

Investing for the Future



Competition has gotten stiffer and it seems to be growing exponentially. Kagan Research recently devoted a complete section to analyzing the impact of new technologies on radio in its *2006 Radio Financial Databook*. The report offers these figures:

- 1) Over 40,000 Internet "radio" stations are broadcasting on the web site, Live365.com alone;
- 2) FeedBurner, a podcast aggregator, recently surpassed a major milestone of 44,000 podcast feeds;
- 3) HDTV is scheduled to go on the air fully in 2009.

And if perception is nine-tenths of the law, than it is little wonder that radio's image has taken a "hit" as the public seems to perceive it woefully behind the times in providing a "new and improved" product as the last medium to adopt digital technology. Radio now stands at a crossroads with an opportunity to become a vital part of the monumental changes in the media landscape by providing the listening public with **improved audio quality**

and reception, new formats, multiple audio channels and data services.

Biggest Thing Since FM

After many years of development and revisions, it seems that the pieces have finally fallen in place for what Ken Mueller, radio curator at the Museum of Television and Radio, calls "**The biggest update to the medium since the debut of FM in the 1940's, HD Radio™.**"

Many of the major broadcast groups such as **Clear Channel, Cumulus, Cox, Entercom and Radio One** (among others), have all made the commitment to adopt the HD Radio™ standard for their entire chains. In fact, iBiquity Digital, developer of HD Radio system, recently announced that the **1,000th digital radio station has begun broadcasting** (HD Radio™ Breaks 1,000 Station Mark, *Radio Ink*, October 18, 2006).

Buckley is Committed to HD and Harris

Buckley Broadcasting has always been committed to HD Radio making history in 2002 with its flagship station, WOR-AM, becoming the first 50,000-watt AM station to begin broadcasting in HD (using Harris' DX50® AM transmitter with a DEXSTAR® exciter).



Owner/President Rick Buckley
Buckley Broadcasting Corp.

Rick Buckley, Owner/President Buckley Broadcasting Corp., believes HD Radio is important to radio's long-term future. "With all the competition terrestrial radio is facing today, HD Radio provides a solution for both programming and technical issues."

Buckley recently named Harris a *Preferred Vendor* for HD Radio for its ten FM and nine AM stations in New York, Connecticut and California. Over a four-year period, Buckley will be adding 3DX™-50, DX® and DAX™ AM transmitters, Z-Series™ and ZX™ FM transmitters, Flexstar™ HDX-FM exciters, HDI-100 Importers and HDE-100 Exporters and DexStar® exciters. The second HD Radio installation is at WDRC-FM in Hartford, followed by installations at WSEN-FM in Syracuse, New York, and KWAV-FM in Monterey, California.

"We're a firm believer in Harris. They've been keeping all of our markets on the air for over 20 years," Buckley said.

Rick Buckley knows the future is HD Radio, and is ready to make the leap with Harris Broadcast.

Harris Leading the Way in HD

Harris Broadcast has been actively involved in the development of the digital radio standard beginning with the introduction of digital modulation for AM in 1987; the development of real time adaptive pre-correction; and linear amplification technology that is crucial for RF spectral mask compliance developed for HDTV and is fully applicable to HD Radio. Harris assisted the digital radio group, Project Acorn, in 1989, and continued its digital radio commitment with the USA Digital Corporation, Lucent Digital Radio, and finally with the formation of iBiquity Digital Corporation with the merger of USDR and Lucent. Through all the IBOC development iterations, Harris provided transmitters for In Band, On Channel testing. With Federal Communications Commission's (FCC) adoption of iBiquity's HD Radio standard in 2002, Harris continues to advise and assist in the evolution of digital radio for the 21st century.



Commercial Radio Companies

Commercial broadcast companies do have deep pockets, but they also own large numbers of stations and have stockholders to answer to. Why would these companies embark on a project that will cost them millions of dollars for new transmitters, tower modifications and equipment with few HD radio receivers in the marketplace, and very little **return on investment (ROI)** in the very near future?

Multicasting and Expanding Audiences

The answer quite simply is **multiple channels**. Harris, along with NPR, developed this concept as an outgrowth of HD Radio. What if someone told you, an FM station owner or manager, that you could acquire **up to three additional channels without having to buy more properties** (securing financing on millions of dollars, applying for approval from the FCC, relocating studios, etc.)? Would you think that it was just another Internet email scam?

FM stations have 150 kilobits per second (kbps) of total bandwidth available with HD Radio technology. This "bit rate" can also be carved into **separate program streams (e.g.,**

101.5-HD2, 101.5-HD3, etc.), which enables FM broadcasters to expand their content offerings **without requiring additional frequencies or spectrum**, and at very low incremental cost.

The big broadcast companies have discovered that for a **minimal investment** for FM (Harris ZX digital transmitter, FlexStar HDX encoder, HDI-100 importer, HDE-100 Exporter, STL PLUS™, NeuStar audio codec preconditioner) roughly \$75,000 or less (depending on the digital mode you choose), they can add channels to their original frequencies **without the added expense of licensing, equipment or station branding, while at the same time doubling, tripling or even quadrupling commercial inventory**. With cost of an **average radio station in the United States at \$1.5 million**, the savings can be compelling.



Bob Hensler
Colorado Public Radio

Colorado Public Radio Depends On Harris Broadcast For The Digital Transition

“When I first got into radio Harris was the standard for broadcasting and it has remained the standard for me through all these years.”

“We chose the FlexStar family of products because of the name. We’ve found that the new exciter and all the equipment – the Importer and Exporter – to be very flexible. It allows us to provide more streams, more channels using reduced or a limited number of transmitter sites. With FlexStar, we can bring all the audio processing back down to the studio and at a satellite head-end as opposed to the top of a mountain that is real hard to get to during the winter.”

Tomorrow Radio – Multicasting Expertise



And again Harris was at the forefront of developing and testing of supplemental digital audio channels by supplying transmitters for the **groundbreaking “Tomorrow Radio Project”** conducted by NPR (National Public Radio). Test results from these first HD Radio multicasts in New York City, San Francisco and Los Angeles were provided to the FCC for its formulation of rules for multicasting.



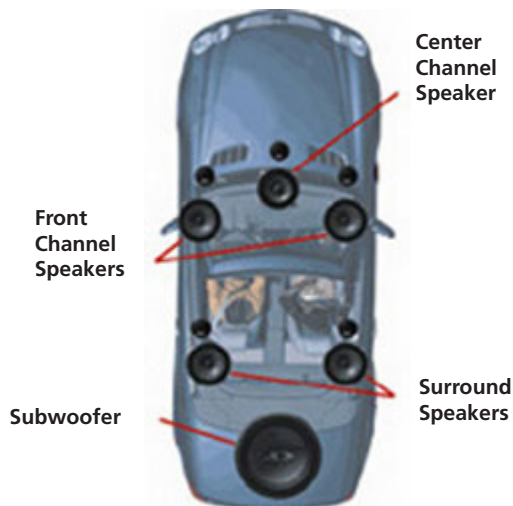
New Stations, Expanded Audiences, New Opportunities for Advertising

With the availability of these new “stations”, broadcasters can **program new formats** for their market place or **expand or augment their existing format**. CBS Radio’s country station, KMPS-FM in Seattle, Washington, has added a second channel on digital radio to cover what is hot and new in country. Clear Channel now has the only country music channel on the air in New York City with its WKTU-FM’s HD2. And the list is growing.

As a stakeholder in your local community, **the sky is the limit** on what you can offer to your listeners such as **expanded sports programming** on Fridays and Saturdays for rabid high school and college fans or a county classic channel featuring Willie, Waylon and the boys. HD Radio can **ignite and excite your audience again**, plus the additional channels will translate into **additional revenue** with your **expanded product available for sale**.

Movie Quality Sound – 5.1

Many of your listeners are installing **5.1 sound systems** for movie playback on home video systems as prices for sound systems drop drastically. With digital radio, 5.1 is not only possible, it is **extremely easy to implement with minimal changes to your physical stereo plant**. Harris Broadcast, in conjunction with Neural Audio Corporation, feature a Mix-Edit system that “watermarks” 5.1 placing it into a stereo stream for broadcast or **storage on your current storage system**. 5.1 is spectacular for music, but can you imagine the response from your advertisers when they hear the **attention getting messages that can be created using 5.1 audio?** Add to that 5.1 promos for your station, and **5.1 is the total package**.



Improved Sound Quality



With the **elimination of the static, pop and hisses and multipath issues** from the analog signal, HD Radio will **greatly improve sound quality for AM and FM** by providing FM stereo quality to AM and CD quality to FM. This improved sound opens **new format opportunities for AM broadcasters** particularly with musical content, hopefully introducing a whole new generation of listeners to the “joys” of AM radio.

With the competition heating up from iPods and satellite radio for musical listeners, HD Radio could **restore listenership** on the AM and FM band.

EXPANDED SERVICES

Exciting Data Services



HD Radio technology will allow broadcasters to offer an expanded range of **new digital information and entertainment services** with text readouts

(Programming Associated Data or PAD) on HD Radio screens. Broadcasters will be able to not only **identify a station, song title and artist**, but **datacast weather forecasts, traffic reports or congestion warnings, sports scores and updates, an advertiser’s address, phone number or web address**.

During emergencies such as hurricanes, radio stations will be able to provide **emergency information from civil authorities** including shelter information and **evacuation routes** for the road system. Advertisers will be able offer to text restaurant locations for lunchtime specials.



Harris’ DATAplus™ software system can interface with a content delivery system for managing data displays on receivers by daypart on one or more multiple systems.

Future is Bright

- Store Content
- Fee Based Services
- Buy Button
- Excess Data Stream Available

In the future, listeners will be able to: pause, store and replay audio programming; have **traffic reports and information downloaded into navigation systems for a fee based service**; have available an **electronic program guide (EPG) similar** to the service offered by cable television channels; download web pages, photos and messages; **and buy music, products and services with a special purchase button** in next generation HD Radio players. Broadcasters will also be able to **sell excess capacity** in the digital stream to companies to send data.



Harris Broadcast's Digital Expertise Perfect Fit For New Station Build Out

"What Harris has set up for Connoisseur is a clear path to HD Radio. . ."

When Connoisseur Media, a new media communications company, won the rights from the FCC to construct ten new FM stations across the United States, they were faced with the daunting task of literally building ten new stations from the ground up including dealing with designers and architects, regulatory issues of zoning and permits for the tower sites and purchasing all the broadcast and transmission equipment.

Connoisseur's Director of Technology Charles Lelievre was given the task of getting the stations online as quickly as possible and updating an additional ten existing stations. After doing some research, he found that **Harris had the expertise and experience with large scale broadcast projects** to get the job done. Best of all, according to Lelievre, **"What Harris has set up for Connoisseur is a clear path to HD Radio."**

"Harris helped me accomplish the impossible – getting at least six stations on in less than a year through quick response in the bidding process, highly competitive pricing and delivering things as promised or even earlier, especially the transmitters."



Charles Lelievre
Director of Technology
Connoisseur Media

Future Consumer Demand for Digital Radio

A recent J.D. Power and Associates 2005 U.S. Automotive Emerging Technologies Study (SM) found that HD Radio is a highly attractive feature that consumers would like to see in their new vehicles based on their estimated market prices. And they found that consumers prefer to pay a one-time fee (for a new radio) rather than a continuous monthly subscription for satellite radio.

HD Radio Car Receivers



BMW is the first car manufacturer to offer HD Radio technology as a factory-installed option. Nine automotive brands, **representing** 49 different vehicle models, **are committed to launch the technology within the next few years.** All of these receivers will have the ability to receive the additional HD channels (HD1, HD2, HD3 and HD4).

Table Top/Audio System Receivers for HD



The following companies have recently released or announced their first home HD Radio tuners: In stores – Boston Acoustics, Radio Shack, JVC and

Kenwood; coming soon – Cambridge SoundWorks, Denon, Integra, Niles, Onkyo, Sangean, Radiosophy and Rotel. Prices continue to drop for these receivers with one receiver now under \$100. A/V receiver manufacturers incorporating HD Radio technology include: Kenwood, Harmon Kardon, Marantz, McIntosh and Yamaha. HD Radio is also available in the Eclipse In-Dash Video System.

Automobile After Market Car Receivers for HD Radio

A large number of manufacturers are offering HD Radio receivers to this important market including: Alpine, Dice Electronics, Fujitsu, Harman Backer, Kenwood and Siemens VDO for the all important early adopters.

HD Radio Consumer Outlets

The industry's first three-piece CD shelf system with HD Radio, the HDX3, will be sold exclusively through Radio Shack outlets across the United States. Additionally, HD Radio car receivers are available nationally at Crutchfield and Tweeter web sites and outlets.

Other consumer suppliers carrying HD Radio are: Best Buy, Amazon.com, HI-Fi Buys, Mickey Shorr, Car Toys, J&R, ABC Warehouse, Ken Cranes, Sound Advice, Harvey and Yahoo.com.

HD Radio – What System Would Work Best for Us?

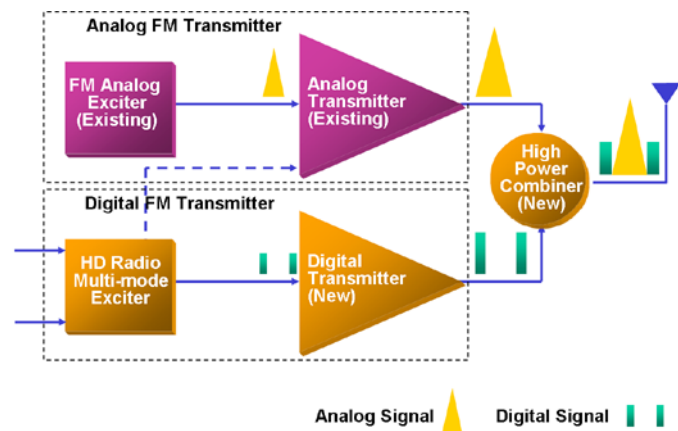
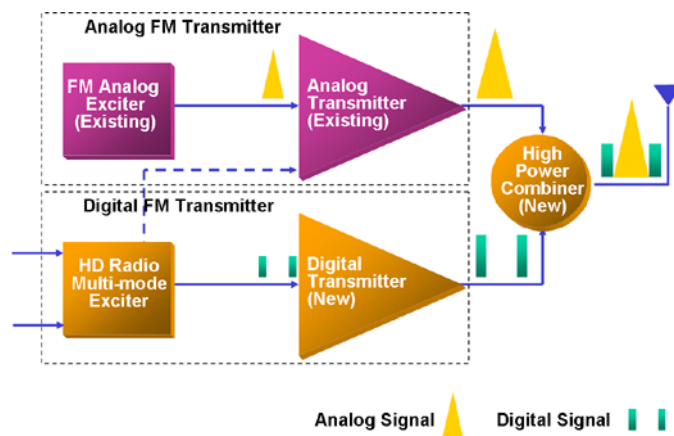


If you already own a Harris AM or FM solid-state transmitter built in the last ten years, you are probably well on your way to implementing HD Radio. The **Harris DX, DAX and 3DX AM transmitters are HD Radio ready**, with some transmitter and antenna modifications and the addition of a Dexstar exciter. **Harris' Z Platinum and ZX FM transmitters are also either HD Ready or adaptable (depending upon the model) with the addition of a FlexStar exciter and the HDI-100 Importer and HDE-100 Exporter.** That means buying a Harris transmitter now for your analog needs guarantees a painless transition to HD Radio when you're ready.

Ready Right Now? FM Options

- **Split Level Combining**

For stations operating their analog transmitter at the maximum power rating, Split Level FM or mid-level combining, a **Harris exclusive**, offers **the ability to add an the analog power component to a digital transmitter, while typically lowering the power of this existing analog transmitter.** This lower power output can improve the tube life of the analog component of the system. The two transmitters are combined in the split-level combiner.



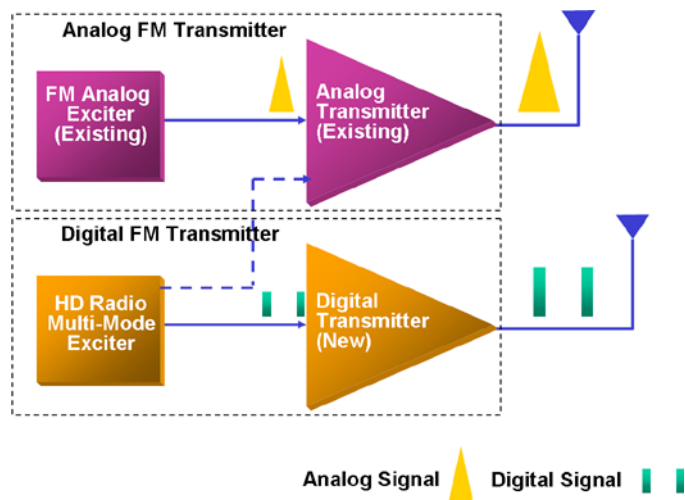
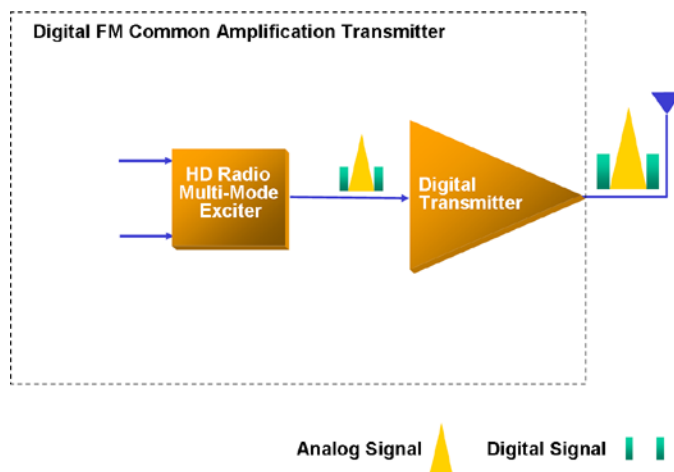
- **Separate Amplification (High Level Combining)**

This method uses an analog FM transmitter and a digital transmitter with combining both signal outputs via a 10db coupler or combiner. In order to overcome the losses of a coupler, the digital transmitter needs a higher power output and the analog transmitter requires an additional 10% over its current power level.

- **Common Amplification/Low Level Combining**

Common amplification or low level combining **takes the HD Radio signal and combines it with the FM analog signal at the exciter level for common amplification through one solid state (Harris Z-HD+ Series) or tube (HT-HD+) transmitter and one antenna.** Common amplification reduces space requirements for transmitters and equipment for HD broadcasting.

While this method can reduce initial cost, installation complexity, and required space when compared to other methods, the overall efficiency of the transmitter as compared with an FM-only transmitter will be lower. The reduced initial cost must be weighed against increased operating cost.



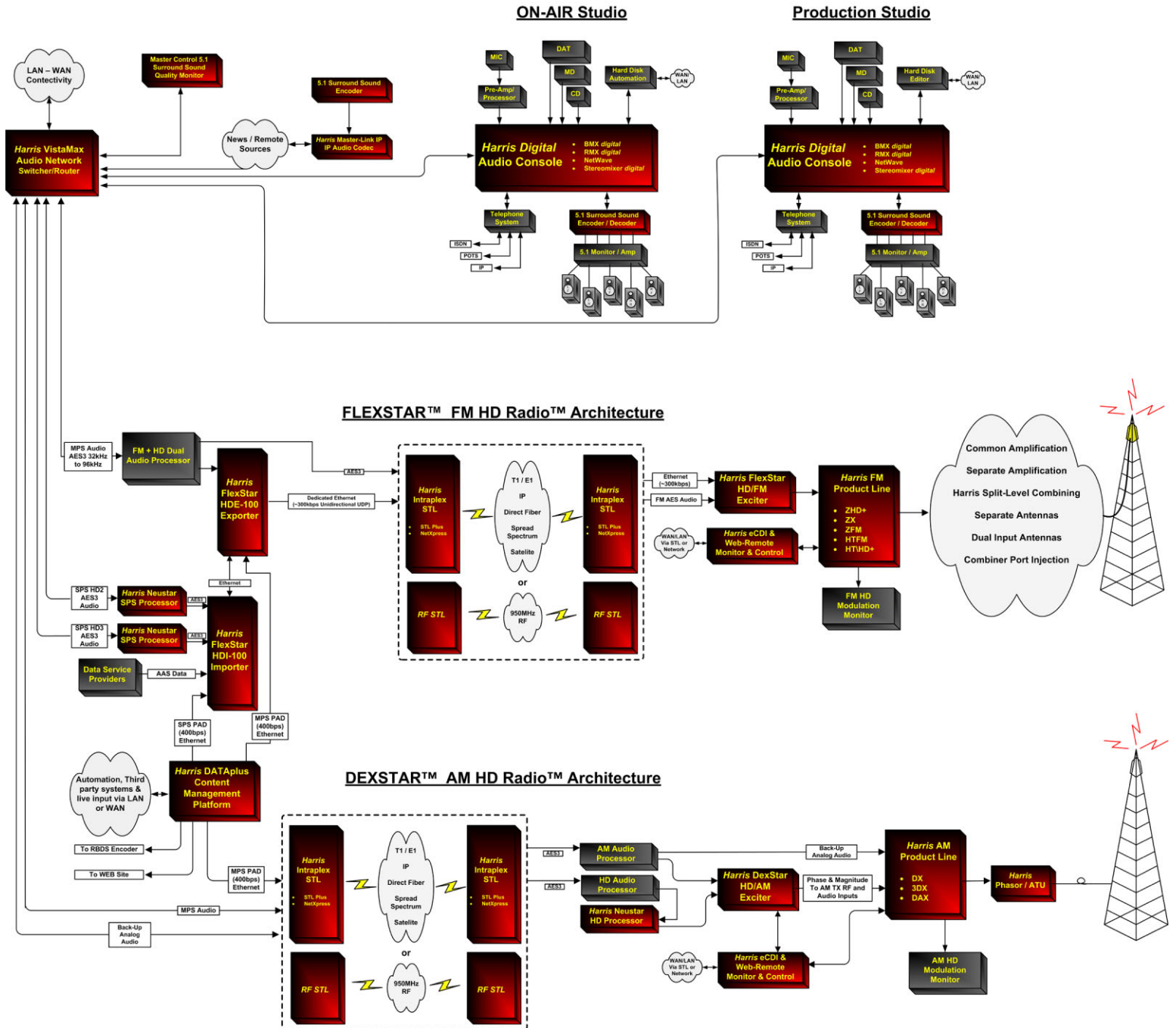
- **Space Combining**

Space combining allows a broadcaster to use a station's existing analog transmitter and analog exciter. Digital and analog signals are broadcast separately (no combiner) over separate antenna systems or an antenna that can be modified for dual-feed. This method features the most **efficient operation of an existing main transmitter with the lowest operating costs of all combining methods.** However, the station must either have an existing stand alone antenna or invest in an additional antenna and transmission line. Additionally, tower loading considerations may come into play and/or additional rent utilizing this method.

All decisions are based on your current transmitter and its power level rating. You should contact your manufacturer's sales representative to discover the most cost-effective implementation pathway for your station.

Harris Broadcast

Digital Experience, Products and Systems for the Entire Broadcast Chain, and the leadership to provide the most reliable, cost-effective and cutting-edge end-to-end solutions for digital broadcasters.



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