

# Axciter

Digital ATSC Exciter-Modulator



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## Digital Exciter-Modulator System

### *Complete ATSC Capabilities*

The Axciter adaptive digital television modulator is the most advanced ATSC exciter available today. Building on the field-proven hardware platform of Axcera's digital exciter family, the Axciter offers terrestrial broadcasters the most flexible solution available. The Axciter supports ATSC, ATSC Mobile DTV and Distributed Transmission System (DTS) slave mode. Because it operates using 100% digital signal processing, the Axciter can evolve as broadcast requirements change, helping to protect your investment for many years to come. The Axciter is also a perfect candidate to retrofit existing transmitters, regardless of transmitter manufacturer; making any transmitter DTS and ATSC Mobile DTV compatible.

The Axciter utilizes a patented VSB modulation technique, which makes it possible to generate a virtually perfect 8-VSB IF signal. Since the Axciter is a completely reprogrammable digital television exciter, it can be easily upgraded in the field with new software versions. Critical parameters can conveniently be set and queried directly on the color LCD screen or via a remote or local interface to a personal computer.

The DSP circuitry also handles frequency offsets allowing any number of user selectable offsets. In addition, asynchronous resampling techniques compensate for errors in the SMPTE-310M input sample rate, ensuring the best possible signal generation.

The companion upconverter/downconverter accepts the standard 44MHz IF output of the digital VSB modulator and produces on-channel RF for any TV channel. The upconverter section, which is based on proven frequency agile dual-conversion technology using low noise PLL sources, requires no fixed channel filter in its signal path. This allows any channel to be selected directly from the front panel display with no tuning or hardware changes required, enabling a single broadband transmitter to back up multiple channels. This also simplifies spare parts stock as the hardware is the same for all channels. The downconverter section converts the output signal samples back to IF for adaptive signal processing

Both the upconverter/downconverter and Axciter modulator can be locked to an external 10 MHz reference for synchronization or precise frequency offset control. Non-volatile operation is achieved through flash-RAM (random access memory), which stores all digital settings for the entire exciter-modulator system. This ensures that in case of power loss, the system will return to the previously selected settings when power is restored, saving time by eliminating the need to re-enter operating parameters.

## Adaptive Equalization

### *An Industry First*

Standard with all Axciters, our exclusive Axcera Adaptive Correction Technology (AXACT™) provides dynamic digital pre-correction that automatically tracks and corrects for distortions, both linear and non-linear, in the complete transmitter system. All adaptive operations are performed in the high-speed processor, which is capable of quickly equalizing a complete transmitter system and completing a full system optimization.

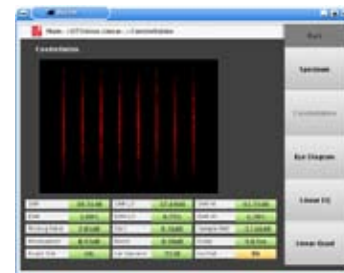
The continuous, real-time, non-linear component of AXACT is by far the most critical element of the correction system. Since the majority of linear distortions are caused by factors external to the transmission system, ATSC receivers are designed to correct for large amounts of linear distortions. However, since these receivers cannot correct for non-linear distortions, this must be handled in the transmitter system or coverage will be affected in the fringe areas.

To obtain the necessary data, AXACT continuously samples the transmitter system output, both before and after the mask filter, through a downconverter integral to the upconverter tray. The modulator processes the data and the necessary digital precorrection is applied to the modulator output signal, resulting in consistent transmitter system performance, independent of environmental changes.

The Axciter also performs over fifteen safety tests upon each adaptive correction run to confirm that the new correction values are appropriate before applying them to the on-air signal. This ensures that the signal will not be negatively affected by a failure of an RF component in the sample path, such as an RF coupler, connector, relay or cable.

## DTVision™ Signal Analysis

### *All In One System Testing*



Available on all Axciters is Axcera's exclusive DTVision digital signal analysis and test system. Designed to eliminate the need for expensive DTV test equipment at a fraction of the price, this system samples the transmitter output and measures critical transmitter performance parameters. The information is then displayed in high-resolution graphical format on the modulator's full VGA front panel display with no external PC required. Optional remote GUI software allows an operator to monitor the Axciter from any location that has Internet access.

Available performance parameters include digital SNR, error vector magnitude (EVM), eye diagram, graphs of adaptive equalizer performance and RF spectrum, constellation diagram, and more.

## Dual Processors

### On-Air Reliability

Every Axciter employs dual processors to ensure on-air reliability. The low-level control computer is a simple processor that is dedicated to running the modulator hardware, which generates the ATSC signal. This processor uses a highly reliable real-time operating system based on uC/OS for the mission critical 8-VSB signal generation.

A second computer is dedicated to providing the adaptive processing, user interface, diagnostics and graphics, using the very stable and reliable Linux operating system. This high performance computer handles the processor intensive functions of performing all adaptive correction and processing the data for the optional DTVision signal analysis measurement and display, all without negatively affecting the critical on-air signal path. In the unlikely event of a failure of this computer, the Axciter remains on the air with a fully corrected ATSC signal. The Linux computer may even be rebooted with no interruption of the on-air signal, and the Axciter is capable of a cold start without the Linux computer. The net result is an extremely high level of on-air reliability.

The Linux computer also allows simple field upgrades to new operating modes, such as DTx slave, ATSC Mobile DTV, or other yet to be adopted ATSC enhancements, as they become available.

## Distributed Transmission (DTx) Slave Mode

### Improved Coverage, Lower Power Consumption

Continuing Axcera's leadership position in Distributed Transmission Technology, any Axciter can be easily field configured for slave mode operation, allowing DTx single frequency operation. DTx can allow a broadcaster to target population centers with much smaller transmitters than would be required for a typical single transmitter architecture. With a well designed system, DTx results in improved coverage throughout the licensed contour, lower overall power consumption, and inherent system redundancy.

## ATSC Mobile DTV (M/H) Capable

### Seamless Migration to ATSC Mobile DTV Service

As a leader in Mobile TV Transmission Technology, Axcera has designed every Axciter to support ATSC Mobile DTV service with a simple software upgrade and no change in hardware. The Axciter can be deployed in three modes by a change in software; Standard ATSC (A/53), Distributed Transmission (A/110) and ATSC Mobile DTV (A/153).

## Interface

Frequency Range	
Low-Band VHF	54 to 88 MHz
High-Band VHF	174 to 216 MHz
UHF	470 to 806 MHz
Transport Stream Inputs (two available)	
Connector	75 ohm, isolated BNC
Input Signal	ATSC compliant SMPTE-310M, 19.39 Mbps, ASI (optional)
Cable Equalization	Automatic
10 MHz Reference Input	
Connector	50 ohm, BNC
Input Signal	-10 to +10 dBm
1PPS Timing Input	
Connector	50 ohm, BNC
Input Signal	TTL
RF Output	
Connector	50 ohm, BNC
Power Level	-10 to +10 dBm, average
Downconverter RF Sample	
Input Connector	50 ohm, BNC
Dynamic Range	-25 to -10 dBm

## Performance

Output Power	-10 to +10 dBm, average (+20dBm optional)
Regulation of Output Power	1% or less
Frequency Stability	±50 Hz (max variation over 30 days) ±2 Hz (with Precise Frequency Option)
Pilot Frequency Offsets	Continuously adjustable in <0.1 Hz steps
Pilot Frequency Dependence on SMPTE-310M Input	
Static	Independent
Transient	Independent
Response Variation	0.2 dB, typical
Group Delay	2 nS, typical
Phase Noise	-104 dBc/Hz or better at 20 kHz offset
Signal to Noise Ratio	>40 dB, typical

## General

ATSC Standards	A/53; A/110; A/153
Operational Temp. Range	0° to 50° C, derate 2°C /1000 ft.
Operational Humidity Range	0% to 95%, non-condensing
Maximum Altitude	10,000 feet AMSL
Size (H x W x D)	
Modulator	5.25"x19"x24" rackmount
Upconverter/Downconverter	3.5"x19"x24" rackmount
Weight	32 lbs. (total mod & uc/dc)
Input Power	117/230 VAC ±10%, single phase, 50 or 60 Hz
Power Consumption	225 Watts typical

## Manufacturing & Support

The Axciter is completely designed, built and factory tested by Axcera under strict ISO 9001:2008 control. This ensures the highest quality manufacturing practices and provides parts and service availability in a very timely fashion, keeping you on the air.

Axcera is serious about our commitment to "Total Customer Happiness." When you choose our products and systems, you will also receive our relentless commitment to your overall satisfaction. Our extensive RF capabilities and experience enable us to provide design and integration services and ongoing customer service and support that are unparalleled in the broadcast industry.

Axcera offers complete RF coverage analysis, system design and integration, installation, project management and support services directly and through our global network of integration and support partners. Our knowledgeable account managers and systems engineers will work with you to ensure that you are provided with a solution that is optimal for your needs. Our world class integration, installation and support team is well recognized in the industry for its exceptional customization capabilities and installation craftsmanship.

Our industry-leading Customer Support Group is a team of experienced field service technicians available 24/7. Our team is also available to travel to your site to quickly resolve any service issues. They are also available for routine maintenance, equipment installation, proof of performance testing and product training.

Our professional support is available by phone 1-800-215-2614 or +1 724-873-8100 or email: [service@axcera.com](mailto:service@axcera.com).

At Axcera we look forward to the opportunity to demonstrate our commitment to your total happiness with our products and services.



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