FlexStar®

FM/FM-HD Radio™ Direct Digital Exciter and Embedded HD Radio™ Importer/Exporter
The FlexStar® trio of products — HDx exciter, the HDE 200 Program Exporter™ and HDI 200 Data Importer™ — are a cost-effective, high-performance, end-to-end solution for conversion to HD Radio™.

**FlexStar HDx Exciter:**
**Performance, Flexibility, Quality**

The FlexStar HDx exciter is a dual output, tri-mode exciter—the first on the market—handling HD, analog FM or FM+HD simultaneously, and is designed to accept the broadest range of analog and digital inputs.

Two exciters in one: The HDx exciter delivers a flawless digital signal, with complete technical and regulatory compliance for GatesAir tube and solid-state HD Radio™ transmitters. It works with analog systems as well, enhancing FM audio quality, and when the time is right, can be easily upgraded to HD Radio.

GatesAir™ Real-Time Adaptive Correction (RTAC™) technology in the FlexStar HDx exciter continuously monitors the transmitter output, and automatically adapts for system nonlinearities, maximizing coverage and keeping the station well within FCC compliance.

The FlexStar HDx exciter delivers sustained quality and performance with its integrated digital stereo generator and adjustable Digital Composite Limiter (DCL), using proprietary algorithms to anticipate and eliminate over-modulation peaks before they occur.
Easy Transition to HD Radio

To convert to HD Radio, add the HDE-200 embedded HD Radio exporter and the HDI-200 data importer, if Advanced Applications Services (AAS) such as supplemental program audio or additional data transmissions are needed.

Incredibly versatile, the FlexStar HDx exciter will far exceed current requirements and easily enables future station growth.

FlexStar HDx Features

- Embedded digital signal processing (DSP) based FM, HD or FM+HD exciter
- Direct-to-channel digital FM modulation
- Dual-output, tri-mode FM, HD or FM-HD operation (two exciters in one)
- RTAC (Real-Time Adaptive Correction)
- Digital adaptive group delay equalization
- Optimized correction for FM tube and solid-state transmitters
- RF mode switching on-the-fly
- Integrated N+1 control system
- Highest-quality FM analog performance
- 10 MHz input reference for synchronous booster and single frequency network (SFN) support
- Easy-to-use graphic user interface (GUI)
- Spectrum display; shows real-time performance
- Integrated digital stereo generator with updated digital composite limiter
- Two built-in subcarrier (SCA) generators
- Integrated, static Radio Broadcast Data System (RBDS) generator
- Up to three external subcarrier inputs
- Auto-switching between analog, AES-3 Main and AES-3 AUX inputs for on-air reliability
- Compact design (only 12 in. deep); eliminates external racks; fits in any GatesAir transmitter
- Efficient, easy-to-service interior
- High-efficiency, auto-ranging power supply
- Internal harmonic filter for stand-alone transmitter
N+1 Frequency Agility
The FlexStar HDx exciter can employ N+1 frequency agility, permitting on-the-fly switching of frequencies--perfect for a broadband transmitter used to backup multiple stations in a market. Up to eight frequencies can be programmed and remotely selected to support N+1 systems.

Precorrection Technology, Cost Savings
Featuring GatesAir RTAC (Real-Time Adaptive Correction) precorrection circuitry, the FlexStar HDx exciter enables transmitters to deliver linear amplification without costly RF bandpass filters. RTAC technology also increases efficiency, saving power, and exceeds the FCC's RF mask requirements to prevent signal interference.

Dual-Output Exciter, One Compact Package
The FlexStar HDx dual-output exciter drives two FM/HD transmitters for quality performance and operating efficiency. Each output can provide both HD Radio and analog FM modulation, making the system configurable to your station's needs. The FlexStar Boost-Pro accessory enables broadcasters to easily drive dual transmitters and eliminate complex RF-phasing hardware, reducing components and maintenance. The compact FlexStar HDx exciter eliminates the need for a deep rack.

Seamless Migration Path to HD Radio
For customers needing a new transmitter, with plans to someday shift to HD Radio, purchase an HD Radio-ready transmitter with a FlexStar HDx analog exciter and add a GatesAir exporter and Exgine upgrade card when it's time to migrate to HD Radio operation.

Integrated Stereo, Dual SCA, RBDS Generators
A multitude of built-in features, such as a digital stereo generator with adjustable composite limiter, two frequency-agile SCA generators and a static RBDS generator, eliminate the need for outboard equipment.

Secure Investment, Unrivaled Digital Experience
GatesAir is the industry-leading provider of solutions for the most complex technological challenges in broadcast, and is committed to helping customers achieve optimum HD Radio performance. GatesAir has been the provider of transmitters for every major HD Radio test, including multicasting.

Multiple Transmitters, Easy Installation
The FlexStar Boost-Pro is a seamless interface of the HDx exciter's second RF output and a second transmitter. With Boost-Pro, a single FlexStar drives dual-transmitter configurations for high-level, separate antennas or GatesAir’s exclusive efficiency improving Split Level™ combining. The integrated electronics phasing control eliminates complicated RF phasing equipment. Boost-Pro features the same reliable, sturdy tri-mode RF amplifier as the FlexStar HDx, and has the same logic connections the FlexStar HDx, the world standard DIGIT®CD and or the SuperCiter™. The Boost-Pro plugs directly into GatesAir transmitters, so installation is simple, and it can also be used with non-GatesAir transmitters.

FM HD Radio Generation 3 Architecture
Front-Panel USB Port
Convenient front-panel USB port permits quick system updates. GatesAir’s exclusive USB capability enables quick backup of system configuration for later recovery or for rapid setup of additional FlexStar exciters.

RTAC Monitoring
RTAC delivers higher transmitter power and efficiencies. Verify performance with the built-in monitoring system.

User Control
Straightforward tactile control and intuitive touch-screen GUI allows for quick setup and accurate monitoring.

Main RF Output
Main high-level output of the tri-mode amplifier can operate in FM, HD only or hybrid, with up to 55 watts of analog power.

RF Sample
Ideal for connection test equipment or a modulation monitor to measure system performance.

Audio Inputs
Mono, stereo analog and dual AES inputs with auto-switching ensure your station will be on the air. Two internal SCA generators for maximum flexibility.

Exgine™ Connections
Optional Exgine™ board provides connection to HD Radio for digital broadcasting. Additional RF-45 connector provides Ethernet access to Exgine board for updates and monitoring.

RTAC RF Samples
Monitors both the output of the transmitter and the output of any filter or multistation combiners for maximum clarity and coverage.

Ethernet Connectivity
Dual RJ-45 connector provides system Ethernet connectivity to the FlexStar to facilitate diagnostics, monitoring and system updates.

GPS Reference Input
Support for single frequency networks is included in every FlexStar. GPS synchronization GatesAir’s Intraplex® SynchroCast® provides robust SPN system. Supports both 10 mHz and 1 PPS inputs.

Parallel Remote Control
Dedicated DB-type connectors provide standard for transmitter connections, interface to user remote controls, and a built-in N+1 interface for multichannel backup operation.

Serial Connectivity
Multiple communications ports provide standard serial connectivity.

Composite and SCA Inputs
Main and AUX composite inputs with auto-switch ensure your station will be on the air. Connections for up to three external SCA and RBDS generators cover even the most demanding installations. Includes 19 kHz output for RBDS.

AUX RF Output
Like the main output, this can independently operate in any mode, with up to 10 mW of power. Couple with a Boost-Pro to drive a second transmitter.
The GatesAir FlexStar HDE-200 program exporter offers a simple and cost-effective transition to HD Radio.

The iBiquity HD codec and encoding algorithms of the HD Radio system are located in the exporter, enabling connection to the Exgine exciter and to the importer for advanced services such as multicasting. Generation 3 technology allows stations to locate the importer, exporter and all audio processing at the studio. Coupled with the new GatesAir Exgine II HAX (Host Audio Extraction) option in the exciter, the stage is set for implementing a more bandwidth-efficient STL.

### HDE 200 Features

- Non-PC based — embedded DSP/microprocessor
- New lower price
- Enhanced reliability
- Fast startup time
- Silent operation: No hard drives, fans, moving parts or air filters to clean
- Front-panel controls, display, confidence monitoring, pre/post delay audio level indicators and headphone jack
- Inclusive studio interface; opto-isolated control and status, with current limited source supplies
- Comprehensive GUI via PC interface over Ethernet.
- Internal GPS. 1 PPT (10-12) accuracy. Maintains 15 PPB (10-9) with GPS unlocked (GPS antenna included)
- Outputs for GPS disciplined 1 PPS, 10 MHz and 44.1 KHz word clock
- Automatic fail-over audio bypass relay for main FM audio on any fault

![HDE 200 Block Diagram](image-url)
**Headphone Monitor**
Front-panel headphone jack and associated level control enable quick monitoring of the signal.

**Level Metering**
Convenient front-panel metering is selectable between input and post delay to provide quick confidence monitoring.

**Status Indicator**
Intuitive indicator to signal system-level faults and provide a reset point.

**Delay Control**
Easily accessible controls for the built-in diversity delay allow for a quick ramp in and ramp out for sporting events or other live operations.

**USB Support**
A USB port is provided for system updates and for saving configurations for back-up or porting to other systems.

**Three-Port Ethernet Switch**
Integrated, high-quality three-port 10/100 Mb/s Ethernet switch enables direct connection of critical broadcast chain components, such as the importer and STL, without the need for an additional switch.

**Audio Connections**
Standard AES-3 connections for the main audio-in, and delay out, as well as MPS audio in and reference monitor output.

**Arbitron Portable People Meter (PPM) Support**
Loop through connection for the PPM encoder to avoid corruption of the encoding process during delay adjustments.

**GPS Integration**
Internal GPS receiver provides standard synchronization for seamless HD Radio operation and provides reference outputs of 10 MHz, 1 PPS and 44.1 MHz.

**Parallel Remote Control**
Standard connectivity for remote control of analog diversity delay ramp in/out functions, system fault indicator and reset and full control of the integrated profanity delay for connections to delay control panel located at the studio.

**System Reset**
A recessed system reset button is available for troubleshooting without the need to remove the unit from the rack.

**Power Supply**
Integrated UL-approved auto-ranging power supply supports a wide range of voltages: 100 to 240 VAC / 48-62 Hz.

PPM is a trademark of Arbitron Inc.
The GatesAir FlexStar HDI200 Data Importer accepts, manages and multiplexes all HD Radio Advanced Applications Services (AAS). This includes supplemental audio channels into the HD Radio data stream that are sent to the HDE200 Exporter, combined into the main program services and sent to the FlexStar exciter. The HDI200 can provide new revenue with additional data services and multiple audio programs.

With the proliferation of multicasting and datacasting on HD Radio, the HDI200 makes it easy to add HD2, HD3 and even HD4 broadcast, as well as HD Radio PAD (program-associated data), album art, station logos news, traffic, weather and other text and graphical content to the HD Radio broadcasts. The GatesAir HDI200 is a 1 RU high-performance, server-grade computer with a solid-state hard drive for increased reliability and performance.

The HDI200 includes an eight-channel audio card that supports HD2, HD3 and HD4 audio and PAD services. Optional Neural™ Pre-Codec Conditioning Processor software provides the highest quality audio broadcasts even at the low bit rates. The Web-based user interface provides convenient control of the HD Radio modes and bandwidth configurations.

**HDI 200 Importer Product Features**

- **Version 4.3 Importer software**
- **Supports HD Radio multicasting**
- **Manages PAD data display**
- **Manages MPS, SPS modes and bandwidth**
- **Optional Neural Codec Pre-Conditioning Processors**
- **Fast boot time**
1 Power Indicator
Easy front panel power indicator illuminates when HDI-200 has been powered on.

2 Hard Drive Activity Indicator
Front panel solid state hard drive activity indicator, illuminates when hard drive is being accessed.

3 DVD Disc Drive
Front panel DVD drive used for complete software downloads and upgrades.

4 Front Panel USB Port
Standard computer USB port can be used for software updates or licensing key input.

5 On/Off Switch
Front panel computer on/off power switch.

6 AC Input
IEC 120VAC input connection.

7 Standard Mouse Port
Rear panel mouse connection port that supports conventional mouse interconnect.

8 Standard Keyboard Port
Rear panel keyboard connection port that supports conventional keyboard interconnect.

9 Video Display Connector
HDI 200 video display connection.

10 Ethernet Ports

11 USB Ports
Rear panel USB parts can be used for USB mouse and keyboard connections.

12 Audio Inputs/Outputs and Word Clock
Audio input connections to and from HDI 200 with word clock connection.
Real-Time Adaptive Correction (RTAC) an advanced type of digital pre-correction that enables the FlexStar HDx FM exciter to more fully utilize the transmitter power amplifier, yet maintain spectral mask compliance of the HD Radio signal. RTAC in FlexStar was derived from the award-winning GatesAir Apex™ DTV exciter and leverages adaptive digital pre-correction technology developed for digital television to correct both solid-state and IOT (tube) transmitters.

Precorrection can be implemented various ways, which are listed below in order of sophistication:

- Analog fixed precorrection
- Digital fixed precorrection
- Digital adaptive precorrection
- Digital, memoryful, adaptive precorrection (RTAC)

There are two types of precorrection used by the the Apex MZX™: linear and nonlinear.

**Linear Precorrection**
Linear precorrection corrects for the non-ideal amplitude response and time response of the transmission system, including the power amplifier and any bandpass filters. Linear precorrection helps optimize the modulation performance of the transmitted digital signal so less equalization is required at the receiver.

**Nonlinear Precorrection**
Nonlinear precorrection corrects for the two major types of nonlinearity (AM to AM and AM to PM) in the RF power amplifier that cause unwanted spectral components and poor RF mask compliance. With AM to AM nonlinearity, the RF power amplifier output amplitude does not exactly track the input amplitude. This nonlinearity occurs typically near the peak output power of the amplifier where saturation effects cause the output response to flatten as the input continues to increase and the amplifier output goes to zero.

With AM to PM nonlinearity, the RF power amplifier output phase does not track the input phase. The amplifier acts like a phase modulator as the power output varies to follow the input signal, producing undesirable sidebands.

**Fixed vs. Adaptive**
Fixed precorrection can improve the system linearity for one specific operating point, but has to be manually readjusted for changes in power output, antenna load impedance, temperature or operating point.

Adaptive digital precorrection uses an RF sample taken at the output of the RF amplifier and automatically adjusts the shape of the precorrection, continuously optimizing the linearization of the system. The bandwidth limitation, especially in tube type amplifiers (IOT) and the stored energy in tuned circuits introduce “memory effects.”

**Digital, Adaptive, Memoryful Precorrection**
Digital, adaptive, memoryful precorrection can correct for these memory effects and for simple AM to AM and AM to PM distortions. Even wideband solid-state RF amplifiers have memory effects that change the shape of the nonlinearities with digital modulation data states. RTAC is the only system with simultaneous, linear and nonlinear, adaptive, memoryful precorrection, providing total correction to all types of RF amplifiers.
HD Radio System Block

HD2 Program Source
HD3 Program Source
HD4 Program Source
Other Data Services

HD Radio System Block:
- AES
- HD2 Audio (AES)
- HD2 PAD
- HD3 Audio (AES)
- HD3 PAD
- HD4 Audio (AES)
- HD4 PAD
- GatesAir FlexStar HDI-200 Importer

12E Bi-Directional TCP/UCP Ethernet

On-Air Console
Program Automation

AES, FM Audio Processing, HD MPS Audio Processing
GatesAir FlexStar HDI-200 Embedded Exporter

AES, Time Aligned Analog FM AES Audio
AES, E2X / IP
AES, HD Radio Ethernet, 512/6's UDP or TCP

GatesAir HD-Link or STL
GatesAir FlexStar HDX-100 HD/FM Exciter
Exgine

Neural Pre-Processing
Neural Pre-Processing
Neural Pre-Processing

HD Radio System Block
ONE Company for Workflow Solutions Throughout the Media Chain

GatesAir is the ONE company delivering interoperable workflow solutions across the entire media delivery chain — providing today’s broadcaster with a single, integrated approach to capitalize on the benefits of IT and mobile applications. By providing unparalleled interoperability across our product portfolio, GatesAir is able to offer customers integrated solutions that improve workflows, save money, enable new revenue streams and provide a migration path to emerging media business models. To meet the evolving needs of broadcast, distribution, government agencies and entertainment businesses, GatesAir is the ONE answer for change.

Service and Support

At GatesAir, we are committed to customer service excellence. It is our goal to provide the highest level of support by applying a simple rule: We take ownership of helping our customers succeed. Our support teams consist of innovative technical experts who support all situations regarding product performance, integration and operational processing. We are adept at providing proven solutions, making workflows better and ensuring reliability of the product and system. At GatesAir, our experienced and dedicated teams stand ready to help you meet your goals for premium product performance, 100% up-time and reduced maintenance investment.

Warranty

Because we want to assure you that GatesAir stands beside its products and system solutions, our products carry a standard set of warranty services, which are competitive with — and in some cases outperform — others in the industry.

Service Packages

We offer value-add services that allow you to customize the level of services you need in meeting mission-critical performance levels. Our service package options offer many ways to upgrade your standard warranty by choosing the All-Inclusive OnePak, or by selecting individual services from our extensive portfolio. Our service and support advisors can assist in the selection of the individual services that best suit your requirements.

For more information, please visit GatesAir.com/products/transmit-radio.aspx

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