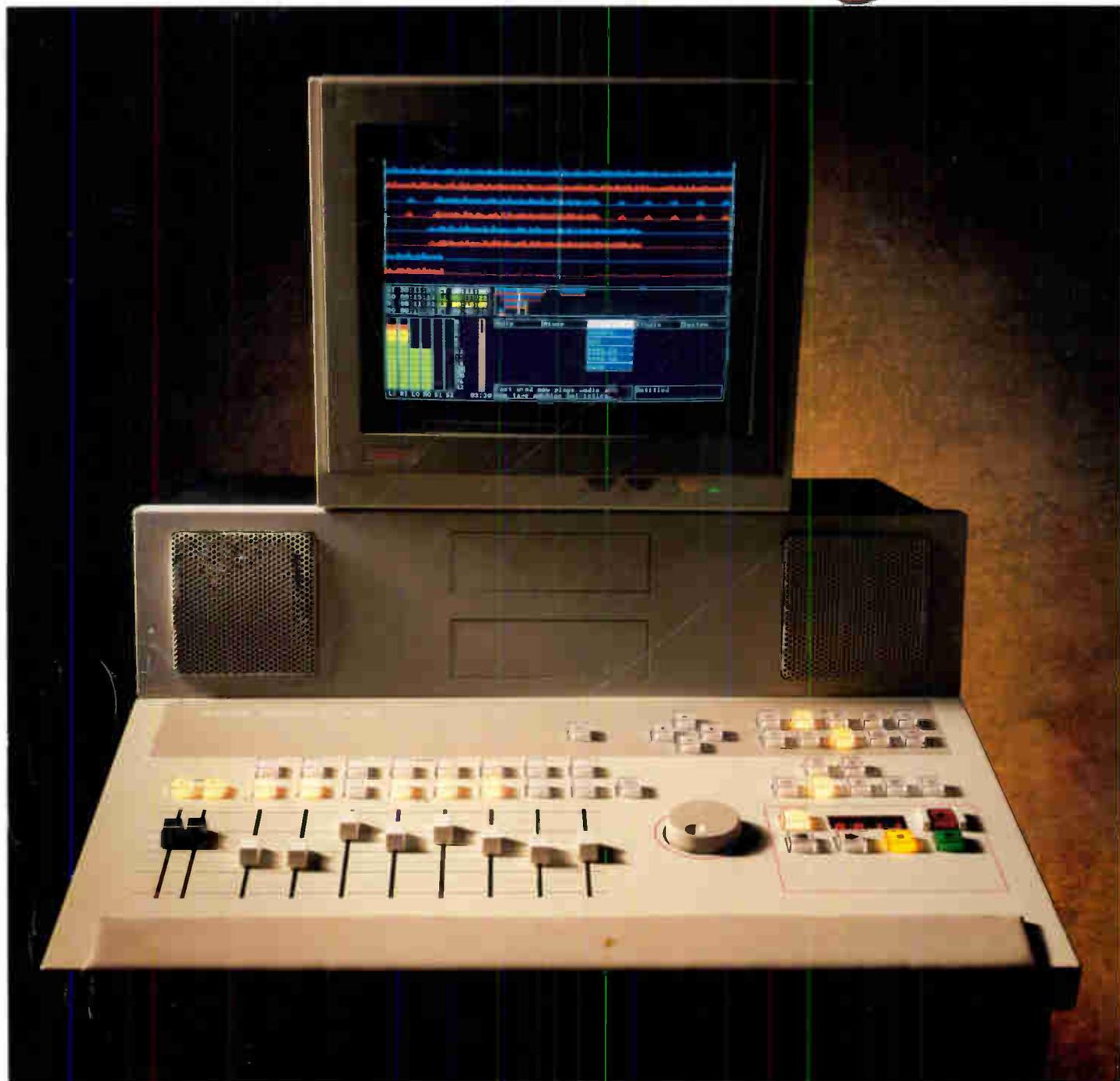


BROADCAST

Communiqué



**WELCOME TO THE
NEW SPEED OF SOUND**

See page 8.





Don't Get Snowed Under.

Your transmitter failed. Now you're faced with drifting viewers, falling ad revenues, and your problems are snowballing.

It's an avalanche you can prevent with Harris Platinum Series VHF television transmitters.



Their unsurpassed reliability stems from Harris Allied power-block architecture. The solid-state modules operate at low junction temperatures, extending their life. Parallel redundancy ensures that a control failure won't stop

your broadcasts cold. And the interchangeable visual and aural power amplifier modules are self-protected against six fault conditions.

Broadcast quality? It's top of the line. Plus, Platinum Series transmitters are available in all international broadcast standards and at power levels from 1Kw to 60 Kw.

Don't chance it with a flaky transmitter. Choose a Harris Platinum Series transmitter. From the company that's building the future of broadcasting.

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FAX 217-224-2764
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TAKING The Lead

Taking Stock

by **MARTHA B. RAPP**
Manager - Marketing Communications

As 1992 comes to a close, one of the biggest dilemmas confronting broadcasters and non-broadcasters alike is this: Technology has advanced with such increasing momentum that we often feel enslaved by it rather than masters of the opportunities it can provide.

With increasing speed we are bombarded by new information that is key to our broadcast businesses and our personal lives as well. With increasing guilt we realize that keeping up with trends— even those that interest us most or stand to have the greatest impact on how we work and live— has become nearly impossible. With increasing concern we suspect that at today's frantic pace, we have to work harder to remember who we are and what it was we set out to do in the first place.

Months before year-end retrospection and resolution set in, Harris Allied began to take stock. We wanted to reaffirm what we can offer that will help our customers respond to the changes ahead. Here's part of our list:

First, we provide extensive single-source capability. We manufacture a huge range of distinctively beneficial transmission products. We provide complete fixed and mobile systems. We distribute more radio studio products than any other supplier, with more than 350 leading product lines.

Second, our comprehensive network of broadcast professionals will help ensure you select the best product for your needs. We can meet with you at your site or if you prefer you can call us at our toll-free radio broadcast resource center. Our applications specialists will provide added backing, and we can also provide other services you may need, including installations and program management.

Third, we back our products and systems with exceptional long-term service. Our parts department is staffed 24 hours a day, and we offer around-the-clock technical assistance as well. We have repair centers for manufactured and distributed products, and we operate the industry's only on-going Broadcast Technology Training Center.

Fourth, as a U.S. broadcast supplier for more than 70 years, our commitment to broadcasting is unmatched.

We are committed to operating as an ethical, high-integrity company which uses sound business practices because our customers are counting on us to be around to provide exceptional products and support for the long term.

Fifth, we invest heavily in the future and focus on the cutting edge to provide products and services of top benefit on a timely basis. In response to one of the most significant trends— digital technology, we already distribute more than 80 different digital radio studio lines, and we're taking the lead in digital transmission. We've been aggressively involved in HDTV and DAB, designing the RF test bed used by the Advanced Television Test Center to evaluate ATV proponents, and supplying the transmitter used for in-band DAB tests at Radio '92. And we introduced the world's first digital transmitters in 1987.

Beyond our division's resources, our parent company Harris Corporation has been involved in digital transmission applications for commercial and government users for many years. Some of Harris' patented technologies will directly apply to broadcast equipment of the future.

Indeed, Harris Allied *does* plan to be involved in the future by helping our customers master technology and use it to respond to trends, and by providing support throughout the process. While 1993 will bring change, it will also bring opportunity. We intend to be ready.

Happy New Year. 🍷

CONTENTS

RADIO TODAYPages 4, 5

Change is seldom easy but new technologies promise benefits that make the transition well worth the results.

SATELLITE UPDATEPage 6

How Tectan products can save video base-band spectrum.

TECH TALKPage 7

Fitting the CD 10 into your studio for affordable second-generation benefits.

PRODUCT SHOWCASEPages 8, 9

INSIDE STORYPage 10

Hilmer Swanson named honorary member of SBE.

RF NOTESPage 11

Licensing for expanded AM band expected to begin imminently.

TV TODAYPages 12, 13

Answers to ATV questions we've received.

SYSTEMS TODAYPage 14

WAREHOUSE SPECIALSPage 15

Broadcast Communiqué is a bi-monthly publication of **Harris Allied Broadcast Division**, which includes four operations:

Quincy, IL: RF equipment manufacturing; RF and audio systems; service and training.

Richmond, IN: Radio studio and satellite equipment distribution.

Florence, KY: Fixed and mobile video and satellite communications systems.

Cambridge, England: RF equipment manufacturing; European radio studio equipment distribution.

RADIO Today

Radio - Tomorrow via Yesterday

by JAMES HAUPTSTUECK
Digital Products Manager

Looking back at the history of radio, it's hard not to become enthralled by the magic of the era. A wonderful sensation fills the soul when you feel the pure love for radio and the magical inspiration that pushed the pioneers forward. The desire of early broadcasters to communicate with their public was intoxicating. The feelings they instilled came across the living room speaker in a way that entrapped all listeners in a trance. An intent audience's heart would beat in unison as the mystical announcer performed spell-binding wizardry before a large microphone.

Yesterday's equipment was expensive for the time. It consumed a lot of energy and it generated a lot of heat. It required a lot of maintenance; was prone to failure, and tended to be very large in size. Designs, usually cast in

stone at the time of manufacture, did not lend themselves to future expansion or upgrade. Services of separate technical operators and an engineering staff were essential to the installation, operation and upkeep of such systems. Transition to new technologies tended to be slow and generally consisted of mechanical changes. Ease of operation was often omitted from design specifications, and equipment—while revolutionary at the time—seems monstrous in comparison to today's equipment.

Certainly over the years more has changed in radio than the equipment. The romanticism has long since fallen by the wayside despite efforts of many to hold on to radio's early allure. Increasingly, the art of radio has become business. Early objectives of communicating to the public have been replaced by the need for quarterly returns on investments, and staying on the air means turning a profit. Theoretically, this year's profits had better be larger than last year's. Yes—radio *has* changed.

Today's radio station is much different than yesterday's. There are computer traffic and billing systems, hard disk digital audio systems, CD players, remote broadcasts via cellular phones,

voice mail systems, smart consoles, automation equipment, digital editing, satellite services, air traffic reports, and the list goes on.

If radio broadcasters who left the industry only 15 years ago were to walk into today's station, they'd be dazed and amazed at what they would see. Perhaps they'd recognize the concepts, but the methods of delivery would leave them befuddled. Tasks that used to take ten to 15 minutes can now be completed with the press of a button. Cuing records—never again. Juggling tapes and huge degaussers and energy-radiating transmitters that put out enough heat to warm a small city—all gone.

Beyond energy efficiency, products that save human energy while increasing productivity and quality of life are becoming a mainstay. In some circumstances, it's no longer even necessary to have staff working late nights, holidays or weekends. A few radio people are even beginning to recognize their families again, and radio broadcasters are spending their time in ways they could only dream about even a year ago. It's a result of advances in technology that are being implemented into the real environment of radio.

All of this brings us to the most important question of all: What does tomorrow hold in store for radio?

Several issues will remain of paramount importance to the broadcaster. Demands for efficiency will continue to increase in every part of the broadcast environment. Broadcasters will continue to look for new ways to use existing talent and equipment to expand their revenue base. Sound quality will continue to improve, and other ways of attracting listeners will be developed in order to keep radio a viable product for the future.

In all likelihood, tomorrow's station will be functionally paperless. The norm will be to transfer information and audio via digital electronics, increasing operating efficiency and reducing expenses. The DJ, traffic person,



sales staff and even management will do every function with the touch of a button, and there will be no need to hold media in your hand, carry it around, and in the process, risk losing it. As people come to trust and understand equipment more, real improvements will begin.

Tomorrow's control room will consist of several monitors which display every possible type of information for the DJ. DJs will see the music, commercials, traffic, news, caller information and even transmission status on their screens. Access to any type of information will be at their fingertips. All audio will travel in digital format over fiber optic cable or via another high quality digital network. Transmission will take place as a digital signal is received in a solid state digital exciter then broadcast through a solid state transmitter. Very little energy will be consumed in the process.

New technologies already are available, and more are coming, to allow the broadcaster to bring in extra income. One of the newest to reach the U.S.—RDBS— will allow the broadcaster to use subcarrier frequencies in new income-producing ways. RDBS will allow stations to improve their marketing ability, and possibly to rent subcarrier space for many different applications. A lot of interest is being generated by paging companies, advertising firms and a host of others.

The expanding technology phenomenon forces broadcasters to ask themselves when they should get involved. It's tempting to just stand back, watch and wait for the perfect systems to be found. The risk is that those who wait that long will miss the opportunities that are already here. There are ways to make improvements *today* that will not leave you out in the cold tomorrow, and most current manufacturers understand the need to produce equipment that is adaptable to future improvements. There also is a trend to take advantage of technology now with low-cost disposable types of equipment as well.

Regardless of your station or application, there are ways to put yourself on the road to savings and higher profit potential. By using technology to your advantage, you can greatly impact your bottom line. The sooner you get started, the further ahead you will be. 🍀

Computers For Today and Tomorrow

by JAMES HAUPTSTUECK
Digital Products Manager

Computers already have changed radio drastically in the last few years. They are streamlining communications, saving time and personnel costs, and improving overall performance and quality.

While it's tempting to feel all computers are the same, nothing could be further from the truth. There are machines to fit specific tasks and applications, just as in virtually every other area of technology. It is imperative to have the right machine to do the required job correctly— one that is rugged enough to take the punishment it will receive. It is too easy to be suckered into buying something that is either insufficient or overqualified for the job.

Why pay \$5,000 for a machine to handle a function that could have been handled by a \$2,000 unit? Even worse, why shop around and buy a \$2,000 machine, get it set up, train people, then find out that it hasn't got what it takes to do the job, or it's too slow, or it breaks after a week or two, or... you get the point.

While there is a lot of change to keep up on, Harris Allied can help by doing the necessary research for you. We can offer you the right computer for the right task. We can also offer you the right type of service for your application without overselling or underselling you on hardware, software, or service.

Let's look at two scenarios and the type of computer that will fit each application:

There are many applications where you need to use a computer but you want the cheapest thing on the market. The situation where this system will be used is not one of extremely high importance, and the computer could be considered disposable in a couple of years. You plan to use it for general accounting or some type of secretarial work. If a problem arises, it won't hurt you to have it down for a couple of days getting fixed.

In this case, we would suggest one of the low-end systems. These systems are



'Computers are streamlining communications, saving time and personnel cost, and improving overall performance and quality.' —JIM HAUPTSTUECK

reliable yet do *not* have a lot of unneeded perks and service features. These computers are cheaper in price than competitive units and give a lot of bang for the buck.

What if you need a low-cost computer for a more important application? You plan to use it to do traffic and billing, digital editing, or some type of function where it *will* need to be in operation every day or else you'll lose money.

We offer low-cost machines that are backed with exceptional service. A DTK system comes with on-site service from General Electric (GE) service centers. GE will come to your location within four hours if you are within 50 miles of one of their 167 U.S. locations. They will be on your site within eight hours if you're inside 100 miles of their location. There is no extra fee for the visit, since it's a part of the warranty. We can also sell COMPU-ADD which allows you to take your computer to any of their local retail outlets for repair. Depending on your requirements, there is a very price-competitive system to meet your needs.

We have access to a variety of other systems including IBM, NCR, MacINTOSH, and CUMULUS. We can match your needs to the right products, software, peripherals, and service that makes sense for you. We have the capability to configure everything from complex networks to simple single-user systems. We can even install a system and train your people to use it.

When it comes to staying on top of technology, we take our jobs very seriously. Servicing you is the entire reason for our existence. Let us know how we can help you today to be prepared for tomorrow. 🍀

SATELLITE Update

Conserving Spectrum

by **JEFF NORDSTROM**
Manager - Satellite Sales

The holidays are an exciting time when we all have the chance to try to fill the wishes of those close to us. If I could have any personal wish, it would be for more spectrum. The fact is, we live in a time when RF spectrum has become a precious and limited commodity. Just as we must conserve our natural resources, we must conserve spectrum. With the theme of saving video baseband spectrum, we suggest the sub-carrier products of Tectan.

Tectan manufactures a number of specialty products for broadcasting's world market. Tectan also has a long record of producing high-quality SPCP satellite products, specialty products for the telecommunications industry, and, most recently, sub-carrier products for satellite and microwave.

This article will focus on three Tectan products—the 450, 454, and 455.



TECTAN 450

The Tectan 450 is a frequency-agile (synthesized) FM sub-carrier designed specifically for narrow band multi-channel applications. Generally, this allows three audio channels to exist in spectrum required by a single old-style channel. More important is the improvement in audio performance, with sound quality better than digital! With better than 90 dB dynamic range; THD of less than 0.1%; no quantizing distortion, and flat frequency response, the 450 provides a virtually transparent audio path for your program audio material.

Is the path rough, as with an ENG truck or a chopper feed? The

threshold extension detector permits the 450 to flawlessly track the incoming FM signal under severe noise conditions that would cause lesser receivers to become useless. The transmitter and receiver are each contained in one-rack-unit-high packages. Two channels per chassis is standard.



TECTAN 454

The 454 model is a good way to upgrade an existing sub-carrier system. The 454 has been engineered to handle the most common deviations used for primary audio satellite feeds. In addition, switchable emphasis networks make the 454 a nearly universal sub-carrier system. Offering maximum flexibility, the 454 features frequency-agility from 1.0 MHz to 9.9 MHz; selectable wide or medium deviation, and various emphasis settings.

Whatever your system requires, you can easily configure the 454 to meet your needs and make a major improvement in audio performance.

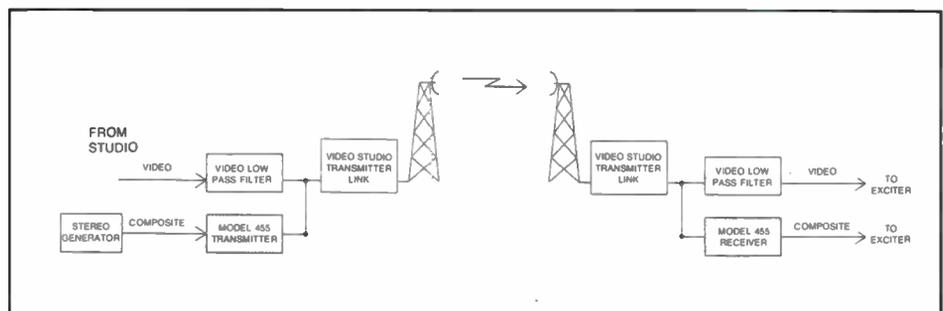
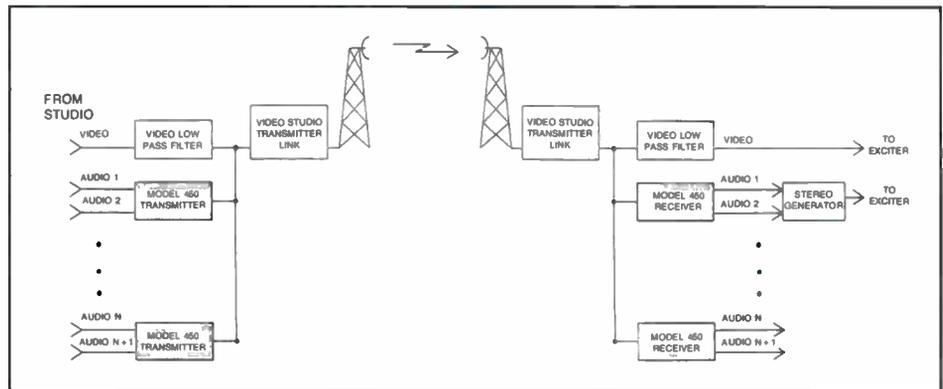


TECTAN 455

Discrete audio channels can be very useful in today's crowded spectrum, but what if composite is needed?

The Tectan 455 was designed for MTS/BTSC applications. How? The 455 provides an ultralinear wideband channel capable of carrying the entire multi-channel BTSC composite signal with virtually no degradation of stereo performance. Compare these specifications with virtually any other wideband sub-carrier: Frequency response - ± 0.1 dB to 70 kHz; THD - $< 0.05\%$ at 1 kHz, and totally frequency-agile, too!

We believe you will find Tectan sub-carrier products an excellent choice for improving audio channels. In today's competitive market, it is important to keep the broadcast advantage, and Tectan will help in that effort at a reasonable price. For further information on these products, please contact Harris Allied at 317-962-8596.



TECH Talk

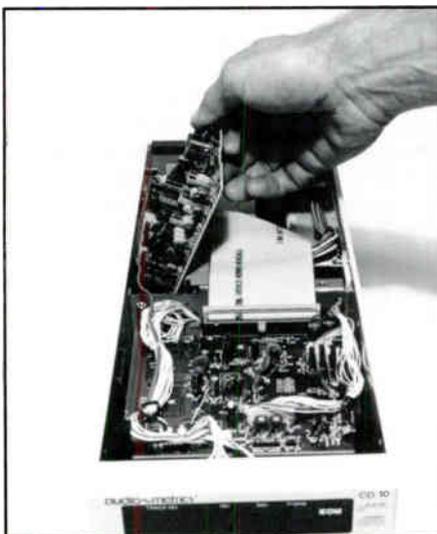
AUDIOMETRICS CD 10 Ideal For Today's Radio Station

by **RON OLER**
Radio Studio Service Technician

The Audiometrics CD 10 is an affordable, full-featured CD cartridge machine. Like previous CD cart players, the CD 10 protects compact discs from user-damage in industry-standard cartridges. In addition, however, this second-generation unit incorporates unique features which make it ideally suited for today's real-world broadcast environment.

Sized so that three units can be mounted side by side in a rack, the CD 10 is designed for accident-free use by virtually any operator. CD titles are clearly visible from the front of the unit, and innovative autolock makes it virtually impossible for a jock to accidentally eject a cartridge during playback. Advanced linear tracking enables cueing to occur quickly. For example, an adjustable cue-to-music threshold (-54 to -72 dB) decreases "start" lag time, providing virtually instant music after cueing.

With ability to recognize and respond to INDEX 3 subcodes used by several syndicators on CDs, the CD 10 can emulate automation in a manner similar



Plug-in circuit boards



Three units can be mounted side by side



Designed for accident-free use

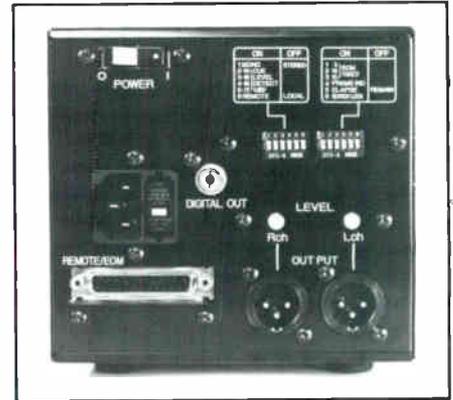
to the secondary tone on a tape cartridge.

CD 10 controls are designed to resemble those on familiar cart machines. A jog shuttle wheel on the front panel performs frame search and location functions quickly, and also permits a user to search forward into the NEXT track or reverse into the LAST track. Four separate illuminated buttons are located on the front panel for "play," "standby," "stop" and "pause."

Front panel displays provide a great deal of functional information. A large flashing indicator displays end-of-message (EOM) data, and the CD 10 features an adjustable variable timed (five to 35 seconds) EOM relay closure. The front display can also selectably show remaining or elapsed time.

The CD 10 features Sony's latest three-beam optics which are easily accessible for cleaning. Use of a one-bit digital-to-analog converter with eight times oversampling and an FDNR analog filter provides superior phase characteristics. The unit's toroidal power transformer reduces hum and RFI.

Designed for long life, the CD 10 features a heavy aluminum deck panel which provides shock isolation from the



Equipped for remote interface

chassis. Low heat generation and positive ventilation provide for a machine which runs cool, and vertically-slotted plug-in cards permit easy access and service.

With the CD 10's IEC II output, direct digital dubbing is as easy as running a cable with appropriate connectors from the CD 10 to a DAT machine.

The basic CD 10, available exclusively from Harris Allied, is priced at \$1395. The unit is backed by a one-year parts and labor warranty.

Additional information on the Audiometrics CD 10 is available by phoning Harris Allied toll-free at 800-622-0022.

Ron Oler is an SBE-certified broadcast engineer and a member of Harris Allied's Radio Studio Service staff in Richmond, Indiana.

Special Starter Package

- 3 CD 10 CD Cartridge Machines @ \$1,395
Special Price \$4,185
- 1 CD 10 Rack Mount (\$145 value) FREE!
- 175 ACD5B CD Caddies (\$840 Value) FREE!

SPECIAL PACKAGE PRICE
\$4,185

PRODUCT Showcase



AKG
DSE 7000

1f your search for a digital production center is serious, our AKG DSE 7000, featured on the front cover, is the most serious work station you'll encounter.

Nobody has anything close to the DSE. Are you serious? Talk to us about on-site demo.



Dynamax DCR1000 Series

Simple cart-like operation with little or no training: the Dynamax DCR1000 Series digital cartridge machine. Its durable, maintenance-free design and use of standard 3½" floppy disk storage of high quality digital audio can reduce your operating costs. Over five minutes of 15 kHz stereo audio on each 13MB floppy.

Nothing to clean or align and no adjustments to make. The disk drive provides over 30,000 hours of service, can be replaced in less than 15 minutes, and costs less than a set of tape heads.

We're so excited about this new compact disc storage system. Not because of its design, but because of the breakthrough price we can now offer to you.



3-Drawer CD Storage

This 3-drawer system comes ready to handle up to 900 jewel cases or CD cartridges. The manufacturer has engineered out obsolescence by making the system MiniDisc-ready, too.

Key lock for security. Strong steel construction. Call for a price quote which includes delivery to your door (in the continental U.S.).



Cutting Edge Unity 2000

We pioneered the idea of trading you dollars for used equipment toward the new equipment you need.

Our most recent trade-in success story involves one of our most successful products: the Cutting Edge UNITY 2000 processor.

Consider your sound image, meet with management... is your on-air processing chain the weak link in your operation? Chances are your present stack is worth good trade-in dollars toward a new UNITY 2000.

Talk to us... We hear and we listen!



Sabine FBX-900

1s feedback drowning out your remote broadcasts? Does howling hurt your TV call-in show? Exterminate it automatically with the Sabine FBX-900 Feedback Exterminator™.

It's automatic, for a sound system that won't squeal during programs, call Harris Allied today— toll-free at 1-800-622-0022.

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in the U.S. & Canada
is in this book



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Auditrionics AirMaster 90

Attractive price, loads of features and digital compatibility are a few of the phrases that accurately describe the Auditrionics AirMaster 90 console.

AirMaster 90 is available in 8-, 12-, and 16-input mainframes and comes with a confident two-year warranty.

Auditrionics' new AirMaster 90 will provide your station with a clean, smooth and exceptional operational performance that's aimed at the turn of the century. Call the Harris Allied 800 number for a brochure which includes complete technical specifications and jock-proof reliability.

Call Later.

Our extended hours make it easier to call on the service, selection and support of Harris Allied, the nation's largest supplier of broadcast equipment.



Eastern

8:00 am - 8:00 pm



Central

7:00 am - 7:00 pm



Mountain

6:00 am - 6:00 pm



Pacific

5:00 am - 5:00 pm

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Cue to music, pitch control, fader start, analog and digital outs, index search and both XLR and RCA connectors.



Tascam CD-401 MKII

What more could you want in a pro machine? How about the Tascam name and an amazing price! We have complete information, pricing and delivery. Call us.



Aphex BIG BOTTOM™

Want an air chain massive enough to squash your competition? Plug in the new Aural Exciter® Type C2 with BIG BOTTOM™. Stations across the country rely on proven Aphex technology to enhance stereo imaging and boost perceived low end with little or no increase in peak output and reduced overload distortion. The new Type C2 adds bass sustain and density without detracting from vocal intelligibility. Get yours before the guys across town catch on!



Moseley DSP 6000

This is Moseley's DSP 6000. CD quality in a studio-transmitter link combined with higher system gain, no phase distortion and freedom from degradation even in multi-hops.

Harris Allied supplies more DSP 6000s to broadcasters who want the digital transmission advantage. Specs including a tell-all 16-page booklet are just a toll-free call away: 1-800-622-0022.

**DTK
Grafika 3C**



Computers are at the heart of the creativity that's changing broadcasting for the better. We're happy to introduce several computer lines including DTK. (See story on page 5.)

DTK computer prices are competitive with unsurpassed on-site service available. We can pre-configure your system at no additional cost with any hardware or software purchased from Harris Allied. For example: buy your CardD™ Digital Editor and any of its accessories from us and we'll install and configure it into the DTK PC free. When you receive your value package, all you have to do is plug it in, turn it on and go!



Eventide VR240

Eventide's VR240 Digital Broadcast Logger makes logging an efficient, practical management tool. Now a single DAT cassette stores 252 hours (ten and one-half days) of audio. Total recording time can be divided among as many as 24 channels. Search-and-locate time is under 90 seconds. The dual DAT drive option gives you up to three weeks unattended logging time and lets you play back on one drive while the other continues to record.

INSIDE Story

Hilmer I. Swanson Named Honorary SBE Member

In recognition of significant technology innovations for AM broadcasting, Harris Allied Broadcast Division's Senior Staff Scientist



Hilmer I. Swanson has been selected by the Society of Broadcast Engineers as an honorary member. Swanson was honored during the SBE's Annual Convention in September.

Once described by *Broadcast Engineering Magazine* as a "dyed-in-the-wool radio engineer whose contributions to AM radio are legendary," Swanson is responsible for much of the technology used in radio transmission equipment today.

Since joining Harris Broadcast Division in 1965, Swanson has advanced from engineering contributor to the highest technical position in Harris Corporation, senior staff scientist.

In 1969, Swanson was granted a patent for development of pulse duration modulation which today is a world standard in AM broadcast transmitters. This modulation technique— today used by every manufacturer of AM broadcast transmitters— significantly improved efficiency and audio performance. Continuing work to improve AM broadcast transmitters, Swanson went on to receive many other patents for such techniques as progressive amplitude modulation and polyphase pulse duration modulation.

In 1986, Swanson was awarded a patent for digital amplitude modulation, used exclusively in Harris' line of DX transmitters. This technology, which promises to become the new world standard in AM broadcast transmitters, enables broadcasters to reduce their power bills by as much as one-third and provides audio performance which is nearly distortion-free.

Swanson has received 19 U.S. patents and numerous foreign letters of patent. In 1990, he received the Engineering Achievement Award from the National Association of Broadcasters (NAB).

Frank Svet Named Vice President Television RF Products

Frank A. Svet has been appointed vice president of television products for Harris Allied Broadcast Division. With total responsibility for Harris' television RF product line, Svet will direct related activities at Harris Allied's operations in Quincy, IL and Cambridge, England.



Svet joined Harris Corporation as vice president of engineering for the Broad-

cast Division in October 1986. Since that time, the division has received six awards from *Broadcast Engineering Magazine* for top new products at annual National Association of Broadcasters conventions; the 1990 Outstanding Corporate Innovator Award for new product development from the Product Development & Management Association, and silver stakeholder and new product development awards from Harris Corporation.

Svet has been awarded four U.S. patents for innovations in transportation control systems. He is a Registered Professional Engineer; a senior member of IEEE, and a member of AFCCE.

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24 Hours a day
7 Days a week

Quality. We carry only tubes manufactured by the most respected names in the industry.

Inventory. One of the largest assortments available for immediate shipment.

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Warranty. All tubes carry manufacturer's warranty.



TO ORDER: CALL 800-622-0022 (Richmond, IN)
or 217-222-8200, ext. 3500 (Quincy, IL)

RF Notes

FCC Expected To Issue Licenses Imminently For Expanded AM Band

by JOHN DELAY,
Radio RF AM Product Manager

As part of a continued effort to improve the quality of medium wave radio broadcasting, the FCC is expected to begin issuing licenses for the expanded medium wave broadcast band at any time. This action is being taken under FCC Docket 91-303.

By expanding the medium wave broadcast band to 1705 kHz, the FCC hopes to reduce interference resulting from increased congestion of the current AM band and other sources.

Expanded band allocations will only be available to existing stations wishing to migrate to eliminate interference. Stations moving to the new band will be allowed to simulcast with their current channel for a maximum of five years.

Under the new ruling, any station that purchases an interfering station and removes it from the air will be eligible for a tax credit.

Licensing is expected to favor "model" full time AM stereo stations that would operate with relatively little interference and use modern equipment. According to the FCC profile, the station also would offer audio quality comparable to FM; provide 10 kW daytime power and 1 kW nighttime power, and use either a non-directional or a simple directional antenna. Co-channel location spacing will be from 400 to 800 km.

While the FCC originally received letters of intent from 361 stations interested in the expanded band, industry experts now predict that between 150 and 175 stations will move. Stations in medium-size markets who have had restricted power due to interference are expected to have the most incentive to act.

Special licensing preference will be given to stations on the U.S.-Mexico border. The governments of the two countries have agreed to allow 21 expanded band medium wave stations to operate at the borders of each country.

A border arrangement also is being discussed by the U.S. and Canada, but regulatory agencies have not reached an agreement at this time.

Equipment Considerations

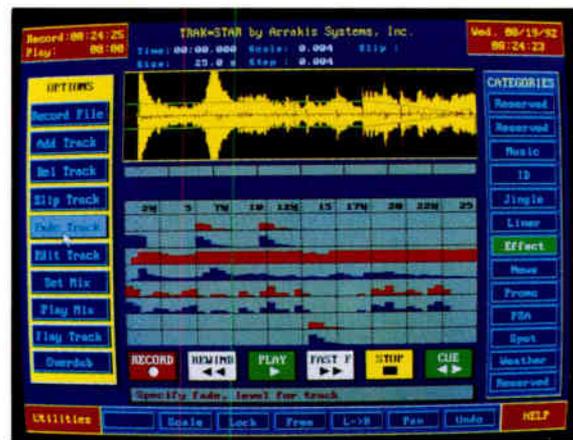
Ultimately, however, the expanded AM band will only be as successful as the equipment that supports it. Many have questioned when receiver manufacturers will have large quantities of expanded band AM receivers on the market. Many industry experts we recently contacted believe this will occur within the next three to five years. What about receiver quality? Again, improved receivers are coming—fast. For some time now, the semi-conductor industry has been developing chips that can improve AM reception. AMAX receivers recently were introduced by Delco and Denon, and other receiver manufacturers are expected to follow soon.

And what about the transmitter? Harris' DX Series 10 kW medium wave transmitters operate from 535 to 1705 kHz; provide FM-comparable performance, and also offer the lowest operating costs of any 10 kW transmitter on the market. We invite you to phone us to discuss your specific requirements or for more information. ✍

Trak ★ Star

FEATURES

- Cost effective digital audio play-record-edit workstation
- 8 tracks of digital mixing, editing, and playback
- CD Quality audio performance
- Non-destructive real time editing
- 120MB base system stores 24 minutes of mono audio
- Optional 766MB hard disk stores an extra 153 minutes
- Optional machine control module



Trak ★ Star, by Arrakis Systems, is the first cost effective multitrack digital audio recorder, mixer and editor designed specifically for the radio broadcast professional. Trak ★ Star provides two audio input and output channels with comprehensive playback and editing of up to 8 tracks simultaneously from disk. Cut, splice, copy, move, delete, scrub and fade any combination of files to create a new spot or jingle.

Ready to use right out of the box, the Trak ★ Star base system comes complete with rack mounted digital hard disk controller, color VGA monitor, keyboard and trackball. With an extremely easy to operate user interface, Trak ★ Star takes only moments to learn and use and actually costs much less than the 8 track tape recorder and multitrack console that it replaces. Anyone in your radio station can now achieve the creativity and productivity of multitrack editing on a digital editor that works the way radio works.

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\$5,995



HDTV Questions and Answers: First of Two Articles

Probably no trend in recent television has generated more confusion or misunderstanding than HDTV. As broadcasters brace themselves for inevitable NTSC/HDTV simulcasting, they are bombarded with information. Much of it is overly complex, inaccurate and misleading, making it virtually impossible to intelligently plan for the future.

Harris Allied has prepared a series of answers to questions we've been asked in an effort to de-mystify HDTV. If you have questions about your specific application, please don't hesitate to phone us at (217) 222-8200, Ext. 3131.

Q. What is QAM and why is it important?

QAM (Quadrature Amplitude Modulation) is an analog transmission technique that may be employed to transmit a digital signal within a prescribed channel bandwidth. This technology, the key to HDTV transmission performance, is important because it is *spectrum efficient*. By transmitting more information (expressed as bits per second per Hertz, bps/Hz¹) in the existing FCC-allocated 6 MHz channel, QAM as part of an ATV system will improve video transmission quality significantly.

Q. How does QAM work?

The term quadrature (meaning ninety degrees) relates to the use of two modulated RF carriers in quadrature that are added together forming a signal which is both amplitude and phase modulated.

Alternatively, one may view the two RF carriers as signals described by sine and cosine, each amplitude modulated then summed. If each RF carrier is modulated with four levels, a total of 16 states (four bits have 16 states) is generated. This is 16 QAM. If five

levels of modulation are used, then 32 states (five bits) are possible for 32 QAM.

Q. What is spectrum efficiency?

Spectrum efficiency is a measure of how many bits per second can be transmitted over a given channel of RF bandwidth. In 16 QAM, 16 states or four bits form what is called a symbol. We are able to ideally transmit four bits per second in one Hertz of RF bandwidth. However, QAM uses sophisticated filters which limit the spectrum efficiency to 3.1 to 3.5 bits per second per Hertz.

HDTV system proponents report they will put about 20 Mbits of data into a 6 MHz channel, thus achieving spectrum efficiency of about 3.3 bits per second per Hertz:

$$20 \text{ Mbits}/6 \text{ MHz} = 3.3 \text{ bps/Hz}$$

As we increase the number of levels in a QAM system, the data becomes more sensitive to corruption by noise and other disturbances. Bit error in the received signal is called the Bit Error Rate (BER).

Q. What is Bit Error Rate (BER)?

When digital bits are passed through a transmission system, some fraction will be received in error. In simple terms, BER is the mathematical probability of receiving a bit error in a digital system during an interval of time. In QAM, some of the transmitted bits will be mistaken for another bit. BER is often expressed as a ratio:

$$\text{BER} = \frac{\text{Bit Errors (bits/unit of time)}}{\text{Total Bits Transmitted (bits/unit of time)}}$$

BER is usually described in scientific notation. For example, 5×10^6 would represent a system that exhibits probability of five bit errors per million bits of data received. The quality of a digital communication system is almost entirely characterized by its BER.

Q. Why is BER so important?

BER and the signal-to-noise ratio (S/N) determine the performance quality of a digital modulation system. One

characteristic of digital QAM is the rapid change of BER with S/N. This is a desirable effect since as long as the S/N remains above a certain value, the BER is small. The steepness of this "cliff" for digital QAM depends on the number of levels (16 or 32).

Q. What is the relationship between BER and linearity?

For the digital signal, there are two important effects caused by non-linearities in the transmitter. Both are caused by the generation of undesirable intermodulation products (IMD). The first is **in the RF channel** IMD which corrupts the reception of the received signal and thus raises the possibility of a degraded BER requiring a higher received S/N. The second is the **out of RF channel** IMD which widens the RF spectrum and interferes with other services. The spectrum mask has not yet been specified by the FCC.

Q. How is a QAM HDTV transmitter power described?

There is confusion about transmitter power. Digital QAM system designers speak of power in a QAM signal as an average. However, the QAM signal has peaks of power above this average. The ratio of the peak power and the average power in a QAM signal (peak to average ratio) is dependent on the HDTV system and the filtering used. Both average and peak power will be major determinants in the amplification method chosen. At the peak of power output, all power amplifiers are more nonlinear and generate unwanted IMD.

Q. How will an HDTV transmitter achieve required linearity?

Current NTSC transmitters use correction circuits to improve amplifier non-linearity. The same circuits with some modification are useable for HDTV transmitters. Another way to improve linearity for any amplifier is to decrease (or "back off") power. As power is reduced, IMD decreases toward the perfectly linear signal. The amount of back-off from saturated output power may be determined by the amount of out of RF channel or in the RF channel intermodulation that can be tolerated.

Q. Is back-off the only way to increase linearity?

No. With IF pre-correction, today's efficient, high quality NTSC transmitters routinely operate well into saturation (0.5 dB compression). In addition, these transmitters already have been used to amplify the HDTV signal, producing excellent picture quality. Linearity correction, already available for all types of power devices and allowing operation to near saturation, is acceptable for NTSC and will be for HDTV.

Q. Are you saying that current NTSC transmitters will handle HDTV transmission?

We believe many will, with possible minor modifications. Extensive engineering measurements have been made using typical HDTV signals with current NTSC transmitters. These measurements indicate that a properly set up NTSC transmitter provides amplitude and phase linearity, swept response and group delay which will be required for HDTV. While power

back-off of 1 to 2 dB from average NTSC operation *may* be necessary to accommodate peak envelope overshoots from the HDTV signal, it has been observed that these systems will tolerate a moderate amount of soft clipping without serious BER or out-of-band radiation effects. More data is needed to determine how much— if any— back-off will actually be required by an HDTV system.

Q. What signal strength is required to receive QAM?

HDTV can be received with weaker signals (lower signal to noise or S/N) than NTSC. It is important to make clear what is meant by S/N. The imprecise use of S/N has led to confusion in comparing the transmitter power required for HDTV and NTSC. In all cases, the noise (N) means the average noise power in a specified bandwidth (called the noise bandwidth). In digital systems, it is common to choose the noise bandwidth equal to the bit rate. For HDTV however, it is sensible to choose 6 MHz as the noise bandwidth. The signal (S) can be either peak or

average power *so long as it is clearly stated*. When anyone uses the term signal-to-noise (S/N), one must ask, "Is the signal peak or average power and what is the noise bandwidth?"

Q. Will HDTV power amplifiers require a more linear dynamic range?

While QAM— like all amplitude modulated signals, *does* require a linear dynamic range, distortion and class of operation also need to be considered. There are two types of non-linear amplitude response distortion: Monotonic distortion (signal curvature) and "S" curvature (two curvature directions caused by crossover distortion at low signal levels). A Class A amplifier has a monotonic gain curve, and a Class B device displays "S" curvature. In an HDTV QAM signal, a Class B device will cause more distortion than a Class A device. This crossover distortion may be minimized by adding bias toward Class A (called Class AB), but only at the sacrifice of efficiency. 

(Next: More on amplifiers and antennas)

**Harris Allied Announces
1993 Training Schedule**

Harris Allied will offer more than 40 different training programs at its Quincy, Illinois Broadcast Technology Training Center during 1993.

General Training Programs are designed for *any* station engineer, regardless of the manufacturer of the transmission equipment in use. Product courses focus on specific Harris equipment.

For complete details on any of the following courses, please phone the Harris Allied Broadcast Technology Training Center from 8 a.m. to 5 p.m. CST weekdays at 217-222-8200, Extension 3508.

GENERAL TRAINING:

RF Circuits I: Jan. 4-8; April 26-30; Oct. 25-29.

RF Circuits II: Jan. 11-15; May 3-7; Nov. 1-5.

TV Workshop: Feb. 1-5; May 10-14; July 12-16; Sept. 13-17.

AM Workshop: June 15-18.

FM Workshop: Feb. 23-26; Aug. 17-20.

Solid State RF Devices and Control Logic: April 12-16.

**COMBINED GENERAL /
TRANSMITTER TRAINING:**

**FM Workshop and HT 3.5/5/10FM,
FM-3.5/5K1 Transmitters:**
March 29-April 2.

**FM Workshop and HT 3.5/5/10FM
Transmitters:** Sept. 27-Oct. 1

**AM Workshop and GATES 1/2/5
Transmitters:** May 24-28; Nov. 15-19.

HARRIS TV TRANSMITTERS:

UHF BT/TV/TVE/S Transmitters:
Jan. 18-22; Oct. 11-15.

TV-60UX/UM Transmitters: Feb. 8-12.

TV-60/120UX/UM Transmitters:
July 19-23.

TV-H/L Transmitters: March 8-12;
Nov. 8-12.

BT-H/L Transmitters: March 22-26;
Aug. 30-Sept. 3.

HT LS/HS Solid State Transmitters:
May 17-21; Sept. 20-24.

UHF Retrofit: Nov. 30-Dec. 3.

HARRIS RADIO TRANSMITTERS:

PT Solid State FM Transmitters:
Jan. 25-27; July 6-8.

HT 20/25FM and FM-25/25K1 Transmitters: Feb. 15-19; Aug. 23-27.

HT 30/35FM and FM-35/35K Transmitters: March 1-5; Oct. 4-8.

FM-5/10/20K-G-H Transmitters:
July 26-30.

SX Transmitters: March 15-19;
Oct. 18-22.

DX 10/25/50 Transmitters: May 3-7;
June 21-25; Dec. 6-10.

MISCELLANEOUS:

VWS: June 2-4; Dec. 13-15.



SYSTEMS Today

These pictures tell the story, in part, of how an S23 Mobile Satellite Communications Vehicle takes shape in our Systems facility. The basic standardized designs are customized to customer specifications. Harris Allied is known around the world for quality systems— both mobile and fixed. Contact us for details on your next mobile or studio requirement. Our broad product line includes ENG vehicles to 53 ft. production trailers, plus edit centers to full turnkey TV facilities. **PHONE 606-282-4800; FAX 606-283-6818.**



Rear of vehicle prior to and after generator installation.



Installation of dual central air conditioning systems.



Installation of satellite antenna and positioning system.



Welding of aluminum framework.



Sizing of carpet for wall and ceiling.



Interior equipment racks.



Rear rack access.



Rack access door, signal panel, and storage.



Finished system in operation.

WAREHOUSE Specials

\$pecial #1

**ARRAKIS
Prewired Studio Package**

\$pecial #2

**ARRAKIS
Demo Studio Package**

COMPLETE PACKAGE



Console

- 1 - 12000-18 Eighteen wide mainframe
- 8 - TPM1 Line Level Stereo input modules
- 1 - TPM1M Mono mic level input module
- 2 - TPM2 Advanced mono mic input module w/pan
- 3 - TPM3 Advanced stereo line level input w/Mode
- 1 - TDA1 4 stereo output distribution amplifier
- 2 - TRS1 1 by 5 stereo remote selector switch modules

Prewired Furniture

- 1 - Modulink Unbalanced "U"
- 1 - Double Pedestal overbridge
- 2 - Equipment pods
- 2 - Turntable isolators
- 1 - Sloped equipment rack (21")
- 1 - Copy bridge (45")

This package was displayed at trade shows. The console has been run through the factory's quality control and carries a six-month warranty. Original list price was \$12,665.00.

\$7,500.00

COMPLETE PACKAGE



Console

- Arrakis 10,000 series 18 position mainframe
- 7 - XAR1 Air One input modules
- 7 - XAR2 Air Two input mod. (Air One + pan/bal.)
- 2 - XAR3 Air Three input mod. (Air Two + 2 aux sends)
- 2 - XST1 Stereo One input mod. (Air Three + 3 band eq)
- 2 - AX1 Aux send/ret. mod. (w/assign and solo)
- 1 - X7P1 Seven position remote selector
- 4 - XSP1 Single slide fader cont. panel/master fader
- 1 - XDA1 Stereo 5 out distribution amplifier
- 1 - XRS1 Routing out distribution amplifier
- 1 - XRS1 Routing switcher control panel (2-16 position thumbwheels)
- 1 - XCR1 Clock control panel
- 1 - XCT1 Cart remote control panel
- 1 - XRR1 Reel-to-reel control panel

Modulink Furniture

- 1 - S/UNBALANCED U Modulux Supreme studio furniture
- 1 - ZX/SLP Tabletop 30 degree sloped equipment rack
- 2 - XTT1 Turntable isolator, cut for Technics SP25
- 2 - Z/SURR-4 Ten RU equipment rack kit for pedestals
- 1 - Z/SPRO-CT Supreme double pedestal cart bridge
- 1 - ZX/BCS-60 Console bridge with copy stand - 60"
- 1 - ZS/ERP-L-8RU Tabletop left equipment pod - 8RU
- 1 - ZS/ERP-R-8RU Tabletop right equip. pod - 8 RU
- 1 - ZX/INJT-16 Interview table - 16" x72"

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E/V 635A • The dependable, inexpensive broadcast mic	\$ 104.00 ea
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Switchcraft A3M connectors • bag of 25	\$ 1.80 ea
Replacement CD jewel cases • pack of 20	\$.55 ea
Duro-Test PS40-682 620 watt clear beacon bulbs • pack of 2.....	\$ 31.00 ea
Duro-Test A21 side marker obstruction bulbs • pack of 6	\$ 4.50 ea
Cotton swabs • 6 inch length • pack of 10,000k	\$ 60.00 pk
Harris Allied standard ON AIR warning lamp-less opt. flasher.....	\$ 19.00 ea
Shure SM58LC workhorse uni-dir. mic • less cable	\$ 130.00 ea
Pioneer PDM501 5 disc CD player	\$ 225.00 ea
Zercom MAX-Z deluxe remote amp • includes case	\$ 976.00 ea
Telex V220 Dual headset w/dyn. mic & 5' cable w/XLR contr.....	\$ 183.00 ea
Andrew HJ11-50 4" transmission line-238' • NEW	\$ 19.25 ft
Andrew HJ50B 3" transmission line-200' • NEW	\$ 18.40 ft
Autogram AC-8M eight input mono console NEW • \$6,026	SALE \$5,490.00 ea

Special prices end March 19, 1993. Quantities may be limited and subject to prior sale. All sales subject to appropriate sales tax.

An affordable, easy to learn multitrack disk recorder for radio.

Harris Allied got your message loud and clear...A lot of you don't want to spend tens of thousands of dollars on a digital multitrack recording system. But you do want the quality and speed of digital. So,

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We researched the entire marketplace. We weighed the plusses and the minuses. We talked. We listened. Then we chose the Roland DM-80.

The DM-80 speeds production, does it at a high speed with high, digital quality. The DM-80 also overcomes computer and sticker shock. For pricing starting at \$7,295 we can place your on-air product in the digital domain with speed and precision that'll make your production sizzle!

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Get the power of the Roland DM-80 and the expertise of Harris Allied to support it. One toll-free call to 1-800-622-0022 gets you complete information.

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THERE COMES A DAY
WHEN PRICES DROP
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Roland's custom VLSI chips give the DM-80 amazing power at a price that will astound you!

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World Radio History