf</a></td>
</tr>
<tr>
<td>Pro:Idiom Mobile</td>
<td>A version of Pro:Idiom which is software based and can be decrypted using an approved and licenses software player.</td>
</tr>
<tr>
<td>Property Distribution Network</td>
<td>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).</td>
</tr>
<tr>
<td>PSIP</td>
<td>Program and System Information Protocol. Signals included in a digital TV signal define the display 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 display a virtual channel 7 on the TV rather than the physical channel 38. PSIP data also includes current and future programming information. <a href="http://www.atscforum.org/">http://www.atscforum.org/</a></td>
</tr>
<tr>
<td><strong>Satellite Distribution Network</strong></td>
<td>This network consists of the dish, LNB and associated equipment necessary to provide KA/KU band satellite signals to the COM3000. The COM3000 requires a SWiM signal to each card proportional to the number of tuners desired. It is assumed that installation technicians have adequate expertise and proper test equipment required to install the distribution system to AT&amp;T / DIRECTV specifications.</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>Standard Definition</td>
</tr>
<tr>
<td><strong>SWiM Switch</strong></td>
<td>Single Wire Multi-switch – An AT&amp;T / DIRECTV module used for the distribution of satellite signals.</td>
</tr>
<tr>
<td><strong>SWQAM2</strong></td>
<td>The SWQAM2 is a software key that will enable 2 QAM channels per key on a QAM20 card. By purchasing 3 SWQAM2 keys a QAM20 can be expanded to 12 QAM channels.</td>
</tr>
<tr>
<td><strong>System Integrator</strong></td>
<td>The person or company that performs the onsite installation.</td>
</tr>
<tr>
<td><strong>System Operator</strong></td>
<td>The company or organization that typically holds the “right of entry” and is responsible for installation and all onsite support on a daily basis.</td>
</tr>
<tr>
<td><strong>Transcryption</strong></td>
<td>The process by which the COM 1000 system converts content streaming from AT&amp;T / DIRECTV ‘s conditional access system to Pro:Idiom encrypted video.</td>
</tr>
<tr>
<td><strong>ZyCast Media Server</strong></td>
<td>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. <a href="http://www.zycast.com.tw/">http://www.zycast.com.tw/</a></td>
</tr>
<tr>
<td><strong><a href="http://www.zycast.com.tw/">http://www.zycast.com.tw/</a></strong></td>
<td></td>
</tr>
</tbody>
</table>
2 Introduction

This document describes the Technicolor COM3000 System and related configuration procedures. It is recommended that you read through the entirety of the manual before working with the system, as it contains some important pointers that may come in handy during setup and maintenance.

2.1 Intended Usage

COMMERCIAL USE This product is designed to go into areas that are not accessible to the public at large and are not for home use. Technicolor COM3000 Products provide Head-End systems for distribution solutions for the AT&T / DIRECTV Commercial and Lodging and Institutions (L&I) markets.
3 COM3000 Product Overview

A COM3000 system consists of the following three components:

- **COM400 chassis**
- **COM51 or COM51A tuner cards (maximum of 6 per chassis)**
- **QAM20 modulator (maximum of 2 per chassis)**

The COM3000 is the next evolution of the Technicolor Multiclient Solution product line. It builds on the successful COM2000 system with additions of several new features.

- **COM400**
  - Chassis includes internal layer two switch supporting IGMP
  - Two 1Gb and two 10Gb ethernet ports
- **COM51**
  - Ability to tune up to 23 DIRECTV channels
  - Supports Pro:Idiom Mobile encryption
  - Supports manufacturer specific AES encryption for use with external devices
  - Automatic Software Upgrades via Technicolor Server
- **QAM20**
  - Outputs 16 QAM carriers, software upgradable to 48 QAM carriers.
  - Full 38.8 Mbps QAM capacity
  - New easy to use setup

Configured with 6 COM51 receivers and one QAM20 a COM3000 can tune up to 138 AT&T / DIRECTV channels.

- Each COM51 card can receive up to 23 AT&T / DIRECTV channels.
- COM51 cards can be incrementally licensed to tune between 8 (base package) and 23 channels in increments of one channel per software upgrade.
- QAM20 is capable of 48 QAM carrier outputs incrementally licensed from 16 (base package) to 48 QAM carriers in groups of 2 carriers per software upgrade.
- The channels are routed to an internal QAM20 modulator for RF output. In addition to the RF output the COM51 chassis provides two 10 gigabit and two 1 gigabit ethernet ports.
The COM3000 system is shown below in Figure 1.

➢ The original AT&T / DIRECTV broadcast video encoding format is preserved, and the output transport stream is encrypted with the Pro:Idiom digital rights management (DRM) by default. Other DRM selections such as AES and Pro:Idiom Mobile are supported.

➢ Multiple COM400 chassis can be connected in order to provide more than 138 output channels. Up to 16 chassis can be connected in the same system.

The COM51 receiver cards are controlled and managed via an Ethernet connection within the COM400 chassis.

➢ The COM51 card includes a built-in web interface and can be configured using a web browser.
➢ To view high definition video from the COM3000 a TV or set top box equipped with decryption technology must be used.
➢ Standard definition channels may be distributed in-the-clear.
3.1 Additional Features
In addition to high quality AT&T / DIRECTV programming, the COM3000 system offers additional powerful features:

➢ Optional Mediatune software upgrade offers switched matrix control capabilities for public space environments.
➢ Internal “home screen” channels can be configured to stream static image message screens direct from the COM3000 system. No additional equipment required.
➢ Vidplay utilizes a free program developed by Technicolor that will stream a MPEG2 transport stream file from a connected PC (not provided) to the Technicolor QAM20 modulator for locally originated video programming.
➢ External content sources such as outboard transcoders and video encoders can also be streamed to the Technicolor QAM20 Modulator.
➢ An electronic program guide (EPG) 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.
➢ Guide.XML works in conjunction with Technicolor set-top boxes to provide an interactive program guide (IPG).
➢ 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 QAM20 modulator).
➢ Low power consumption. Typically, a fully loaded chassis draws <200 watts.
3.2  Compatibility with Previous Hardware
➢ COM400 chassis will support COM46 cards but not QAM6.
➢ COM51 Cards will work in COM360 Chassis
   o A COM46 will only show the first 12 QAM carriers on the QAM20.
   o A COM360 can only stream 1 Gb to a QAM20.

<table>
<thead>
<tr>
<th>COM SYSTEM COMPATIBILITY MATRIX</th>
<th>Chassis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COM200</td>
</tr>
<tr>
<td>Receiver Cards</td>
<td>✔️</td>
</tr>
<tr>
<td>COM24</td>
<td>✔️</td>
</tr>
<tr>
<td>COM46</td>
<td>✔️</td>
</tr>
<tr>
<td>COM51</td>
<td>☠️</td>
</tr>
<tr>
<td>QAM Cards</td>
<td>✔️</td>
</tr>
<tr>
<td>QAM6</td>
<td>✔️</td>
</tr>
<tr>
<td>QAM20</td>
<td>☠️</td>
</tr>
</tbody>
</table>

3.3  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.

3.4  COM400 Chassis
Figure 2 below is a front and rear view of the COM400 chassis.

➢ Requires 3 RU rack space.
➢ MTFB (Mean Time Before Failure) >43,800 hours (five years).
➢ Chassis number assigned via dipswitch beneath top cover access panel.
➢ Ventilation flows from front air vents to rear exhaust fans. Maintain adequate space for free air flow through system.
➢ Chassis has slots to accept six COM51 or COM51A and two QAM20 cards.
➢ COM51, COM51A and QAM20 cards are assigned default IP addresses per location in chassis and chassis number.
➢ 10 Gigabit Ethernet switch configurable for Multicast Filtering, IGMP Snooping.

Equipped with 4 ethernet ports:

➢ Two 10 gigabit ports.
➢ Two 1 gigabit ports (Do not connect your external Managed Ethernet switch to the 1 gigabit port. The 1 gigabit ports are connected internally to an unmanaged 2 port switch.)
➢ All ports support auto-negotiate per IEEE802.3-2015 specification. (Any Network interface device will connect to any port).
3.5 **COM51 Card**

The COM51 card, shown in Figure 3 below, is a customized AT&T / 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 COM51 base configuration can receive up to 8 HD or SD AT&T / DIRECTV channels. Optional software upgrades increase the capacity to 23 channels.
- The COM51 removes the AT&T conditional access encryption and adds Pro:Idiom or other content protection DRM.
- The output from the card can be delivered to a QAM20 modulator or chassis ethernet connections via the COM400 chassis’ internal 10 gigabit Ethernet network.

- Web server user interface
- Supports 8 to 23 tuners (licensed in one-tuner increments)
- Requires a DSWiM input to both RF connectors for full 23 channel configuration (one DSWiM30 per COM51 card).
- Hot-swappable
- Recessed reset button
- LED indicators
- Compatible with legacy COM360 chassis and QAM6 modulators with limitations
- Manual software updates via internal TFTP server.
- Queries Technicolor update server for software updates at bootup and at daily intervals, downloads and installs software automatically.
  - Server will instruct COM51 to complete update at a prespecified time in early AM hours.
- REST monitoring to AT&T/DIRECTV server is enabled as default.
- REST Monitoring and software query can be disabled via software license.
- Dual IP allows for local management via the default IP and will allow DHCP address assignment for COM51.
3.6 COM51A
COM51A is a specially configured COM51 card which works only with the Technicolor NTSC-8 analog modulator.

➢ It will not stream IP video to a QAM or ethernet port.
➢ Only the NTSC-8 will receive video data from a COM51A.
➢ A COM51A is software upgradable to a standard COM51.
➢ Note: When a COM51A is upgraded a COM51, any COM51A tuner licenses will be converted to COM51 tuner licenses (which requires tokens).
3.7 QAM20

The QAM20, shown above in Figure 4 is an Edge QAM256 modulator capable of outputting up to 48 QAM carriers.

- QAM20 ships from the factory authorized for 16 QAM carriers. The unit is upgradable in 2 QAM increments via optional software license (SWQAM2) to a maximum of 48 QAM output carriers.
- Depending on the DIRECTV channel bit rate, each QAM carrier may support up to three HD or eight SD program channels.
- Accepts IP input from:
  - COM51 Card
  - COM46 Card
  - External MPEG2 transport stream (.TS)
- Each QAM is individually agile and able to output to any carrier frequency in a 128-channel range
  - ModeLow enables carriers 1 to 128 (57MHz to 819MHz) output
  - ModeHigh enables carriers 26 to 158 (237MHz to 999MHz) but not 95 to 99
- New User interface makes configuring channel line ups easier than the previous QAM6.
- QAM Licensing is the responsibility of the Product Distributor.
4  Installation Overview

4.1  System Connections
Figure 5 below illustrates connections to a COM3000 system.

4.2  Pre-Installation
The COM3000 System is quite a bit different from the AT&T / DIRECTV set-top box (STB) receiver traditionally used in these installations. The COM3000 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 COM3000 does not have any native user interface. Controlling and monitoring the COM3000 requires a laptop computer. We recommend using the Chrome browser.

4.3  Training and Support
It is expected that every installer has completed COM system and MFH2 training. 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.
➢ Internet connection for remote troubleshooting

Primary support for all Technicolor products is provided by the distributor who sold the product. The Technicolor website contains:

➢ Product Documentation and Manuals
➢ Software and Release Notes
➢ Technical Tips

https://www.technicolor.com/distribute/home-experience/mcs-document-library
4.4 Required Tools
A successful installation is dependent on having the proper tools on the jobsite. Below is a list of recommended tools.

➢ AT&T / DIRECTV Advanced Installation Meter (AIM).
➢ Digital RF signal level meter
➢ Laptop computer and Ethernet cables
➢ #10 Torx driver
➢ It is recommended that a TV of the same make and model used at the jobsite be available in the Headend / MDF room for testing.
➢ IPTV installers should have a preconfigured and tested IGMP switch to verify IP outputs from the COM3000.

4.5 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 mounting method.
➢ Determine distance from the dish to head end and plan for cable selection and routing appropriately.
➢ Route cable and grounding (electrode bond) according to AT&T / DIRECTV and local requirements.

Headend Location
➢ The headend should be in a clean, climate-controlled environment.

Additional Considerations
➢ Access to grounding point per AT&T / DIRECTV, National Electric Code (NEC) and local requirements.
  o Note to System Installer – This reminder is provided to call the SMATV systems installer’s attention to Section 820-93 of the National Electric Code which provide guidelines for proper grounding and, in particular, specify that the Coaxial cable shield shall be connected to the grounding system of the building, as close to the point of cable entry as practical.
➢ Access to all distribution wiring closets.
➢ Access to an internet connection.

Inventory and Evaluation of Customer’s Televisions
➢ TVs must be capable of displaying Pro:Idiom encrypted MPEG-4 programming. Knowing what receivers, you will be working with is critical to a successful installation.
➢ Familiarize yourself with television programming requirements.
4.6 Distribution Networks

RF Networks
- RF networks need pass digital signal tests per 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.
- If you are not experienced with digital RF networks it is recommended you contract a qualified RF system technician to design, install, and troubleshoot the RF plant.

IP Networks
- IP Networks need to utilize multicast address schemes.
- Switches must be enabled for IGMP (Internet Group Management Protocol).
- Network Cabling must be installed in accordance with industry standards.
- COM3000 provides a layer two switch in COM400 chassis with IGMP snooping.

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

4.7 Channel Lineup
Determine in advance what networks the customer will require on the system and the channel assignments for each.
Assign RF carriers to each network. If possible, start RF channel lineup at Ch. 23 or higher (super-band).

This will:
- Eliminate possible signal ingress into the RF plant from VHF broadcast signals
- Keep the property signal out of the aeronautical frequencies in the 126 – 134 MHz range.

The COM3000 can modulate up to three AT&T / DIRECTV high definition programs on one 6MHz QAM carrier.
- Do not to combine higher bandwidth local, sports, and premium channels on the same QAM carrier.
- In some markets local channels may exceed 18 Mbps.
- It is a recommended best practice to monitor channels for peak bandwidths and not to exceed an average bit rate greater than 35mbps per QAM channel.
4.8 **External Video Sources**
The COM3000 can modulate video sources from multiple sources.
- Each source needs to be an MPEG2 single transport IP stream and will require a QAM output carrier 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 35 for more information on avoiding Pro:Idiom key loss.

4.9 **TV Compatibility**
The Technicolor COM3000 system outputs MPEG4 content on a MPEG2 transport stream containing the original encoded video stream as available from AT&T.
- High definition programming is MPEG4 (H.264) with AC3 audio
- High definition programming includes Pro:Idiom encryption unless otherwise authorized by AT&T and properly licensed for operation.
- All TVs on the property must be capable of receiving and decrypting MPEG4 encrypted signal.
  - AT&T approved transcoders are available to facilitate unencrypted MPEG2 or digital standard definition content. Use of transcoders require AT&T approval and COM51 licensing.
- Research and familiarize yourself with all required television programming procedures.
- Non-compatible TVs can be used with a Pro:Idiom set back box such as the Technicolor DCI401MCS.
4.10 **Installation Guidelines**

Installers should be familiar with all AT&T/DIRECTV installation requirements for commercial systems (MFH2) including the following:

- 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 COM51 cards are -25 to -45 dBm per transponder.
- For optimum communication between the SWiM and the COM51 6-9 dB of attenuation is to be inserted between the SWiM and the COM51. AT&T recommends a DIRECTV approved 6 or 9 dB DRE loop-through tap. The Swim should connect to the “IN” port and the COM51 to the “TAP” port. The “OUT” port should be terminated.
- It is required that a AT&T / 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.

**Technicolor Requirements**

- It is required that COM51 cards be connected to a DSWiM30 module for full 23 tuner capability.
- Connecting a DSWiM output to the COM51 lower RF input support 15 tuners.
- The COM3000 system is designed to operate properly in ambient environments of 104 °F (40°C) or less.
- Controlling and monitoring the COM3000 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 COM3000.

4.11 **AT&T / DIRECTV Activation**

Like any other DIRECTV receivers, all COM51 cards require authorization from AT&T before they will function properly.

- Each COM51 receiver in each COM400 chassis is to be authorized by the System Integrator. Without this authorization, the cards will not be able to stream video programming from the DIRECTV satellites. Channel 113 will stream as a test channel on unauthorized cards.
- Under normal circumstances, the COM51 cards in the COM3000 system should never lose their authorization. However, like any DIRECTV set-top box, if a card is left disconnected from the DIRECTV network, or powered off for an extended period, it may lose its authorization.
4.12 Component Assembly
➢ Carefully unpack and install the QAM20 and COM51 cards in the COM400 Chassis as shown below in Figure 6. Be sure to line up the cards with the guides in the chassis.
➢ After inserting the COM51 card, finger tighten the two thumb screws to secure the card in the chassis.
➢ QAM20 should mount in the lower QAM port of the chassis
➢ A #10 Torx driver is required to secure the QAM20 in the COM400 chassis.

Figure 6 - Installation of the QAM20 and COM51
4.13 Setting up Multiple Chassis

For multi-chassis installations each chassis will need to be assigned a unique chassis ID.

➢ The COM400 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 access door on the top panel of the COM400 chassis as shown below in Figure 7.

![Figure 7 – COM400 Dipswitch Access Panel](image)

Facing the back, dipswitches are 1-4 from the right to the left as shown in Figure 8.
➢ Dipswitch numbers as shown in Figure 8 are added to the photo. They are not actually labeled.

![Figure 8 - Chassis ID Dipswitch](image)

➢ The default IP address of each COM51 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 $192.168.3.[1 + (chassis ID \times 16) + \text{slot number}]$.

Example for chassis one:

$$1 + (16 \times 1) + 1 = 18$$

IP address of chassis one slot one is 192.168.3.18
The table below details chassis dipswitch settings and the corresponding IP address.

<table>
<thead>
<tr>
<th>Chassis ID</th>
<th>Switch1</th>
<th>Switch 2</th>
<th>Switch 3</th>
<th>Switch4</th>
<th>Default IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UP</td>
<td>DOWN</td>
<td>DOWN</td>
<td>DOWN</td>
<td>192.168.3.18</td>
</tr>
<tr>
<td>2</td>
<td>DOWN</td>
<td>UP</td>
<td>DOWN</td>
<td>DOWN</td>
<td>192.168.3.34</td>
</tr>
<tr>
<td>3</td>
<td>UP</td>
<td>UP</td>
<td>DOWN</td>
<td>DOWN</td>
<td>192.168.3.50</td>
</tr>
<tr>
<td>4</td>
<td>DOWN</td>
<td>DOWN</td>
<td>UP</td>
<td>DOWN</td>
<td>192.168.3.66</td>
</tr>
<tr>
<td>5</td>
<td>UP</td>
<td>DOWN</td>
<td>UP</td>
<td>DOWN</td>
<td>192.168.3.82</td>
</tr>
<tr>
<td>6</td>
<td>DOWN</td>
<td>UP</td>
<td>UP</td>
<td>DOWN</td>
<td>192.168.3.98</td>
</tr>
<tr>
<td>7</td>
<td>UP</td>
<td>UP</td>
<td>UP</td>
<td>DOWN</td>
<td>192.168.3.114</td>
</tr>
<tr>
<td>8</td>
<td>DOWN</td>
<td>DOWN</td>
<td>DOWN</td>
<td>UP</td>
<td>192.168.3.130</td>
</tr>
<tr>
<td>9</td>
<td>UP</td>
<td>DOWN</td>
<td>DOWN</td>
<td>UP</td>
<td>192.168.3.146</td>
</tr>
<tr>
<td>10</td>
<td>DOWN</td>
<td>UP</td>
<td>DOWN</td>
<td>UP</td>
<td>192.168.3.162</td>
</tr>
<tr>
<td>11</td>
<td>UP</td>
<td>UP</td>
<td>DOWN</td>
<td>UP</td>
<td>192.168.3.178</td>
</tr>
<tr>
<td>12</td>
<td>DOWN</td>
<td>DOWN</td>
<td>UP</td>
<td>UP</td>
<td>192.168.3.194</td>
</tr>
</tbody>
</table>
4.14 System Power Up
Once assembled and connected to RF distribution power up the COM3000 by plugging in the power cord. There is no external power switch.

4.15 System startup LED Behavior

The COM51 card has 6 LEDs on the front panel the top three are:

- PWR – Displays solid green when card is powered
- Activity – Flashes green when there is Ethernet activity between the chassis and card
- Link – Displays solid green indicating the card has Ethernet link to the chassis backplane

Boot up
Upon powering up the COM51 cards LEDs will go through a series of flashing indicating boot up.

Figure 9 below describes the LED activity during boot and normal operation.

<table>
<thead>
<tr>
<th>LED 1</th>
<th>LED 2</th>
<th>LED 3</th>
<th>Stage</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>Power Off</td>
<td>Normal Boot</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>Power On</td>
<td>Normal Boot</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>Checking imageA signature</td>
<td>Normal Boot</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>Checking imageB signature</td>
<td>Normal Boot</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>Booting ImageA</td>
<td>Normal Boot</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>Booting ImageB</td>
<td>Normal Boot</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>Failsafe downloading image. Card will attempt TFTP download from 192.168.1.254. COM51.bin. Using external TFTP software.</td>
<td>Fail Safe Mode</td>
</tr>
<tr>
<td>FLASH</td>
<td>OFF</td>
<td>OFF</td>
<td>Failsafe image download failed, reboot after 10 seconds</td>
<td>FATAL ERROR</td>
</tr>
<tr>
<td>OFF</td>
<td>FLASH</td>
<td>OFF</td>
<td>Failsafe image invalid, reboot after 10 seconds</td>
<td>FATAL ERROR</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>FLASH</td>
<td>Programming failsafe image into flash failed</td>
<td>FATAL ERROR</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>Failsafe flash programming</td>
<td>Fail Safe Mode</td>
</tr>
</tbody>
</table>

Figure 9 - LED Behavior at Boot Up
4.16 LED Behavior after Boot up

Once the COM51 has successfully booted the LEDs will provide operational information as shown below in Figure 10.

<table>
<thead>
<tr>
<th>LED 2</th>
<th>LED 3</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>SWM error</td>
</tr>
<tr>
<td>OFF</td>
<td>FLASH</td>
<td>SWM error while APG acquisition</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>SWM error</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>HW initialization (FPGA loading)</td>
</tr>
<tr>
<td>ON</td>
<td>FLASH</td>
<td>APG acquisition</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Running</td>
</tr>
<tr>
<td>FLASH</td>
<td>OFF</td>
<td>Software upgrading</td>
</tr>
<tr>
<td>FLASH</td>
<td>ON</td>
<td>Software upgrading</td>
</tr>
<tr>
<td>FLASH</td>
<td>FLASH</td>
<td>Software upgrading (flashing at same time)</td>
</tr>
<tr>
<td>FLASH</td>
<td>FLASH</td>
<td>Software upgrade failure (alternate flash)</td>
</tr>
</tbody>
</table>

Figure 10 - Operational LED Behavior

Under normal operations all three LEDs are solid green:

➢ LED1: ON if all requested tuners are locked.
➢ LED2: OFF=SWM error; ON=Running; FLASH=SW upgrading
➢ LED3: OFF=FPGA loading; ON=FPGA loaded; FLASH=APG acquisition LED 1 indicating all requested tuners are locked
5 COM400 Chassis

The COM400 chassis differs from previous COM chassis due to the presence of a Layer 2 managed Ethernet switch. Due to the number of tuners in a COM51 and the potential of having 138 HD streams within the system, the switch with IGMP capabilities, is necessary so that COM51 cards are not overwhelmed by the amount of video data available on the backplane. By default, the COM400 is set to provide a stable environment, however, if you are using the system to output IP multicast video, a couple simple settings can be implemented for a more robust solution. These settings are covered in the following section.

5.1 Accessing the COM400 User interface

➢ To determine the IP address of the COM400 user interface use the following formula:
  o 192.168.10. (chassis id +1)
  o For most single chassis configurations this would equate to 192.168.10.2
  o Login is Admin, leave Password field blank

![Figure 11 - Ethernet Switch Interface](image-url)
5.2 Port Definitions

When you first log into the COM400 the landing page will display the graphic shown below in Figure 12. Ports 1-11 are utilized in the COM400 chassis and displayed as lit with a connection to each port is made.

In this example all ports are connected except #7, the top QAM port.

Port State Overview

Refer to the table below for port definitions.

<table>
<thead>
<tr>
<th>Port #</th>
<th>COM400 Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COM51 slot 6</td>
</tr>
<tr>
<td>2</td>
<td>COM51 slot 5</td>
</tr>
<tr>
<td>3</td>
<td>COM51 slot 4</td>
</tr>
<tr>
<td>4</td>
<td>COM51 slot 3</td>
</tr>
<tr>
<td>5</td>
<td>COM51 slot 2</td>
</tr>
<tr>
<td>6</td>
<td>COM51 slot 1</td>
</tr>
<tr>
<td>7</td>
<td>QAM Port 2 (TOP)</td>
</tr>
<tr>
<td>8</td>
<td>QAM Port 1 (Bottom)</td>
</tr>
<tr>
<td>9</td>
<td>Unmanaged Ethernet switch to both 1 GIG ports</td>
</tr>
<tr>
<td>10</td>
<td>Top 10 GIG</td>
</tr>
<tr>
<td>11</td>
<td>Bottom 10 GIG</td>
</tr>
</tbody>
</table>

Note: Since both 1 gigabit ports are connected to the same port on the layer 2 switch via an unmanaged Ethernet switch all multicast traffic requested by one port will be present on the other. For this reason, it is recommended that the 1 gigabit ports not be used for multicast traffic.

NOTE: The COM400 will revert to its saved running configuration after a power cycle. If you accidentally make changes and are unable to recover, a power cycle will revert the chassis back to where you started. Conversely, once changes are made to the system they must be saved as “running config” as described in Section 5.9.
5.3 Setting a Password
To set a password navigate to >Configuration>Security>Password

![Image of System Password](image)

If the password is lost the unit’s password can be reset to default by connecting a CAT5 jumper between the two 10 G ports and power cycling the COM400.

5.4 COM400 Software Update
To determine the current software running on the COM400 navigate to:
Maintenance > Software > Image Select
As shown below in Figure 14 the software version is displayed on the top line labeled Image

![Image of Software Image Selection](image)

To update COM400 software navigate to Maintenance > Software > Upload
Click Select File and navigate to the folder in which the software is saved. Upload to the COM400. Then select Start Upgrade as shown in Figure 15.

When software upgrade is completed reset the system to factory defaults:
Navigate to maintenance > Factory Defaults click Yes

![Image of Software Upload](image)
5.5 COM400 Settings for Multicast

By default, the COM400 is set to provide a stable environment, however, if you are using the system to output IP multicast video, a couple simple settings can be implemented for a more robust solution. These steps have been tested and proven using a variety of managed Ethernet switches from well-known manufacturers. No other advanced or further setup should be necessary for the COM400 and COM51 cards to work properly in a Multicast environment.

If other specific settings are required by the managed Ethernet switch provider that you have selected, please continue with caution and test in a lab environment before installation on a live site.

The recommended setting / actions are:

➢ Verify the COM400 is running current software
➢ Enable flow control on all ports.
➢ Verify IGMP Snooping is enabled.
➢ Connect your managed Ethernet switch to one of the 10GbE ports (they can negotiate to 1GbE).
➢ Enable Router Port for the port connected to the managed Ethernet switch.
➢ Keep it simple. Don’t depend on advanced settings or modes.
➢ Persistently save your settings.
5.6  IGMP Settings

From the main menu navigate to:
Configuration > IMPC > IGMP snooping > Basic Configuration

As shown in Figure 16:

➢ Verify Snooping Enabled is checked. If not, check the box and then click Save
➢ Fast Leave should be unchecked unless a STB is connected directly to the COM400.
➢ Select Router Port for the port connected to your core switch. This will allow all Multicast traffic
  through the port. The external switch can then handle all IGMP functions.

![Figure 16 IGMP Settings](image)

From the IGMP snooping menu navigate to VLAN Configuration as shown in Figure 17
Verify Snooping is enabled. If not check the box and then click Save

Querier Election should be off if you are using a managed external Ethernet switch. Enable
Querier Election if you don’t have an external managed Ethernet switch.

![Figure 17 - IGMP VLAN Configuration](image)
5.7 Port Settings

From the main menu navigate to Configuration > Ports as shown in Figure 18.

This screen provided information for the state and settings of each port on the switch.

Verify that the port connected displays a green link light as shown in the figure below.

Flow Control

- Some switches will use a flow control that allows the switch to request a slower data rate if the buffers start to fill. Checking the flow control box will allow the COM400 to respond to these requests. We recommend enabling flow control on all ports.

Advertised Port Speed - Informational

- The 10G ports “advertise speeds between 100M and 10G. If your switch is having problems auto-negotiating the connection, you can shut off advertised speeds above the rated bandwidth of your switch port.

MTU - Informational

- COM51 maximum transmission units (MTU) is 1500. Some external switched may prefer the COM400 switch settings be set to a matching MTU (Frame Size) setting. The lowest MTU setting available in the COM400 switch is 1580 as shown below on port 11.

Port Configuration

<table>
<thead>
<tr>
<th>Port</th>
<th>Link</th>
<th>Speed</th>
<th>Adv Duplex</th>
<th>Adv Speed</th>
<th>Flow Control</th>
<th>PFC</th>
<th>Maximum Frame Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1Gfx</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10Gfx</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1Gfx</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1Gfx</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1Gfx</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1Gfx</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Down</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2.5Gfx</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2.5Gfx</td>
<td>2.5Gbps FDX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Down</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>10Gfx</td>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 18 - COM400 Port Configuration
5.8 Changing the Chassis Management IP address (OPTIONAL)

Making changes in this area can affect system communication. Proceed with caution.
Management IP address should only be changed when it is necessary to manage the entire system from a different subnet. The IP address of all COM51 cards will need to be changed to the same subnet as the chassis. Change the COM51 card IP address and add an alternate IP address for the QAM before proceeding.

To change the IP address used to access the COM400 chassis navigate to:
Configuration->System->IP, as shown in Figure 19.

![Figure 19 - COM400 IP Configuration](image)

Click on **Add Interface**
Set the following:
- VLAN = 2
- Fallback =1
- IP address = new management IP address (for this example we will use 10.0.0.251)
- Mask Length = 16

Click on **Save**

![Figure 20 - Add IP interface](image)
Next navigate to:
Configuration->VLANs->Configuration as shown in Figure 21.

In order to access the chassis and the associated COM cards and QAM from the same port all connected ports will need to be set to the same VLAN.

➢ Set Allowed Access VLANs to 2
  o Refer to the chart on page 1 to identify the ports being used
➢ Set each port to be used on VLAN2 to the following settings:
  ➢ Mode = Hybrid
  ➢ Port VLAN =2

Once the port is changed you will no longer be able to access the COM400 on the default IP address from that port. It is recommended to leave one port on VLAN1 so the chassis can be accessed with the default IP.

In the example shown in Figure 21 above, both one gigabit ports (port 9) and the top 10 gigabit port (port 10) will use the new VLAN IP assignment.

Connecting directly to the bottom 10 gigabit port (port 11) will allow connection with the default IP address.

Ports 5, 6, and 8 have been set to the new VLAN settings. This sets COM51 cards in slot one and two and the QAM to VLAN2.
To verify the change has taken effect connect your PC to a VLAN two port.
Change the IP settings in your PC’s ethernet connection to the correct subnet to access the new IP address.

Enter the new IP address into the browser and verify you connect to the COM400 and the COM51 cards. (COM51 cards will need static IPs assigned to match the new subnet)

Change your IP setting back to match the default 192.168.3.XX subnet 255.255.0.0. Connect to a VLAN one port and verify you can access the COM400 at the default 192.168.10.2 address.

If you run into problems, reboot the COM400 chassis and all configurations will return to default. Once operations are verified save the configuration to running config as described in Section 5.9, Save Changes to Running Configuration.

5.9 **Save Changes to Running Configuration**

Once you have verified all the setting changes are correct, save the settings to running configuration. Failure to complete this step will result in all new settings being lost upon power cycle.

As shown in Figure 22 Navigate to: Maintenance > Configuration > Save startup-config

Click Save Configuration

![Save Running Configuration to startup-config](image)
5.10 COM51 Card Discovery Issues
If you have problems with COM51 card discovery the following changes may help:

➢ If you have a QAM system with no multicast video packets you can disable IGMP snooping via:
  Configuration->IPMC->IGMP Snooping->Basic Configuration->Snooping Enabled=UNCHECKED->Save. This permits MDNS discovery packets to be set to all ports.

➢ If you have a IP system, enable IGMP querier election in your external managed Ethernet switch. This causes the MDNS IGMP join requests to be re-issued after every IGMP querier packet.

5.11 Debugging Tips
A few tools are very helpful for assisting in debugging any IP multicast network:

➢ Inexpensive managed Ethernet switch with known working settings. This will provide a “known good” switch configuration and act as a point of demarcation when troubleshooting.
➢ Unmanaged Ethernet switch. This can be placed between the core switch and the IP receiver. A PC running Wireshark connected to the unmanaged Ethernet switch will capture all the multicast IP packets being sent to the IP receiver.
➢ PC with Wireshark application.
6 The COM51 Web Interface

Each COM51 card uses the same simple to use web-based application as the COM46. The user interface provides an easy means to control and configure the COM3000 system.

- Accessed by entering the IP address of any COM51 cards in the system into a web browser’s address bar.
- Upon opening the user interface will display the COM51 discover screen.
- Chrome is the suggested browser.
- By default, the IP address of the first COM51 in chassis one is always 192.168.3.18.

6.1 User Password

To facilitate increased security the COM51 user interface is locked via a user password. The default password is, “com3k”. Lock status is specific to the IP address of the PC used to log in. Once the system is unlocked it will remain unlocked for 8 hours or until rebooted for the PC connected. When you first access a COM system you will be prompted to enter a password as shown below in Figure 23.

![Figure 23 Password Challenge](image)

Once the default password has been entered you can change the password via the Lock tab of the COM51 user interface as shown below in Figure 24.

![Figure 24 - Lock Screen](image)

To change the password, enter an alpha numeric text in the Password field and click submit.
If you would like to allow read only access without a password start your password with “Read”, as in Readabcd123. Note: no spaces in password.
Some circumstances require a blank COM51 password, such as Mediatune and NFL Sunday Ticket scheduler. To set a blank password leave the Password field blank and click on Submit.

6.2 COM51 Licensing

The COM51 card default setting enables eight tuners. As previously mentioned, additional tuners can be licensed in one tuner increments. This process should be completed during the order process. The tuner licensing is the responsibility of the Distributor providing the system.

➢ Tuner licensing count is displayed in the “Tuners” column of the COM51 user interface SysInfo page as shown below in Figure 25. The first number represents the number of licensed tuners, the second represents the number of SWiM frequency slots available.
➢ Tuner licensing is the responsibility of the Distributor who provided the equipment.
➢ The notes section permits installer information to be retained.

![Figure 25 - SysInfo Page Tuner Count](image)

The COM51 must be licensed to stream signals. In systems with a QAM20 or NTSC-8 this license will be provided via the hardware when connected to the COM400 chassis. If you are using a COM51 system in an IPTV system with no QAM or NTSC-8 the cards will need to be licensed for use by your distributor.

Symptoms of no IP license:
➢ All tuners will work after re-boot, after several minutes all tuners other than the first tuner will stop. COM51 card will display tuners >1 in red.
➢ Syslog will report, “No QAM found need license”.
➢ Loading a COM51 license file overwrites any existing license in the card. Any new license file must contain any existing licenses.
On the Overview tab (discussed below), the COM51 will highlight unlicensed tuner numbers in grey, and the bitrate, SNR, and Strength fields will be highlighted in red as shown below in Figure 26:

➢ The final verification of licensing is in the COM51 SysLog. A COM51 exceeding the license count will display the following message in the Syslog:

```
user.err syslog: a: ***Need Tuner License File: tuners=8;
```
6.3 Overview Tab

The Overview tab shown below in Figure 27 provides a streamlined method for initial configuration and quick status monitoring of the COM3000 system using a series of pulldown menus to configure each card. The Overview tab displays additional information not shown on the Discover tab. Including:

- QAM Summary
- Encryption method
- Virtual channel assigned though EPG / Guide.XML

![COM3000 Overview Page](image-url)
6.3.1 QAM Summary

The QAM summary portion of the Overview tab as shown in Figure 28, displays basic information about the QAM20s mounted in the system. Base 1 is the RF channel assigned to QAM Index one. Base channels 2 and 3 are not used.

<table>
<thead>
<tr>
<th>Chassis</th>
<th>IP</th>
<th>Alt IP</th>
<th>Base Ch 1</th>
<th>Base Ch 2</th>
<th>Base Ch 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>192.168.6.2</td>
<td>192.168.6.99</td>
<td>23</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 28 - QAM Summary

Chassis – The QAM chassis number is determined by the COM400 chassis designation and QAM slot.

- Slot 1 is the top QAM slot
- Slot 0 is the bottom QAM slot

Formula to associate QAM20 IP addresses and chassis number:

- COM400 chassis designation + (QAM Slot#*16) +1

\[
\begin{align*}
(1 \times 16) + 1 &= 17 \text{ (top slot COM400 chassis one)} \\
(0 \times 16) + 1 &= 1 \text{ (bottom slot COM400 chassis one)} \\
(1 \times 16) + 1 &= 18 \text{ (top slot COM400 chassis two)} \\
(0 \times 16) + 1 &= 2 \text{ (bottom slot COM400 chassis two)}
\end{align*}
\]

Chassis 1 slot 0 (bottom slot) = 192.168.6.2

- IP – Displays the default IP address to the QAMs
  - Hyperlinks - The IP hyperlink(s) are linked to the associated QAM card
- Alt IP – Displays alternate IP address programmed for each QAM
- Base channels – Displays base output channels for QAM Index 1. Base channel 2 and 3 fields are not used.

6.3.2 Display Options

Select preferred options for display of QAM or IP output configuration and HD/SD channel selections.

Display Mode  
- QAM  
- IP

SD Duplicates  
- Show  
- Hide
6.3.3 Channel Tuning Options

➢ The chassis and slot number hyperlinks in the Chassis and Slot columns allow you to collapse the display for the selection so that multiple cards and chassis can be more easily displayed.

Chassis number hyperlink  Slot number hyperlink

➢ Tuner number hyperlink will navigate to the COM51 advanced edit page

Security - Figure 29 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 standard definition channels by default. Removal of Pro:Idiom Encryption from HD channels must be authorized by AT&T.
➢ Pro:Idiom - This is the standard setting for HD Pro:Idiom encrypted channels
➢ Transcode – Enables AES encryption to approved 3rd party devices
➢ Simulcrypt – Samsung Lynk (support provided by Samsung)
Channel - Figure 30 shows the Channel dropdown feature. This allows you to assign a tuner to any channel in the guide data, including channels not authorized.

If SD Duplicates is selected both HD and SD channels will display

If Hide SD duplicates is selected only the HD channels will display

Figure 30 - Channel Selection Drop Down

6.3.4 Security Mode

Mode - Figure 31 shows the dropdown options for QAM and IP output modes.

Figure 31 - Output Mode

Major.Minor / IP:Port - Figure 32 below shows the Mode column. If QAM mode is selected this field allows selection of the major and minor QAM channel.

➢ The dropdown menu will display channels programmed for QAM output.
➢ If IP mode is selected the field input is for the IP and port number assigned to each program

<table>
<thead>
<tr>
<th>Tuner</th>
<th>Security</th>
<th>Channel</th>
<th>Mode</th>
<th>Major.Minor / IP:Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>284 SCIHD</td>
<td>QAM</td>
<td>32 1</td>
</tr>
<tr>
<td>2</td>
<td>None</td>
<td>209 ESPN2HD</td>
<td>QAM</td>
<td>32 2</td>
</tr>
<tr>
<td>3</td>
<td>None</td>
<td>204 FNHHD</td>
<td>QAM</td>
<td>33 1</td>
</tr>
<tr>
<td>4</td>
<td>None</td>
<td>202 CNNHD</td>
<td>QAM</td>
<td>33 2</td>
</tr>
<tr>
<td>5</td>
<td>None</td>
<td>212 NFLHD</td>
<td>QAM</td>
<td>33 3</td>
</tr>
<tr>
<td>6</td>
<td>None</td>
<td>206 ESPNUHD</td>
<td>IP</td>
<td>192 166 0 1005</td>
</tr>
<tr>
<td>7</td>
<td>None</td>
<td>None</td>
<td>IP</td>
<td>192 166 0 0 0 0</td>
</tr>
<tr>
<td>8</td>
<td>None</td>
<td>None</td>
<td>IP</td>
<td>192 166 0 0 0 0</td>
</tr>
</tbody>
</table>

Figure 32 - Major/Minor Ch or IP and Port Settings
Bitrate - Figure 33 shows the Bitrate field.

- Displays a snapshot of the bitrate at the QAM20 port associated with the selected QAM major/minor channel. In the example QAM ch 33-2 is streaming 5.9 Mbps.
- If the stream is not routed to a COM20 card the Bitrate will read 0.0.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Major.Minor / IP:Port</th>
<th>Bitrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAM ▼</td>
<td>33 ▼ . 2 ▼</td>
<td>5.9 Mbps</td>
</tr>
<tr>
<td>QAM ▼</td>
<td>33 ▼ . 3 ▼</td>
<td>7.5 Mbps</td>
</tr>
<tr>
<td>IP ▼</td>
<td>152 . 168 . 3 . 18 : 1005</td>
<td>9.0 Mbps</td>
</tr>
<tr>
<td>IP ▼</td>
<td>152 . 168 . 0 . 0 : 0</td>
<td>6.0 Mbps</td>
</tr>
</tbody>
</table>

Figure 33 - Bitrate Display

SNR and Strength - Figure 34 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 in dBm.
- If the strength is -50dBm or below the block will highlighted yellow.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Major.Minor / IP:Port</th>
<th>Bitrate</th>
<th>SNR</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAM ▼</td>
<td>32 ▼ . 1 ▼</td>
<td>4.7 Mbps</td>
<td>10</td>
<td>-26</td>
</tr>
<tr>
<td>QAM ▼</td>
<td>32 ▼ . 2 ▼</td>
<td>7.0 Mbps</td>
<td>13</td>
<td>-23</td>
</tr>
</tbody>
</table>

Figure 34 - SNR and Signal Strength
6.4 Discover Page

Most configurations on the COM3000 system can be done via the Overview page previously discussed. However, there is redundant information in the Discover page and links to advanced edit pages for feature configurations and troubleshooting.

➢ The COM51 card issues a discovery call for all other COM51 (and COM46) cards in the system and populates a table with basic information on current tuning parameters and RF signal levels.
➢ Once this information is complete the Discover Web Page, showed in Figure 35 is displayed.

![DIRECTV COM3000](image)

**Figure 35 - COM51 Discover Page**

6.4.1 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 chassis in the 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 twenty-three entries per card for this column.
➢ The COM51 will display 23 tuners regardless of licensed tuner count.

**QAM or IP Address** - If any tuner is streaming to a QAM20, then “QAM” is displayed as the column header.
➢ Signals are routed out of the system, then “IP Address” will display as the column header.
➢ If the card is sending video to a QAM20, 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 QAM20, then “Bitrate” is displayed as the column header.
- If streams are routed out of the system, then “Port” will display as the column header instead.
- If the card is sending video to a QAM20, this field shows the instantaneous bitrate of the channels being sent out of the QAM20. Otherwise this field contains the destination port associated with the destination IP address described above. You must have a unique IP and or port number for each individual channel you wish to stream.

**Channel** - This field displays the name and the DIRECTV channel number tuned.
- Field is also a link that permits the user to change channels.
- If the card has not been authorized or paired, then the channel will be highlighted in red.
- After the APG guide data has been acquired the channel’s callsign will also be shown.

**SNR** - This field returns the Signal-to-Noise Ratio associated with the selected tuners.
- SNR should be >11
- Low SNR (<11 >8) results in a yellow highlight
- Very low SNR (<8) results in a red highlight

**Strength** - This value provides a value corresponding to the internal Automatic Gain Control setting in the COM51.
- For the optimum performance of the COM3000, this value should be between -25 and -55.
- If the Strength is low, it will be highlighted in yellow and if the Strength is very low, it will be highlighted in red.
6.5  **The Basic Channel Tune Screen**

The channel tune is accessed either by clicking on the tuner number from the COM51 Overview page or by clicking on the DIRECTV channel number from the Discover screen. The Channel Tune screen shown in Figure 36.

![COM51 Basic Tune Screen](image)

- This page permits two different ways of tuning AT&T / DIRECTV channels with Pro:Idiom encryption.
- Specifies the destination IP address and port along with the AT&T / DIRECTV channel number.
- Allows entry of a QAM channel, sub-channel and AT&T / DIRECTV channel number. This is redundant to the channel tuning on the Overview screen.
- Channels entered in this screen will tune to HD programming. This can be helpful when tuning local channels not easily identified as High Definition.
6.6 Advanced Tune

The Advanced Tune page can be used to change the main tuning parameters of a channel. Additional parameters can be accessed by clicking the Advanced Edit hyperlink at the bottom of the Basic Tune screen, which navigates to the Advanced Tune screen shown below in Figure 37.

Information identifying the chassis / slot / tuner and card IP address currently being addressed is displayed at the top of the page below the command links.

**Chassis** - This value shows the Chassis number of the COM400 that holds the COM51 card you are currently tuning.

**Slot** - This value shows the Slot number within the COM400 chassis that holds the COM51 card you are currently tuning.

**Tuner** - This value indicates which tuner on the COM51 card you are controlling.

**IP** - This field shows the IP address of the COM51 card you are currently interacting with.

---

**DIRECTV COM3000 Interface**

Commands: Overview, Discover, PairingInfo, TuneAll, Help

Display, SvInfo, HealthInfo, EPG, Syslog, Lock, ATSC, NTSC, QAM

Edit (Chassis=3, Slot=1, Tuner=1, IP=192.168.3.50)

**Channel Tune**

- **Dest_IP_Address**: 192.168.6.19
- **Dest_Port_Number**: 85
- **Protocol_Type**: UDP
- **Channel_Object_ID**: 3000947
- **Major_Number**: 202
- **Minor_Number**: 65536
- **Stream_ID**: 100
- **Security_Mode**: 1
- **Persistent**: 1

![Figure 37 - Advanced Tune Screen](image)

Most of the configurations in the advanced edit page are redundant to settings entered from the Overview page of the COM51 UI.

- 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 COM51 will stream to any valid unicast or multicast address.
**Dest_Port_Number** - This field represents the destination port of the IP address you wish to stream to.

<table>
<thead>
<tr>
<th>Dest_IP_Address</th>
<th>Dest_Port_Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>192.168.6.19</td>
<td>65</td>
</tr>
</tbody>
</table>

**Protocol_Type** - This field is used to control whether the COM51 streams the data in UDP or RTP packet structures. The default value is UDP.

<table>
<thead>
<tr>
<th>Protocol_Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = UDP</td>
</tr>
</tbody>
</table>

**Channel_Object_ID** - This field is the data that the COM51 uses for tuning purposes. It will be automatically filled in when a valid AT&T / DIRECTV channel number is entered into the “Major_Number” field. Before the card has been successfully tuned, the default value is 0.

<table>
<thead>
<tr>
<th>Channel_Object_ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>3900947</td>
</tr>
</tbody>
</table>

**Major_Number** - This field is equivalent to the AT&T / DIRECTV channel number you tune to on a typical AT&T / DIRECTV tuner. The default value is 0.

<table>
<thead>
<tr>
<th>Major_Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>202</td>
</tr>
</tbody>
</table>

**Minor_Number** - This field is automatically filled in by the COM51 card, with a default value of 65535. If the AT&T / DIRECTV channel has a minor channel number then the Minor_Number value must be entered.

- Many AT&T / DIRECTV channels have both high-definition and standard-definition channels with the same Major and Minor numbers. The COM51 will default to the high-definition channels when tuned from this field.
- To set 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.

<table>
<thead>
<tr>
<th>High-definition Minor_Number (default)</th>
<th>Standard-definition Minor_Number (add 100000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor_Number: 65535</td>
<td>Minor_Number: 165535</td>
</tr>
</tbody>
</table>
Stream_ID - This field is optional and allows a unique identifier to be applied to every video stream produced by the COM3000 system.

- The allowable values for this field are any whole number between 1 and 65535. This field is to be left as default for normal operation.
  - To enable a second audio stream set the Stream_ID to 54000.

  Stream_ID: 100

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 AT&T / 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.

Persistent - Setting this value to ‘1’ tells the COM51 to retain all channel and IP-destination settings in memory (i.e., data entered into the card is “persistent”).

- Eliminates the need to reprogram the COM51 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.
6.6.1 Informational Status

The Info section, shown below in Figure 38, provides a view of many key indicators to the operation of the COM51 card. A concise index to the characteristics of each individual COM51 card according to its status and user-defined settings.

![Image of Info section](image)

**Figure 38 - “Info” Section of the Advanced Edit Page**

Following is a brief explanation of each field shown above:

**Chassis_ID** - This field represents which COM400 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 COM51 card (1 through 23).

**Card_IP** - This field shows the IP address of the COM51 card

**Receiver ID** - This field reports the Receiver ID, or RID. This value is the first of two parameters required to obtain authorization on the AT&T / DIRECTV network.

**CAM_ID** - This field reports the CAM ID. This value is the second of the two parameters required to obtain authorization on the AT&T / DIRECTV network.

**Network_ID** - This field displays the AT&T / 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 39 details the Network_ID numbers and corresponding satellite.

<table>
<thead>
<tr>
<th>Network_ID</th>
<th>Satellite</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>101L</td>
<td>18V DC</td>
</tr>
<tr>
<td>0</td>
<td>101R</td>
<td>13V DC</td>
</tr>
<tr>
<td>2</td>
<td>110</td>
<td>22 kHz on</td>
</tr>
<tr>
<td>3</td>
<td>119</td>
<td>22 kHz on (same cable as 110)</td>
</tr>
<tr>
<td>10</td>
<td>99B(c)</td>
<td>DC (B-band) s = spot beam; c = conus =</td>
</tr>
<tr>
<td>11</td>
<td>99A(s)</td>
<td>DC (A-band)</td>
</tr>
<tr>
<td>12</td>
<td>99</td>
<td>Reverse Band</td>
</tr>
<tr>
<td>13</td>
<td>103</td>
<td>Reverse Band</td>
</tr>
<tr>
<td>14</td>
<td>103A(s)</td>
<td>DiSEqc with 22 kHz</td>
</tr>
<tr>
<td>15</td>
<td>103B(c)</td>
<td>DiSEqc with 22 kHz (enable B-band)</td>
</tr>
</tbody>
</table>

In the example below, we are looking at CNN HD:

![Network and Frequency Index](image)

**Authorized** - This field provides feedback on whether the card has been authorized within the AT&T 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 COM51 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 AT&T has issued a blackout of the content on a 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.

*Blackout: 0

**SW_Version** - This field reports the software version that currently resides on the COM51 card.

*SW_Version: ST04.01.43

**COM51 LED Control Feature**

The information shown in Figure 40 below is one of the subsections available on the Advanced Edit page.

---

**LED Control**

![LED Control](image)

**Figure 40 - 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
COM51 CAM Log Data
This section gives you the ability to read the log files generated by any COM51 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.

**Read CAM log**

![Submit Query](submit_query_button.png)

Figure 41 - CAM Log Interface

Under normal circumstances, an authorized card will produce a very short CAM log file with 0 0 0: CARD_INSERTED displayed.

![DIRECTV COM2000](directv_com2000.png)

**Commands:** Overview, Discover, PairingInfo, TuneAll, Help
- Refresh, Display, SysInfo, HealthInfo, EPG, Sislog, Lock, ATSC, 401, CAM

CAM log from 192.168.3.18: 

- Refresh Clear_CAM_Log
- U 0 0: CARD_INSERTED
- Done.

To convert GMT to local time subtract timezone offset:
- Pacific=-8; Mountain=-7; Central=-6; Eastern=-5
- Add an hour if daylight savings time is in effect.

If, however, there are issues with the card’s authorization, you will see messages that show error codes:

![Figure 42 - Cam Log Report](figure_42.png)

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

**Refresh** - Refreshes this display.

**Clear_CAM_Log** - Clears all current entries in that card’s CAM log.
COM51 Software Reset
This section allows you to initiate software reset on the COM51 card. Activating this feature is the equivalent to pushing the recessed reset button on the face of the COM51 card and has a similar effect as pressing the small reset button on a traditional set-top box.

**Reset**

**Figure 43 - Reset Interface**

COM51 File Transfer Utility
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 COM51 cards. See Section 11 for more information on upgrading your COM51 cards.

**File Transfer**

**Figure 44 - File Transfer Interface**

Following is a brief explanation of each field shown above:

**Usage** - This field is used to tell the COM51 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 COM3000 Technical Support - Mediatune Installation Folder on the Technicolor / MCS website for details.
2 = Software Upgrade – This option is used to update the COM51 software.
3 = Log – This option tells the COM51 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 downloads the XML license file that enables advanced features on the COM51 such as the HD upgrade for the COM51A.
Options above 5 & 6 are not enabled for field use.

**Server_IP_Address** - This field tells the COM51 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 COM51 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** – Must be set for TFTP
**COM51 User Configuration Options**

This section gives you the ability to customize select features of the COM51 cards to better suit your application.

- Change IP settings the card
- Control and configure Syslog server
- Enter IP address of NTSC-8 and Tuner Count

### 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.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IP_Config</strong></td>
<td>This field allows for one of 3 methods of IP address assignments to be chosen. See Section 4.13 Setting up Multiple Chassis.</td>
</tr>
<tr>
<td><strong>Base_IP</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Gateway</strong></td>
<td>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]. 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.</td>
</tr>
<tr>
<td><strong>Subnet</strong></td>
<td>This field allows you to give a subnet mask of your choosing to the COM51 card. This field is only applied in the Fixed mode.</td>
</tr>
</tbody>
</table>

**Figure 45 - User Config Interface**

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. See Section 4.13 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]. 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 to tell the COM51 card to continue whatever mode it is currently using.

**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 COM51 card.
**Gateway** - This field allows you to set a default gateway of your choosing for the COM51 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 COM51 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 or TFTP32 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.
**NTSC-8_IP** – Enter the IP address of a NTSC-8 to be fed from this COM51 card.

**NTSC-8_tunercount** – COM51 cards will stream 1-23 tuners to NTSC-8.

Enter the number of tuners you are using for NTSC-8s. One COM51 card will stream 23 channels and a program guide to NTSC-8. (see NTSC-8 integrators manual)

**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.

**VLAN Config for 192.168.3.xx** - This feature is reserved for AT&T use.

**Remote Access** – Reverse proxy (still under development)

**VidPlay** – Not used It is recommended to use an inexpensive PC and VIDplay.exe software available from Technicolor through your distributor. See External Video Sources

**Misc Get/Set** – This function is used for multiple purposes. Entries are case sensitive as shown in Figure 46.

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>siteKey</td>
<td>64 bit hex</td>
<td>Pro:Idiom mobile key</td>
</tr>
<tr>
<td>factoryReset</td>
<td></td>
<td>Resets COM51 to factory settings. All feature and tuner licenses are lost</td>
</tr>
<tr>
<td>tunerCount</td>
<td></td>
<td>Displays licensed tuner count</td>
</tr>
<tr>
<td>bitrate</td>
<td>0-23</td>
<td>Returns bitrate of specified tuner index</td>
</tr>
<tr>
<td>blackout</td>
<td>0-23</td>
<td>Reports blackout by tuner index</td>
</tr>
<tr>
<td>ccErrors</td>
<td>0-23</td>
<td>Reports CC errors by tuner index</td>
</tr>
<tr>
<td>mms</td>
<td></td>
<td>Mediatune MMS license count</td>
</tr>
<tr>
<td>updateBitrate</td>
<td></td>
<td>UCW4026MCS Software update Mbps</td>
</tr>
<tr>
<td>updateCount</td>
<td></td>
<td>UCW4026MCS software Update Iterations</td>
</tr>
<tr>
<td>help</td>
<td></td>
<td>Shows all available commands</td>
</tr>
</tbody>
</table>

*Figure 46 - Get/Set Usage*
COM51 “Direct Tune” Feature - The information shown in Figure 47 below is one of the subsections available on the Advanced Edit page.

➢ This section gives you a method to force a tuner to a satellite and transponder pair.
➢ This can be useful when attempting to track and isolate RF problems with the COM3000 system. The data required to perform this operation can be gathered from the basic “Tune” interface shown in the previous sections.

A brief explanation of each field follows:

**Figure 47 - 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 AT&T / 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 AT&T / 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.

**Simulcrypt Feature** - Simulcrypt (Samsung LYNK) support is provided by Samsung. It requires a Samsung LYNK key server at the site.

6.7 **Displaying COM3000 Status**

By clicking the Display hyperlink at the top of any COM3000 web interface page, you can see the information last obtained by the last Discover call, but without issuing a new Discover command.
6.8 Pairing Info
By clicking the PairingInfo hyperlink at the top of any COM3000 web interface page, you can quickly evaluate the authorization status of all cards in the system.

➢ In the example shown in Figure 48, all cards are activated and paired
➢ 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.

Figure 48 - COM51 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 COM51 card that resides in the chassis and slot combination to its left. If you want to know the DHCP IP address use the URL: [http://192.168.3.18/cgi-bin/webcmd?screen=ifconfig](http://192.168.3.18/cgi-bin/webcmd?screen=ifconfig)

  - This field is also a link to see the Syslog for that card.

**RID** - This field reports the AT&T / DIRECTV Receiver ID, or RID. This value is the first of two parameters required to obtain an authorization on the AT&T / DIRECTV network.

**CAM_ID** - This field reports the AT&T / DIRECTV CAM ID. This value is the second parameter required to obtain authorization on the AT&T / 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 COM51 card’s CAM has been authorized.

  - A value of ‘1’ indicates that the card has been authorized, thereby enabling the card to receive AT&T / 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 AT&T / 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 COM51 card.

**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 specific card, you can upgrade multiple cards at a time.

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 specific card. The available options are shown below.

0 = Set_Log_IP – This option allows you to identify the IP address to which you wish to send COM51 logging for monitoring by a syslog utility.
1 = MT – Installs Mediatune.
2 = SW_Upgrade – Installs updated COM51 software.
3 = Log – This option allows you to copy a COM51 card’s syslog to a PC.
4 = License – This option allows you to load various software licenses to enable new modes and features in the COM51. One example might be upgrading the COM51A to HD mode or enabling other features originally locked by the manufacturer.
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 COM51 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 COM51 acts as a TFTP server for other cards in the system. The Browser Upload field allows you to upload the selected file to the card.
➢ The Choose File and Upload buttons are used to find and upload the desired file(s) from the browser.
6.9 TuneAll

The information shown in Figure 50 below is the result of clicking the TuneAll hyperlink at the top of the COM3000 web interface page. This section provides a practical way to configure an entire COM3000 system with minimal effort.

➢ The Transcode and TranscodeHD buttons will automatically configure the system to interface with a Video Propulsion transcoder.
➢ Destination IP and ports will be changed and reflected in the Overview tab.

To use this feature, start by copying and pasting the information provided at the bottom of the browser page (below the Submit button) either directly into the text field provided or into your text editor of choice, and then modifying it as indicated by the instructional comments located in the field above the box.

Figure 50 - Tune All
The text 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;

➢ A sample active system might look 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, copy and paste this information into the field in the TuneAll command page and then click Submit.

➢ Saving a copy of the tuning table for your entire system in the form of a text file is recommended.
6.10 Help
The Help tab provided a short reminder of the functions of each tab on the COM51 user interface as shown below in Figure 51.

6.11 SysInfo
The SysInfo tab shown below in Figure 52 provides important information about the COM51 status.

➢ This table identifies feature sets licensed for each COM51 card in the system.

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 - This field shows the IP address of the COM51 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 COM51 card. Every IP-enabled device contains a similar address, which is used to ensure that all Ethernet traffic is routed to the correct destinations.
➢ Tuners - Displays the licensed number of tuners for each COM51. The first number represents the licensed tuner count, the second is the number of available SWiM channels.
➢ Features - This field displays the licensed operational features for each card.
   o HD - Streamout - The basic license configuration of all COM51 cards.
- MT - Mediatune
- IP - Licenses card for IP output in the absence of a QAM20
- Transcode - N/A
- Clear HD - Allows HD programming to be output in clear QAM (requires AT&T / DIRECTV authorization)
- NTSC-8 - COM51 card is outputting video to a Technicolor NTSC-8 modulator.
- Monitored - COM3000 is connected to a REST server monitoring the health of the system. This feature displays as “26” on a COM46 card which is viewing a COM51.

6.12 HealthInfo

By clicking the HealthInfo hyperlink at the top of any COM3000 web interface page, you will access the page shown below in Figure 53. The data available here gives you an indication of the overall health of the COM3000 system and can be used to identify potential problem areas at a glance.

![Figure 53 – COM51 Health Info Page](image)

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.
- **CardIP** – This field shows the IP address of the COM51 card that resides in the chassis and slot combination to its left.
- **Card_Temperature** – Reports internal temperature
- **IC_Temperature** – This field reports the internal temperature of the main processor chip on the COM51 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 COM51.
- **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”.


6.13 Syslog
The system log file for the COM3000 system records messages related to the performance of the cards.

- Much of the data in the logs is not relevant to the card’s performance.
- To guide a system operator through the log entry interpretation Technicolor has changed key log entry errors to red font.
- If you are experiencing problems with the COM3000 system a quick check of the SYSLOG can alert you to problems. Contact your distributor or Technicolor support for further assistance.

The information shown below is the result of clicking the Syslog hyperlink at the top of any COM3000 web interface page.

- Note that the syslog will only show the last 500 lines of messages from the card you are currently logged into.

Figure 54 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 COM3000 web interface page, the syslog data may also be accessed directly from the PairingInfo screen by clicking directly on the hyperlinks for each card’s IP address.
6.14 EPG
Each COM51 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 EPG provides the viewer with 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.
- Channels in the scrolling guide can include:
  - All AT&T DIRECTV networks tuned on the system
  - Channels from external sources.
- COM3000 EPG has the ability to store and stream welcome screen images to the QAM20 that will play direct from the COM51 card.
- The SysInfo page will display ‘EPG’ in the EPG field of a card outputting EPG data. Figure 55 below shows an example of the SysInfo page displaying the EPG designation. The EPG is running on card one in chassis one. The card IP address is 192.168.3.18.
- 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 Page can also be used to convert the AT&T/DIRECTV guide information into PSIP guide information that is supported by many televisions.
- PSIP permits the channel number to be remapped, and the channel name to 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 QAM20 chassis number and QAM20 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-AT&T / DIRECTV channels to the EPG. This is done by adding an entry where instead of a AT&T / DIRECTV channel number, the capital letter ‘N’ appears followed by the channel name, and program information separated by underscore characters.
   o For example: 10-1 Nlobby_The_Lobby_Channel 117

➢ 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.
6.14.1 Guide.XML Overview

Technicolor has developed an interactive guide feature that works exclusively with the DCI401MCS and UCW4026MCS boxes and future set-top boxes.

DCI401MCS must be running software version 01.22.11 or newer.

Setup is similar to the instructions for EPG.

- Leave the IP field set to 1.2.3.4
- Click on Guide.XML to load and customize the guide as described in EPG Overview.
- For UCW4026MCS set the Mode to 13 for android function
- For DCI401MCS set the Mode to 3 for Guide.XML
- Verify channel data and hit submit when complete.

Electronic Program Guide Display

![Figure 56 - IPG Setup Page](image-url)
6.14.2 Getting Started with EPG

Access the EPG setup screen shown in Figure 57 below, click the EPG hyperlink at the top of any COM3000 web interface page. Take note that the EPG will be set up on the card you are using to manage the COM3000 system. Since only one EPG is desirable, take care in properly identifying and setting up the EPG on one card.

Advanced users may set up multiple EPGs that do not conflict with each other. For example, a guide.XML file can be set up on one COM51 for UCW4026MCS operations while a second COM51 can run EPG and PSIP for televisions.

There are two options for loading data into the EPG text box as shown in Figure 57:

- **EPG Load** – loads data for the non-interactive scrolling guide that displays on a designated channel.
- **Guide.xml** – Loads data for interactive guides in the DCI401MCS and UCW4026MCS boxes.

Figure 57 - COM3000 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. Typically, this will be the IP address of the QAM20 card you are going to use for the EPG channel. *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 COM51 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.

**Time Zone PSIP** - 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 Time zone Offset field.

**Mode** – Selects what function the EPG will accomplish
0 = Normal scrolling guide and PSIP
1 = Ignore DST
2 = Welcome Screen
3 = Guide.XML for DCI401MCS set back boxes
13 = Android guide for UCW4026MCS set back boxes

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 COM3000 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 QAM20 is in so that it knows the QAM20’s IP address for sending PSIP guide data.

**Port** – This tells the guide which QAM20 UDP port is being used for sending PSIP guide data. If not using PSIP this field can be set to -1.

**Examples:**

10-0 501-65535-hd ➔ TV channel 10 carries HBOHD (from COM3000)
23-0 209-65535-hd ➔ TV channel 23 carries ESPN2HD (from COM3000)
45-0 202-65535-ad ➔ TV channel 45 carries CNN (from SMATV or COM3000)
37-0 8-65535-hd ➔ TV channel 37 carries local channel 8 (from OTA, SMATV, or COM3000)
2-1 NLocal_Program_Info 1 71 ➔ Non-AT&T / DIRECTV channel (channel name Local)

Note: The actual content could come from the COM3000, a separate SMATV system, or from off-air, as long as the channel is available in AT&T / DIRECTV’s lineup.
The screen shown in Figure 58 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 designation.

Figure 58- COM51 EPG Load

The results shown on this page contain the programming information for all COM51 cards in your system based on the current tuning table. This information will automatically be loaded into the appropriate text field the next time you visit the EPG page.
6.14.3 EPG for IP Multicast Systems
When the COM51 is tuned for multicast IP output the guide will load with the IP information in place of the QAM IP and port designation as shown below in Figure 59. Editing the channel mapping is the same procedure as RF channels.

For interactive guides in the DCI401MCS and UCW4026MCS boxes the Guide.XML button must be clicked to load the initial data.

Electronic Program Guide Display

<table>
<thead>
<tr>
<th>DestIP:</th>
<th>12.3.4</th>
<th>For IPTV use 226.2.3.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>DestPort:</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TimezoneOffset:</td>
<td>5</td>
<td>Pacific:+8:mountain:+7;Central:+6;Eastern:+5</td>
</tr>
<tr>
<td>TimezonePst:</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Mode:</td>
<td>13</td>
<td>0=normal; 1=ignoreOSIT; 2=Welcome screens (welcome.bmp); 3=guide.xml; 13=Android</td>
</tr>
<tr>
<td>LogosIpServerIP:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LogosFilename:</td>
<td></td>
<td>170x69 24bp bmp bitmap file</td>
</tr>
</tbody>
</table>

The format is displayNumber-minorNumber-majorNumber-minorNumber-[hd][d] qemChassis port
OR displayNumber-minorNumber-majorNumber-minorNumber-[hd][d] multicastIP port
OR displayNumber-minorNumber-majorNumber-minorNumber-[hd][d] -qemCarrier program
OR displayNumber-minorNumber MyChan Event_info qemChassis port
The chassis and port are used for PSIP guide generation. Set to -1 to disable.

Figure 59 Multicast Guide.XML

To generate a scrolling guide with a Guide.XML system, the first octet of the DestIP must be 226.

6.14.4 EPG Customization and Channel Mapping
Program Guide can be customized to serve two purposes:

- Match the guide information to the property channel lineup.
- Insert PSIP data to facilitate channel mapping and programming information. Note: check with television manufacturers for PSIP and channel mapping functions in Hospitality environments

To customize the EPG to match the property’s lineup you will need to edit the EPG data

- You may edit the EPG information in the text field on the EPG 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.
6.14.5 EPG Editing
In the example below, we will edit a typical EPG entry
The first line of text is:

RF channel 33-1 is playing DIRECTV channel 621 in HD on QAM20 1 Port 65

Changing the RF channel designation will change the guide display and send PSIP information to the TV.
2-0 621-65535 –sd-1 65
The EPG will now display program information for channel 621 on channel two in the guide
RF channel 33-1 will be mapped to virtual channel 2

Once you are finished entering all of the information necessary to build your EPG copy the information from your text editor, paste into the EPG data field and click the “Submit Query” button at the bottom of the screen. Wait 5 -10 minutes for the guide to build. The resulting guide should look like Figure 60 below.

![Figure 60 - EPG Channel](image-url)
6.15 Welcome Screen
The welcome screen feature allows the creation and playback of up to 10 static images on a QAM channel. This is useful with Hospitality TVs and DCI401MCS boxes. The UCW4026MCS gets its unique “landing page” from the AT&T Advanced Entertainment Platform server.

➢ Each welcome channel will use the EPG function on a card not currently being used for EPG or Guide.XML
➢ The images will change approximately every 15 seconds. EPG on each COM51 card can send an image to a different QAM port.

6.15.1 Welcome Screen Image Creation
Welcome screens need to be formatted as 24-bit 720x480 bitmaps. There are multiple software tools to edit images. For the purpose of this exercise, we will use PowerPoint to create a screen and Paint to size the display file.

➢ Create an informational slide in PowerPoint as shown below in Figure 61.

![Figure 61 Welcome Page PowerPoint Slide](image)

➢ Save the PPT as “welcome1” (all lower case with no spaces) as a Device Independent Bitmap (*.bmp), as shown in Figure 62 below:

![Figure 62 - Welcome Screen Image Creation](image)

➢ Next open the file in Microsoft
➢ Use the Resize and Skew feature to set the image to 720X480 as shown in below in Figure 63.
   o Select Resize by Pixels
   o Set Horizontal to 720
   o Set Vertical to 480
   o Uncheck Maintain Aspect Ratio
   o Click “OK”

Figure 63 - Welcome Screen Settings Using Microsoft Paint
➢ Image will resize to correct format as shown below in Figure 64.

➢ Save file!!!
➢ Repeat the above procedure to create multiple screens, welcome2, welcome3, etc. Note file names must be lower case with no spaces.
6.15.2 Uploading Welcome Screens to COM51

Determine card to use:
➢ Access a COM51 card not currently running the EPG (see the EPG status in SysInfo)
➢ Navigate to the COM51 PairingInfo tab
➢ Upload welcome images one at time to the cards tftp section as shown below in Figure 65.

![Figure 65 Upload File to COM51 TFTP]

Select EPG tab
➢ Enter the IP address and port# of the QAM you want to use to stream the welcome screen.
➢ Enter 2 in the Mode field.
➢ Enter the IP address of card you are using for FTP
➢ Paste or enter the name of the file you uploaded to the COM51 TFTP.
➢ Click Submit.
➢ Reboot the COM51. When the reboot is complete the card’s EPG page will look like Figure 66 below:

![Figure 66 - Upload Welcome Screen Image to EPG]
6.15.3 Adding Welcome Screens to Guide Data
Welcome screens should be included in EPG/IPG programming to facilitate channel mapping and inclusion in EPG/IPG guides.

- Enter the welcome screen channel and mapping information into the guide as if it was any other external source being modulated by the QAM20.
- Log into the COM51 card running EPG and add the channel to the EPG information as shown in Figure 67.

![Figure 67 - Adding Welcome Screen to EPG and PSIP](image)

You can verify the screens are streaming by checking for data on the corresponding QAM port as shown in Figure 68 below.

![Figure 68 - Verify Welcome screen is streaming](image)

6.15.4 Disabling Welcome Screens
To disable the Welcome screens
- Set the Mode field to 0.
- Click Submit.
- Reboot card.
7 QAM20

The QAM20 setup is very different than the QAM6 unit. Output RF channels can be assigned to individual QAMs and the setup has been streamlined.

7.1 Accessing the QAM Page

The QAM tab of the COM51 user interface can be accessed in one of two ways:

From the Overview Page QAM summary click on the QAM IP address hyperlink as shown in Figure 69.

![Figure 69 - QAM Summary Hyperlink](image)

From the QAM tab of the COM51 user interface enter the IP address of the QAM in the field and click Submit as shown in Figure 70.

![Figure 70 - QAM Tab IP entry](image)
7.2 **QAM Software Version**

Before beginning the installation verify:

- QAM software version matches the latest available on the Technicolor website.
- Software version is displayed in the Control section at the bottom of the QAM page as shown in Figure 71.

**Control**

```
chassisId = 1, hwVersion = 3.1, swVersion = 1.4.5, tempC = 58
MAC = 60:3d:26:9f:3d:39, licenseCount = 48
```

![Figure 71 - QAM Software and License Count](image)

7.3 **Updating QAM20 Software**

The QAM20 will utilize the TFTP server on the COM51 card for software updates. Use the TFTP section of the COM51’s pairing info screen to upload the QAM20 software. Once uploaded, copy the file name, navigate to the QAM tab. Paste the filename into the filename field. Click submit. (QAM20 does not need to be rebooted to accept the software update)

**Control**

```
chassisId = 1, hwVersion = 3.1, swVersion = 1.4.5, tempC = 58
MAC = 60:3d:26:9f:3d:39, licenseCount = 48
frequencies: Index=1 Freq=23 Count=48 //freq=0 to disable
config:
alternateIp: 192.168.6.99
tftpIp: 192.168.3.18
tftpFilename: qam20_main_image_v1.4.5.bin
reset: 0
Submit
```

7.4 **QAM License Count**

Verify the QAM20 license count is correct for your installation and matches the bill of materials from your distributor.

- QAM20 license files are uploaded using the same procedure as software updates.
- License count is displayed in the Control section, next to the MAC address

**Control**

```
chassisId = 1, hwVersion = 0.0, swVersion = 1.2.0, tempC = 39
MAC = 80:c6:ab:c0:02:0f, licenseCount = 48
```
7.5 Setting QAM Output Channels
The QAM carriers can be assigned in one of two 128 RF channel groups
➢ Low group channels 1-128
➢ High Group channels 26-158

If you need to utilize channels above 128 you must have all QAM carriers at or above 26
Channel outputs are set using the three boxes in the control section as shown below in Figure 72.

Control

chassisId = 1, hwVersion = 0.0, swVersion = 1.2.0, tempC = 39
MAC = 80:c6:ab:c0:02:0f, licenseCount = 48

frequencies: Index=-1 Freq=23 Count=48 //freq=0 to disable

Figure 72 - Setting QAM Outputs

The three boxes at the bottom of the control screen are used to reference the following:

➢ Index - Sets the QAM index referenced in the first column of the QAM table. By default, the field is populated with -1. As a safety measure you must delete the -1 and enter the QAM Index.
➢ Freq - Sets the QAM carrier index to be assigned to the QAM referenced in the first box
➢ Count - Sets the number of QAMs to be set in sequential order
In the example shown in Figure 73, we are setting QAM 1 to channel 23 and will set all remaining QAM outputs in sequential order. When submitted the QAM output channels will be listed in the column labeled Chan in the QAM table.
7.6 Setting Unique RF output to a QAM index

RF carriers can be assigned for an individual QAM index or group of QAM indexes. To set a unique RF carrier for an individual QAM index:

➢ Enter the QAM number in the Index box
➢ The desired output frequency index in the Freq box
➢ Enter a 1 in the Count box to change only that QAM output

In the example shown below in Figure 74 we will change QAM Index 48 to channel 90.

Once you enter the information click submit. You will see QAM index 48 now has an output carrier index of 90 as shown below in Figure 75.
7.7 Setting the frequencies for a group of QAM carriers

A group of QAM carriers can be set:
➢ Enter the first QAM carrier to be set in the Index box
➢ Enter the frequency index in the Freq box
➢ Enter the number of QAM carriers to be set in sequential order

In the example shown in Figure 76 and Figure 77 we will change the outputs of QAM carriers 38-48 to channels 70-80.
Click Submit and the new QAM carrier outputs will display in the table.

Control

chassisId = 1, hwVersion = 0.0, swVersion = 1.2.0, tempC = 39
MAC = 80:c6:ab:c0:02:0F, LicenseCount = 48

Figure 76 - Changing Outputs Channels on a Group of QAMS

Figure 77 - QAM Group Outputs
Simultaneous QAM and Multicast IP Output

Like the COM2000, the COM3000 system is capable of outputting both IP and QAM signals simultaneously. The QAM20 can capture multicast streams that match the alternate IP address range.

- This process requires setting the alternate IP address to a multicast IP address with the 3rd and 4th octets set to zero. (for example: 239.100.0.0)
- Send video to specific multicast address values with a UDP port value 5000 or higher.
- The 3rd and 4th octet values will be converted to a virtual port number which controls which QAM carrier and program the video is directed to.
- The COM3000 QAM20 has a much larger capacity and the port designations extend beyond the limits of an IP address 4-octet.
- In order to fully utilize the 48 QAM capacity of a QAM20 the port numbers for QAM Index 16 and above must be converted to use both the 3rd and 4th octet of the multicast IP address.
- There is a formula to accomplish this:

\[
\text{Port} \# / 256 \text{ rounded down to whole number} = 3\text{-octet} \\
\text{Port} \# - \text{Third Octet value} \times 256 = 4\text{-octet}
\]

<table>
<thead>
<tr>
<th>Port #</th>
<th>Port/256 = 3rd Octet</th>
<th>Port - (3rd Octet) * 256 = 4th Octet</th>
</tr>
</thead>
<tbody>
<tr>
<td>257</td>
<td>257/256 = 1.003 (round down) =1</td>
<td>257 - (256*1) = 1</td>
</tr>
<tr>
<td>258</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

If the Alternate IP field of the QAM20 is set to 239.100.0.0 then the IP address to send data to port 257 would be: 239.100.1.1:5000

The table on the following pages provides the correct IP and Port assignments.
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<th>Port #</th>
<th>3rd octet</th>
<th>4th octet</th>
<th>QAM Index</th>
<th>Port #</th>
<th>3rd octet</th>
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<tr>
<td></td>
<td>242</td>
<td>0.242</td>
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<td>498</td>
<td>1.242</td>
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<td>754</td>
<td>2.242</td>
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<tr>
<td></td>
<td>243</td>
<td>0.243</td>
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<td></td>
<td>499</td>
<td>1.243</td>
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<td>755</td>
<td>2.243</td>
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</tr>
<tr>
<td>16</td>
<td>257</td>
<td>1.1</td>
<td></td>
<td>32</td>
<td>513</td>
<td>2.1</td>
<td></td>
<td>48</td>
<td>770</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>258</td>
<td>1.2</td>
<td></td>
<td></td>
<td>514</td>
<td>2.2</td>
<td></td>
<td></td>
<td>771</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>259</td>
<td>1.3</td>
<td></td>
<td></td>
<td>515</td>
<td>2.3</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
7.9 QAM20 qamLog
The qamLog button will display the QAM20 log. Each time the qamLog is read, several capital ‘C’ characters are appended to the end of the log. To determine if the QAM20 is “happy”, click the qamLog button twice with several seconds between presses. Ideally the qamLog will show “CCCCCCCCC” at the end of the log.

A lower case ‘c’ followed by two numbers indicates a continuity counter error which indicates missing packets. Add one to the first number to determine the QAM carrier. Add one to the second number to determine the program number. For example, “c12” indicates that the second QAM carrier, third program has missing packets.

A ‘P##’ indicates a PCR time continuity with the two numbers meaning the same as above.

Many errors often indicate that two different video sources are being sent to the same UDP port.

7.10 QAM20 UDP ports
The QAM20 UDP ports are defined by the formula:

\[ \text{Port} = \text{QamChannel} \times 16 + \text{QamSubChannel} \]

For example, if the second QAM carrier is set for frequency index 24, to send video to 24-3, the video should be sent to UDP port \(2\times16+3 = 35\).

7.11 Input of External Sources to QAM20
External programming sources that provide UDP MPEG2 transport streams (such as audio/video encoders) can be routed to an unused port on the QAM20 and broadcast through the coaxial plant.

➢ Set destination IP in the encoder to the IP address of the QAM20 and an unassigned QAM port.
➢ Input must be an MPEG2 transport stream.

7.12 Steaming Multi Program Transport Stream to QAM20
To stream Multi Program Transport Stream (MPTS) to the QAM use the QAM Index port base (multiple of 16 displayed in QAM20 tab under port base).

➢ This will pass all information contained in the stream, including PSIP data through to the QAM output. Care should be taken when mapping channels.
➢ For example: An off-air local channel stream will map the channels to the local PSIP assignment, not to the QAM output carrier.
➢ When used a MPTS stream should be the only data streamed to a specific QAM carrier.
8 Vidplay Software

Vidplay is a small executable program created by Technicolor to stream content from a local PC.

➢ Save the MPEG2 transport stream as a .ts file.
➢ Create a folder on your PC desktop named vidtest.
➢ Save vidplay.exe file and the video files in the folder.
➢ To play the video open a DOS prompt and enter cd desktop/vidtest

C:\Users\Angelo>cd desktop/vidtest

➢ At the vidtest prompt enter: vidplay QAMIP:port filename

➢ Example: vidplay 192.168.6.2:20 Kingstest1.ts

➢ When the exe runs you will see the information at the top of the dos shell window.

➢ Navigate the COM3000 QAM tab and verify it is streaming to the QAM

➢ In this case the video will play on ch 23-4
➢ The video will continue to play in a loop until the DOS window is closed.
# Troubleshooting

## Software Version
Before troubleshooting be sure all components of the COM3000 are running current software. Software can be found on the Technicolor website or from your distributor.

### Verify Satellite Feed
- Before troubleshooting the COM3000 verify satellite signal passes EIV check on the DIRECTV AIM meter at the COM51 input.

### QAM Output Strength
- Use a test TV and field strength meter to test picture quality directly from the COM3000 QAM output.
- Signal from the QAM will need to be attenuated to correct levels (~20dB)
- A DCI401MCS set back box is a good troubleshooting tool to verify picture quality.

### BCM_Rfmicro
If the COM51 syslog contains multiple BCM_Rfmicro errors then there is not enough attenuation between the COM51 and SWiM. Attenuation should be added between the SWiM and the COM51. The error indicates that the COM51 didn’t receive expected SWiM protocol messages from the SWiM. This may cause SWiM registration errors. AT&T recommends a DRE pass through tap.

## COM51 Reset Button

Figure 79 below shows the COM51 reset button, accessed via a small hole in the front of the card below the AT&T logo.
The button serves three purposes:
- Momentarily depressing the button results in a COM51 reset, like a power cycle or a software reset
- Depressing the reset button for 30 seconds will result in a factory reset
  All settings will revert to factory defaults
  IP address will revert to default for chassis / slot
  License files will revert to HD + Streamout
- Holding the reset button for 60 seconds will result in a factory reset and force a recovery to download an image from an external TFTP server. Server must run on a PC with an IP of 192.168.1.254. File should be the latest COM51 software with the filename changed to “COM51.bin”

![COM51 reset button](image-url)
9.1 Troubleshooting Common Problems

The most common problems encountered with the COM3000 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, Ethernet, and coaxial cables) are fully plugged or screwed in.
➢ Proper RF signal levels are available at the inputs to the system.
➢ An AT&T / DIRECTV AIM meter must be used to test the signal quality. An EIV test must return a fully passing result on all transponders.
➢ COM51 RF input 1 is the lower RF input, connection of a DSWIM to this input will facilitate use of the first 15 tuners.
   o A DSWiM connection to input two is required for full 23 tuner configuration.
➢ Once you have ensured that all RF parameters are correct, try retuning and/or rebooting any problematic cards.
➢ Verify the COM51 has been properly authorized. Check CAM logs and Syslog for errors. A COM51 card will not return a 721 error if it is properly authorized.
➢ Escalate authorization issues to your distributor, AT&T retailer services, of your ASM.

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

10 Preventing Pro:Idiom Key Loss

There are two mechanisms which may cause Pro:Idiom key loss in some commercial television sets: Unapproved mapping or remapping of PIDs

➢ If external video sources are using PIDs normally reserved for Pro:Idiom key PIDs the TV may lose its ability to decrypt Pro:Idiom channels.
➢ High quality Edge QAM modulator will relocate the Pro:Idiom key PID to a protected range
➢ Separate off-air and external video sources from Pro:Idiom channels.

11 Transcoder Operations

As DIRECTV migrates away from broadcasting SD content, existing COM systems configured to these channels will need to transition to the corresponding HD channels. However, the HD channels are encrypted and may not be suitable at the current installation. In order to continue to provide the SD digital channels to the property the encrypted HD content will need to be transcoded back to unencrypted SD.
AT&T has approved the use of the Video Propulsion FG4630 HD MPEG4 to SD MPEG2 transcoder. Other transcoders are also available. This device receives encrypted HD programming from the COM system over IP, transcodes it to unencrypted SD and streams it back over IP to the Technicolor QAM.

To assist in integration and configuration of the system Technicolor has created a streamlined procedure for both COM46 and COM51 receivers.

Minimum Required Software:
- COM46 version 03.03.91
- COM51 version 04.01.27

A license key for transcoding will be required. This feature license file is available from your Technicolor distributor at no charge but requires AT&T approval.

Once the software and license keys are loaded on the cards there is an “easy button” that will configure the COM cards for integration with the Video Propulsion Transcoder.

Verify the following before starting:
- The COM system is currently authorized and tuned to the correct channel lineup.
- You have followed AT&T procedures to authorize the customer account for HD
Navigate to the COM cards **TuneAll** tab and click on the Transcode button.

![Transcode button](image)

### Current Tuning Table

```
1-1-1, 192.168.6.2:17, 202-65535:0;
1-1-2, 192.168.6.2:18, 204-65535:0;
1-1-3, 192.168.6.2:19, 206-65535:0;
1-1-4, 192.168.6.2:33, 206-65535:0;
1-1-5, 192.168.6.2:34, 212-65535:0;
1-1-6, 192.168.6.2:35, 218-65535:0;
```

You will see the channels populate in the text field formulated for use by the transcoder.

- Adding 50 to the IP address
- Adding 20000 to the port number
- Changing SD channels to HD channels.
- Changing the Security Mode to 3=Transcode

Click submit to accept the changes. As usual the system will display the discover screen when tuning is completed.

The encrypted HD video is received by the transcoder at 192.168.6.52. It is then decrypted and transcoded to unencrypted SD and forwarded to the Technicolor QAM at 192.168.6.2 and port 20000 less than the input port.

Example:

```
VP input 192.168.6.52:20017 -> VP output 192.168.6.2:17
```
To confirm the changes are successful and the system is working well, you can verify the bitrate of the transcoded video in the web interface.

12 Receiverless HD

Under certain environments AT&T will allow HD programming to be broadcast without Pro:Idiom encryption. The programming is in MPEG4 format which some TVs will not receive. It is advised that you test TVs on site and provide options for set top boxes such as the Technicolor DCI401MCS for televisions that are not capable of processing the MPEG4 signal. Consult with your distributor or AT&T area service manager for more information on receiverless HD.

13 Syslog Server Setup

The COM51 card syslog retains 500 lines of text for review in troubleshooting. Old entries are deleted as new entries are added. To preserve syslogs for a longer period for troubleshooting a syslog server may be set up on a local PC.

There are multiple syslog programs available. For this exercise we are using TFTPD32.

Tftpd32 is a free program you can download at [http://tftpd32.jounin.net/tftpd32_download.html](http://tftpd32.jounin.net/tftpd32_download.html). You may have used this program in the past to upgrade software on COM24 cards.

Below are the steps to create a syslog server:

1. Download and install Tftpd32
2. Enter IP address of your PC in the COM51 card. (PC network card must be set to the same subnet as the COM51 system. In this example we are using the default 192.168.3.XXX network settings.
3. Below is the result of an IPCONFIG command line request showing the network settings:

```
C:\Windows\System32\ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection 2:

    Connection-specific DNS Suffix . : 
    IPv4 Address . . . . . . . . . . . . . . . . . . . : 192.168.3.108
    Subnet Mask . . . . . . . . . . . . . . . . . . . : 255.255.0.0
    Default Gateway . . . . . . . . . . . . . . . . . : 192.168.3.1
```
From the Advanced Edit page scroll to the User Config section:

**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.

Enter the IP address of your PC in the “Log_IP” field. Leave the “Log_Level” field blank. Repeat this step for each card you want to capture logs from.

Reboot the card(s)

Create a directory named “syslog” in the root of the C drive. (c:\syslog)

Open the Tftpd32 program and click on the GLOBAL settings. Select Syslog Server, uncheck other boxes. Click OK.
In the TFTP settings menu go to SYSLOG check the “Save syslog messages” box and enter the file location in the “To file” field: Click OK.

From the TFTP main screen select the “Syslog Server” tab. You will see the syslog information displayed in the text box, designated by the IP address of the card in the “from” column.

Open the syslog.txt file you created and verify the log information is populating the file.

The syslog files will grow large pretty quickly especially if you are logging several COM51 cards simultaneously. You may want to archive the files every couple of hours.

To archive the files:
Stop the Tftp server
Change the name of the syslog.txt file to something you can refer to later such as 1025_1600syslog.txt. In this case I used the date and time.
Restart the Tftp server and verify the new syslog file is populating.
14 Open Software Notification

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

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