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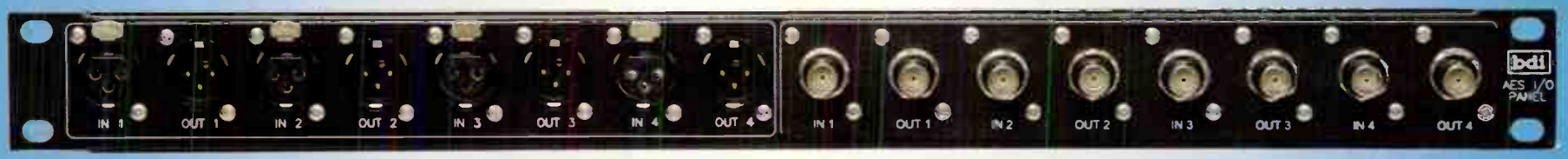

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In This Issue

Critical Content for Radio

Cover Story – *by Clark Novak, Lawo Inc. (page 6)*

Rationalizing the Rack Room: AoIP's Next Phase: *"Those of us who've been around a few years remember the shockwave AoIP made. It completely upset radio's traditional engineering model. The ability to connect everything in your studios, production rooms and engineering racks, sending and receiving audio signals using IP-Audio via off-the-shelf computer networking technology, was truly revolutionary."*

Chief Engineer – *by Scott Schmeling (page 10)*

Again ... I Hate When This Happens: *"I was going to go grab our FIM to take some monitor point readings a while ago. I checked battery voltage before going out and could see there was a battery problem. This FIM uses two 67.5 Volt batteries and five 1.5 Volt D-Cells. So I opened the battery compartment door on the back and what I discovered was an abundance of "battery snot!"*

System Solutions – *by Wiely Boswell (page 14)*

PoE: LAN Power Over Ethernet: *"It is getting common to power all types of things over an Ethernet cable. There are a few things to consider and I will try to dig into the subject. This subject relates to USB computer ports that provide power as well. All the neat gadgets and serious accessories can put a power demand on the source. USB ports and Ethernet ports have steadily increased their speed and power delivering capacity. I will start out with USB ports and 5 VDC power. (I just made up that term, but it seems very appropriate.) There was no way I would put fresh batteries in before cleaning this mess up! So instead of a trip in the field, I started disassembling and cleaning."*

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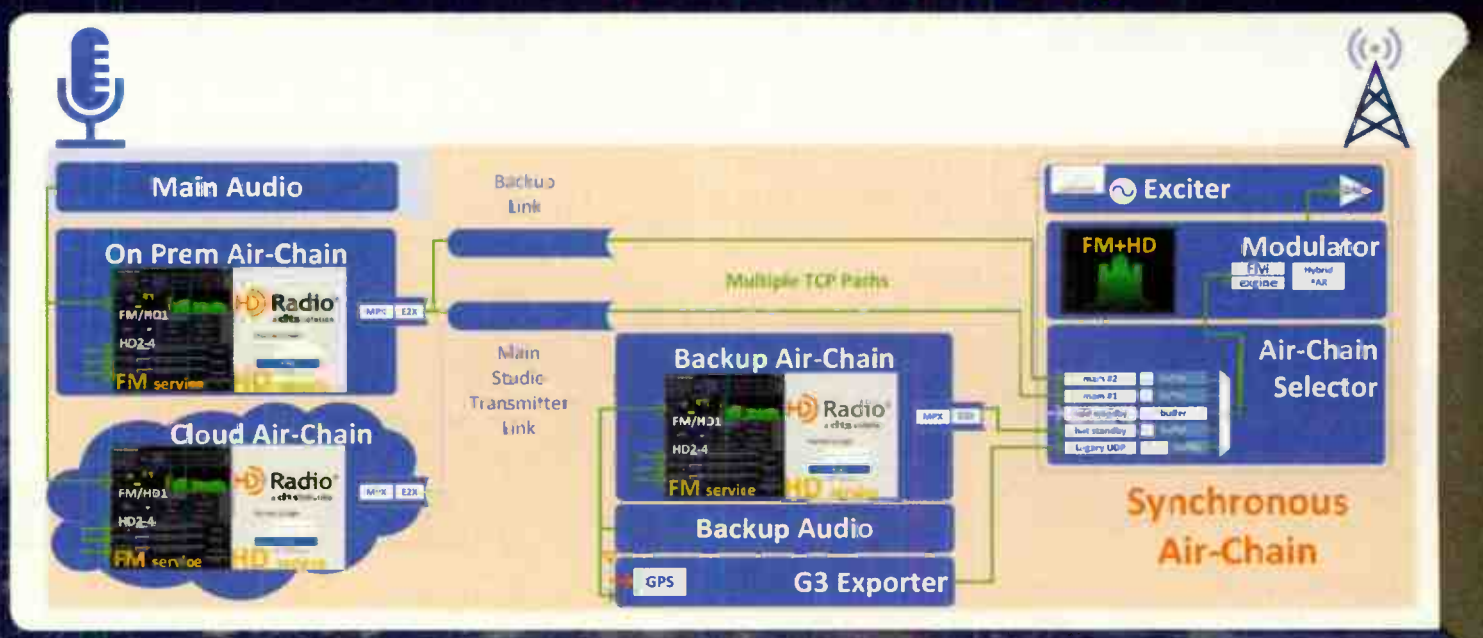

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Cover Story

Rationalizing the Rack Room: AoIP's Next Phase

by Clark Novak – Lawo, Inc.

First Phase: AoIP Arrives

Those of us who've been around a few years remember the shockwave AoIP made. It completely upset radio's traditional engineering model. The ability to connect everything in your studios, production rooms and engineering racks, sending and receiving audio signals using IP-Audio via off-the-shelf computer networking technology, was truly revolutionary. Overnight, cost-per channel dropped like a rock; discrete cabling and punch-blocks were quickly discarded in favor of Ethernet runs one-tenth their size. System designs became simpler, and project costs decreased. Ethernet's routing / sharing abilities also obsoleted "big iron" audio routers.

Second Phase: IP-Audio Standards

At first, a handful of competing networking technologies fought it out in the marketplace. This hindered adoption a bit, since the systems were non-compatible. It took the AES67 standard to fix the problem.

Today all major AoIP networking technologies are compliant or compatible with the AES67 standard. Complementary standards have been ratified too, such as SMPTE ST2110-30, which defines sampling rate and bit depth so that compliant radio & TV systems can interchange audio more easily.

Third Phase: Device Concentration

Another AoIP advantage is the ability to place inputs precisely where they're needed. In the old days, remote sources meant discrete cabling for each input, along with overhead cable trays and bundles as thick as your arm. AoIP accomplishes this with high-density edge devices in interview studios, news booths and performance studios, with just a couple of Ethernet cables running back to the rack. It's that same rack that sets the stage for AoIP, Phase Three.

AoIP facilities still require multiple audio input devices, a mixing engine for every studio console, signal processors to sweeten audio – enough gear to fill a rack room. With studios and transmission facilities continuing to downsize, space for that equipment is more precious all the time.

But if Moore's Law is still in force, then AoIP devices should be getting more powerful, more agile, able to handle more inputs, outputs, signal processing duties, etc. – right?

Enter Power Core

Lawo engineers had this idea of "device concentration" in mind when they began designing Power Core, a state-of-the-art 1RU AoIP I/O gateway, routing engine and DSP processor. It has modular I/O to handle analog, AES/EBU and AES67 audio, plus huge amounts of DSP-based signal-processing capacity. It is also feature-customizable via tiered licenses that let you balance cost with capabilities.

Standard I/O includes two AES67 / RAVENNA ports, 4 MADI ports and a DB-25 connector for GPIO. Each AES67 port supports 64 stereo channels for a total of 128 active stereo streams (256 mono). These ports support the ST2022-7 standard for redundant networking links. Each MADI port supports 64 mono channels, and can also be configured for redundant operation; radio / TV operators find these useful as a baseband-to-AoIP bridge.

Power Core: I/O, mixing, routing & DSP in 1RU.

The rear panel has 8 modular card slots, which can be filled with a variety of I/O cards: Mic / Line, AES/EBU, MADI, Dante, and a "Studio I/O" combo card with Mic, Headphone and line connections. Dual power inlets are provided for redundancy. Dual Gigabit ports, a CAN port and an RS-422 port provide remote control access.

As you can see, Power Core takes the "device concentration" idea pretty seriously. All of that signal connection capacity could easily occupy 6-8 RU with traditional AoIP devices.

Inside the box, it's even more interesting. Power Core is also a console mixing engine that can handle up to 60 physical and 60 virtual faders. While few stations need one console that big, Power Core can also be configured as a mixing engine for up to four independent mixing devices simultaneously – traditional physical consoles, or touchscreen virtual mixers. This is a real game-changer for medium-sized studios, reducing the engine-to-console ratio by 75% and saving considerable cost.

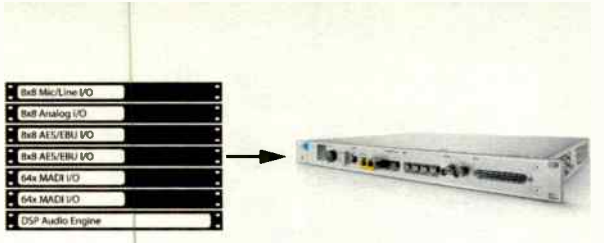
But there's more. Power Core contains so much DSP that it can become a networked, whole-plant, audio-processing-on-demand provider for as many as 96 input channels and 16 stereo (32 mono) summing busses. One Power Core in the rack room can apply EQ and dynamics processing to any source before routing to its final destination.

This dynamics toolkit is quite robust, with automatic gain optimization for mics, a 5-parameter equalizer with three fully-parametric EQ bands plus two semi-parametric bands, gates, expanders, compressors, limiters and de-Essers. There are also four individual AutoMix groups to maintain preset mixes for multiple inputs. Onscreen bus and source metering via EBU R128 and/or PPM meters are included. Many clients employ a Power Core to sweeten sources inside the facility, mix-minus channels sent to field reporters or talent working at home, or for program audio fed to network affiliates.

This is a lot of capability for a broadcast device that only occupies 1U in your central rack.

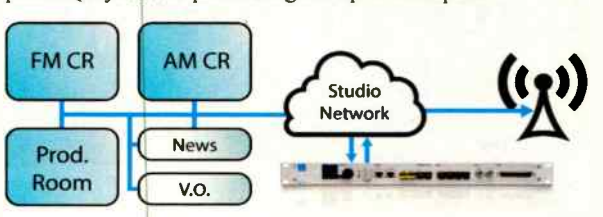
Examples

Multiple license options make it possible to tailor Power Core to specific needs. If those needs change, the license can be easily upgraded via software. Current options are EDGE (a pure I/O device), SAN (a Super Audio Node with I/O with DSP capabilities), L and XL packages for powering a single mixing console, and MAX, which allows one Power Core to power up to 4 individual mixing consoles. Here are a few examples of how these options can help reduce rack space requirements.



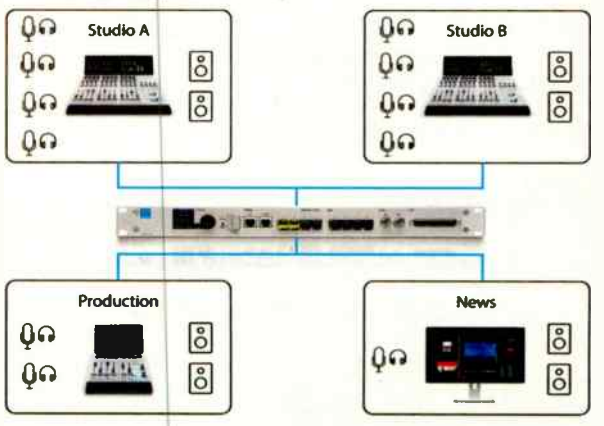
Super Audio Node

Here's an easy way to save 6RU. Using the SAN (Super Audio Node) license, with a Mic/Line input card, an 8x analog input card, two 8x analog output cards and four AES-EBU I/O cards, one Power Core takes the place of four rack-mounted analog and two AES3 I/O devices and their associated network switch ports. 128 channels of MADI I/O replaces two 64x64 MADI devices. Bonus: this configuration also includes a 1,728 x 1,728 routing matrix and 64 mini-mixers, plus EQ/dynamics processing for up to 16 inputs.



On-demand Signal Processing

Whole-plant, on-demand audio sweetening is a compelling application. The "L" Power Core license provides 48 channels of input audio processing; use it to improve the quality of satellite or remote feeds, audio from phones or social media, livestreams, etc. AutoMix automatic mixing is also included, useful for keeping multi-mic interviews balanced or for riding gain on playout system outputs during unattended operation. These capabilities are available at the same time audio I/O functons are being performed, gaining more cost and space savings while increasing capabilities.



Mixing Engine to the MAX

Since AoIP debuted, the console to mixing engine ratio has been 1:1. What if you could slice that down to 4:1? Power Core's MAX license allows it to power up to four average-sized mixing consoles (or software controllers, like Lawo VisTool). Along with this comes an expanded 1,920 x 1,920 routing matrix, 96 instances of DSP dynamics processing and 80 summing busses, along with the audio I/O capacity and bridging features already mentioned. We're talking some serious space and cost savings now – the kind that can add up to significant numbers in a medium or larger facility.

Let's Get Small!

With apologies to Steve Martin, it seems clear that AoIP's next revolution will come from reducing the size of its infrastructure. Thanks to technological advancements in computing and DSP, we finally have the means not only to improve our operational performance by adding capabilities, but to do so with less capital expense and in a smaller physical footprint than ever before. – *Radio Guide*

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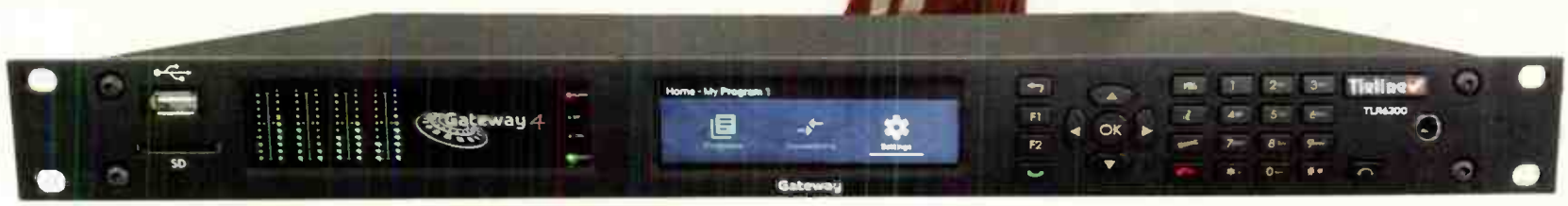

* The Gateway 4 codec supports 4 channels only and is not upgradable to support more channels.

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Studio Site

Taking Your Studio On the Road

New devices that bring high tech to the field or the office next door,

by George Zahn

It's happened more than a few times, and there's that terrible feeling when every studio at the station is tied up for recording or interviews or live delivery – then a guest shows up early (or late) and there's nowhere to go to record. When it's happened to me, I've been so happy to have a portable microphone/recorder unit at my disposal. I was able to take the guest into an office with half-decent acoustics and pull the interview off anyway.

I've written in the past about a variety of microphone/recorder all-in-one units. I still use an old Zoom H2 in a remote kit, as an SD recorder attached to a mixer through the line-in option. That old workhorse has been used, as described above, when a noted paleontologist arrived, only for me to find all the studios taken. That old H2, even with somewhat limited bass response, was a life saver.

Zoom H2N Recorder

Over the years, we've looked at newer models. Whether it's a backup recorder/microphone at the station or a field recording device – used even more now for podcasts or extra field audio and nat sound – the options are becoming even more refined, including better built-in microphones and microphone interfaces. We've come so far from the bulky cassette and even solid state recorders of yesteryear.

Just when I think the technology has advanced far enough for most needs, I find new technology that is more compact, better sounding, and more multi-functional. Among the new devices hitting the market are a simple hand held microphone and recorder, but with advanced microphone capsule pickup pattern options. Another is a fancier new multi-track digital handheld recorder with built-in X-Y microphones but with XLR inputs for using alternate microphones or audio inputs.

A Mic in the Hand

Yellowtec, a company out of Germany, has been manufacturing audio interfaces, mixers, accessories, and microphone/recorder combos. Their iXm handheld microphone/recorders look like a standard handheld vocal microphone. Yellowtec claims the internal rechargeable lithium ion battery can last for up to sixteen hours of recording. If you need longer than that or forget to charge, the microphone will accept 3 basic AA batteries as well.

We'll discuss capsule options in a bit, but other standard features include a mini-plug headphone jack to check audio in the field, a mini-plug line in jack plus a USB 2.0 connection. The iXm records onto SD or SDHC cards up to 32 GB. The device has an LEA (Level Energy Arbitration) which they claim functions better than Automatic Gain Control and smooths out audio levels, helpful in areas where the sound environment may not be controllable. The controls are built into the handle of the microphone itself. There are some new features now available, including an upload app for Apple or Windows.

Similar to a system microphone, Yellowtec offers a Pro Line of interchangeable capsules that will allow different pickup patterns from omnidirectional to cardioid or even supercardioid. The capsules, available separately, simply screw on or off of the Yellowtec body. It appears the omnidirectional head is no longer being offered by Yellowtec, but may available on the secondary market.

The Pro line from Yellowtec are capsules made by Yellowtec itself. The microphone body with one capsule appears to retail around $800, but Yellowtec also offers a Premium line of capsules which are manufactured by Beyerdynamic and provide higher performance and better frequency response, but the Premium capsules are about $150-200 more expensive.

Yellowtec iXm Podcaster

If budget is a concern, Yellowtec offers its Podcaster microphone/recorder. The unit is less expensive (about $600-700 retail) than the standard iXm units. The Podcaster does not have the rechargeable battery, and it only comes with the Pro Line cardioid head, limiting your options. It's also good to shop around if looking for any items, since supply chain issues can increase prices and affect availability. Some retailers appear to be offering Wavelab editing software, carrying case, and Yellowtec windscreen as a bundle.

A Multi-track Multitasker

Lacking an immediately available performance space for a small band that came to our station several years ago on short notice, I was able to make our conference room a passable recording area. Using a small mixer and some nice Sennheiser studio mics, we ended up running the mixer output to one of our rack mounted digital recorders in the air studio. Now, if we encounter that situation, one handheld unit can do almost everything.


Zoom H8

In the past, we've discussed portable recorders that can record multiple tracks, That early H2 Zoom Handy Recorder allowed an impressive four channels of recording from its built-in microphones. That feature held through Zoom's H4n model. Zoom has since offered the H8 model which has twelve tracks of recording with four XLR microphone inputs and two onboard microphones. The H8 was made to take on models from Tascam, and started offering a touchscreen control.

Tascam has fired another shot across the bow in this battle of inputs and interfaces built into a hand held recorder. The new Tascam Portacapture X8, which not only allows for 6 tracks of digital recording (plus two more for mixdown), but has an elaborate and larger color display and control interface.

Tascam Portacapture X8

The Portacapture X8 has four XLR/TRS microphone inputs and 32 bit/192kHz resolution, While the Zoom H8 has more simultaneous recording tracks and can record for 20m hours on four AA batteries (compared to 11 for the new Tascam), the Zoom H8 records at 24 bit/96 kHz.

Tascam is adding its DSP options offering low-cut filter, compressor/limiter, and normalization and noise gate settings. The unit can "remember" settings from one recording in a series to the next. The 3.5 inch screen is designed to make a decent GUI. For those capturing video and wanting a better live audio recorder, the X8 from Tascam has a cold shoe mount. The X8 retails for about $500, The Zoom H8 is about $400.

As I've always advised, when seeing any of these devices, we tend to get excited about getting a new toy, but if you know a professional using one or more of these devices, it's a great way to see if you can try their model to see if it fulfills your audio needs. Trying is a great option beyond just reading reviews. No model is perfect for every need, but the ability to set up in station, on the road, or in the field, is becoming simpler and more cost effective every day. If you have unique applications for any of these or other devices, please share them, and we can pass along some creative ideas!

George Zahn is a Peabody Award winning radio producer and Station Manager for WMKV-FM at Maple Knoll Communities in Springdale, Ohio. He is a regular contributor to ***Radio Guide*** *and welcomes your feedback. Share your stories with others by sending ideas and comments to: gzahn@mkcommunities.org*

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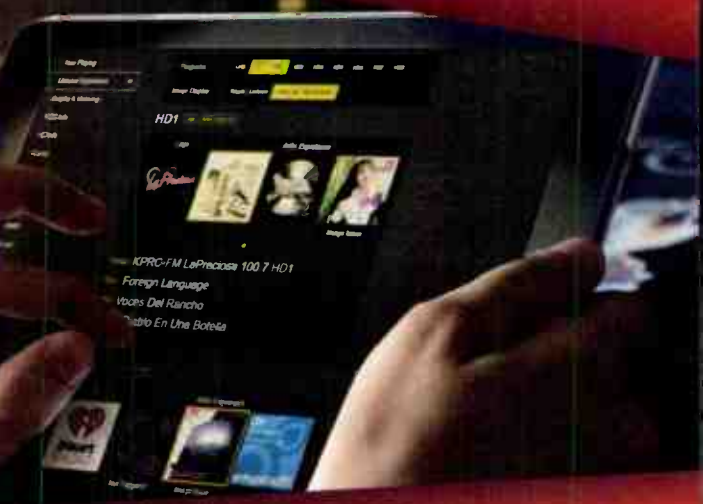

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FCC Focus

Infrastructure Investment and Jobs Act

Why It's Important for Broadcasters

by Gregg P. Skall, Member – Telecommunications Law Professionals PLLC

Broadcasters are facing ever-increasing competition from Internet-based competitors and even from their own networks. In response, broadcasters are looking ever more aggressively at their own Internet-based revenue opportunities, including streaming. With the accelerating conversion to 5G broadband mobile services, it has become important for broadcasters to understand the efforts to enhance and expand broadband in their service communities. Critical to this evolution is the recent bipartisan Infrastructure Investment and Jobs Act (the "Infrastructure Act"), passed last year and described by the White House as a "once-in-a-generation investment in our nation's infrastructure and competitiveness" that is designed to "ensure every American has access to high-speed Internet."

Broadcasters need to understand the act and learn how to take advantage of it for advancing their own businesses. And, given the importance to all communities, urban, rural and suburban, of closing the "digital divide," everyone deserves to understand the role of their local governments in determining how the dollars will be distributed to properly and efficiently achieve the goal. The Infrastructure Act specifically requires state and local governmental agencies to solicit input from a broad cross-section of community leaders and stakeholders so that all voices and perspectives are heard in the process of putting the available funds to use. As a result, an informed community is important for this process to work effectively. This is, therefore, an important and timely topic for news and discussion programming on local stations. This article provides an overview of the latest developments to aid your efforts to report on this topic.

The Infrastructure Act: The Infrastructure Act allocates over $65 billion in funding for broadband deployment. The largest portion of these funds ($42.45 billion) is allocated to establish the *Broadband Equity, Access and Deployment Program* (the "Bead Program") which will be administered by the National Telecommunications and Information Administration, (NTIA). The program will award grants to state and local governmental entities that will be responsible for establishing and administering grant programs and overseeing system deployments Each state will receive a minimum of $100 million under the BEAD program. The remainder will be allocated to the states on the basis of demonstrated need for additional funds to bring service to unserved and high-cost locations, taking into consideration, among other things: (1) unserved areas where 80% of the population lacks speeds of 25/3 Mbps; (2) underserved areas where 80% of the population lacks speeds of 100/25 Mbps; (3) the need to connect eligible community anchor institutions; (4) the need for additional data collection, broadband mapping, and planning resources.

Recipients of BEAD program funds would be required to provide service at speeds of not less than 100 Mpbs/20 Mbps with sufficiently low latency to allow reasonably foreseeable, real-time, interactive applications. In addition, grantees would be required to match at least 25% of the project's cost, unless NTIA waives the requirement.

In addition to establishing the BEAD Program, the Infrastructure Act establishes other broadband-focused programs which are summarized briefly below:

A. Enabling Middle Mile Broadband Infrastructure Program: This program will distribute $1 billion to "encourage the expansion of middle mile infrastructure to reduce the cost of connecting unserved and underserved areas to the backbone of the Internet" and "to promote broadband connection resiliency through the creation of alternative network connection paths that can be designed to prevent single points of failure on a broadband network." States, local governments, Tribal governments and private companies are all eligible to receive a grant under the program for up to 70% of the total project cost.

B. State Digital Equity Capacity Grant Program: The Act authorizes $60 million for planning grants to be made available to states and for the development of State Digital Equity Plans. In addition, it authorizes $650 million over five years for grants to states to support the implementation of State Digital Equity Plans and digital inclusion activities.

C. Digital Equity Competitive Grant Program: The Act authorizes $650 million over five years for public-sector/not-for-profit entities to develop and promote digital inclusion and broadband adoption activities.

D. Other Programs: Finally, the Infrastructure Act authorizes more programs geared toward increasing access to broadband, such as extending the Emergency Broadband Benefit program under the new name, the Affordable Connectivity Program, and a brief provision on Digital Discrimination that would require the FCC to adopt rules facilitating equal access to broadband Internet service. It also reauthorizes funding for various other broadband programs such as the ReConnect Program and NTIA's Broadband Connectivity Fund.

The Broadcaster Role - Adequate State and Local Planning: Broadcasters can play an important role by informing the public so that they can provide the input necessary to ensure the success of these programs. There is much work to be done at the state and/or local level to ensure that these funds are properly distributed and managed. Some states have already passed broadband legislation, some have it under consideration and some will pass much of the responsibilities to local governments. A recent report by Tilson, a digital infrastructure deployment company, found vastly differing levels of readiness among states to implement the Infrastructure Act and many states have not yet even proposed legislation to create and implement the broadband grant programs.

The bottom line is that there is much work to be done at the state level. Broadcasters can serve the public interest by bringing public attention to these programs and discussion about what their state and local governments should do to achieve the best result properly and efficiently without fraud or abuse. NTIA will almost assuredly establish requirements to: (i) review the grant and sub-grant processes contained in state plans; (ii) assure that the plans are properly authorized by state law; (iii) ensure that the relevant state or local administrative agencies have been funded for a sufficient period of time to enable them to achieve the program objectives; and (iv) confirm that states have in place the resources to monitor the grantees' compliance over time.

State plans should be adopted on a transparent basis with adequate input from interested parties and the public, with well-publicized notice and comment periods. Whenever states rely upon input from outside consultants and experts to formulate broadband policies, this fact should be made public and well publicized. Consultancy contracts should be awarded on a competitive basis pursuant to a public request for proposals ("RFP") or request for quotations ("RFQ").

NTIA is statutorily required to ensure that the funding in this program is distributed to areas that lack any or sufficient access to broadband Internet service. In the past, determining the specific areas that are either unserved or underserved with high-speed broadband service has been challenging and it remains so today. The Act seeks to avoid these problems by dedicating some funds to states for mapping, which is important because lack of funding in the past has been a barrier to the creation of reliable broadband service maps. If states undertake their own mapping initiatives, they must be able to pass critical analysis that they are reasonably accurate.

Finally, the ultimate recipients of funds must be required to demonstrate that they meet quality of service standards to assure that end users receive a truly high-speed broadband service. This will require continued diligence by state and local officials as rapid changes are taking place in the development of terrestrial services, mobile wireless services, fixed wireless services and satellite-based services. Considerations such as terrain or population density may weigh in favor of one technology over another, and well-informed local officials should be the best resource for making these critical local decisions.

Conclusion: A well-informed public is critical to help guide the distribution of the massive funds designed to bring broadband to all Americans. Broadband can be a game-changer, not unlike the introduction of the telephone, radio and television. Broadcasters can play an important part to make sure their local audiences and government officials are well informed and able to provide meaningful input and make informed decisions. And, if reliable broadband proliferates, there may be additional business opportunities for broadcasters to pursue Internet-based revenue streams.

This column is provided for general information purposes only and should not be relied upon as legal advice pertaining to any specific factual situation. Legal decisions should be made only after proper consultation with a legal professional of your choosing.

Gregg Skall is a member of the law firm of Telecommunications Law Professionals PLLC. He frequently lectures on FCC rules and regulations, represents several state broadcaster associations and individual broadcasters and other parties before the FCC.

The Reporter.

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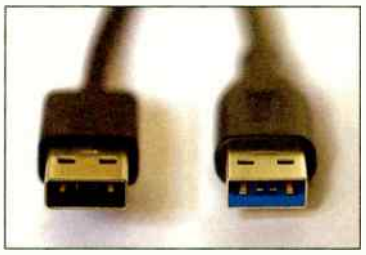
LAN Power Over Ethernet – PoE

by Wiely Boswell

It is getting common to power all types of things over an Ethernet cable. There are a few things to consider and I will try to dig into the subject. This subject relates to USB computer ports that provide power as well. All the neat gadgets and serious accessories can put a power demand on the source. USB ports and Ethernet ports have steadily increased their speed and power delivering capacity. I will start out with USB ports and 5 VDC power.

The original USB cable end has four contacts, the outside two connections carry the power and the inside two connections on the connector carry data. The plastic insert showing inside the connector indicates which version it supports.



White: This usually signifies an old-school USB 1.0 connector or port.

Black: This color identifies a USB 2.0 Hi-Speed connector or port

Blue: This signifies a newer USB 3.0 SuperSpeed connector or port

Teal: The most recent addition to the USB color chart identifies a 3.1 SuperSpeed+ connector or port.

Continuing with 5 VDC, an Apple phone charger has a USB connector and is typically capable of a 1 Amp charge. The voltage is going to remain at 5 VDC and the phone controls the charge with its own battery management system. An Ipad requires a 2 Amp charger. Once you surpass the current rating, the voltage is going to drop or the supply shuts down. A USB hub will require external power, if the sum of the current the attached devices use is more than the host port can support. If the equipment being powered experiences load surges, the resulting voltage drop can cause a reboot.

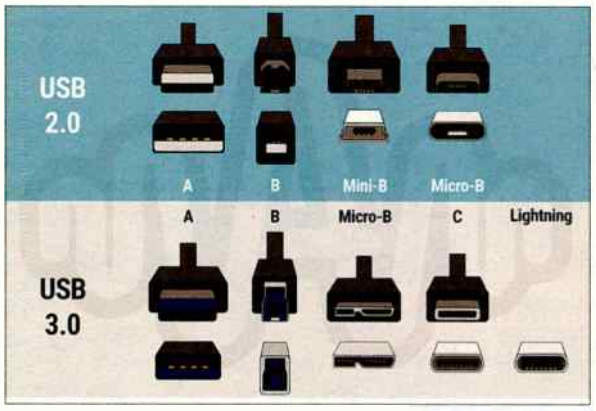
PTZ (pan-tilt-zoom) cameras that use pan/tilt motors will experience a load surge as it boots up and the motors cycle though startup. One inexpensive PTZ camera, that I use in front of equipment in a rack, lets me remotely see the Eb/No reading. Other cameras at the studio can scan over Internet and generator equipment in the telephone room. These are not the more expensive PoE (power over Internet) IP cameras; they have separate power and Ethernet connections. They operate on 5 VDC with a very small coaxial power connector into the camera. The supply is rated at 2 Amps and has a USB connector. I tried extending the supply cable but the surge resulted in enough of a voltage drop through the cable to cause it to start rebooting – you have little to loose at 5 VDC. My solution was to use a buck converter. It was preset to convert 12 VDC down to 5 VDC at 3 Amps. It is sealed in molded plastic and it will run the camera using a 12 VDC supply. You can, of course, expect possible switching noise. A buck converter uses a switched-mode technology, and it relies on an inductor/capacitor combination and can boost voltage, as well drop voltage in a highly efficient method. Remember, digital devices such as this and my dash cam, will trash AM reception. The noise floor, in general, keeps going up. USB is fixed at 5 VDC so the interface can loose voltage.

A nice gadget to have in the computer tool box is a USB volt/amp meter (**Figure 1**). It displays the voltage and you can measure the drop under various loads and verify a USB port power is working properly.

Figure 1

The latest standards offer a large range of connector types, speeds, and power available. USB cables have limited distance. USB 1.0 began in 1996 and moved up to 3.1 in 2013, USB 3.2 in 2017, and now USB 4, defined in 2019, runs at 40 Gbps.

The most common cable has a type A (flat end) to type B (somewhat square end). This type cable is typically used from a computer to a printer or to other devices like the Pira FM Scope/RDS test set. The 3.0 / 3.1 cable will have an extra row of pins on top of what looks like the regular type B end. This can support more current to a "software handshake qualified," attached peripheral device (up to 3.1 Amps). Cables are less than 10 feet long, for higher speeds like 3.1. USB 2.0 can go further at up to almost 17 feet, with a speed of 480 Mb/s. A 3.1 micro B connector is used with external hard drives and appears as two small flat connectors.



Two example cables are USB 3.0 cable to micro B cable. It appears the two outside power pins are longer such that power connects before data pins.

The USB 3.1 A connector has additional pins hidden. They can be seen on the 3.1 B end as well as the length difference. Again, the extra pins provide the intelligence for high speed operation.

The connection area of a modular RJ45 connecis also small. Now we are subjecting these type connections to up to 2 Amps and 57 VDC Ethernet power delivered is not limited to 5 VDC. Ubiquiti wireless access products use PoE of different voltages and you have to be careful not to connect a 48 Volt PoE inserter to a 24 VDC access point.

LAN cable connection could be a reliability issue. There are gold plated contacts in a modular connector and the plating thickness becomes very important, especially for multiple insertions that can wear it away. Bell Labs invented the modular connector system. Phone line standards were very high. Not just any connector could handle 90 VAC ringing voltage and -48 VDC standing on the line always waiting for an off hook. A poor connection became quite evident as noise on the line. Four-wire data circuits, including T1s, also used modular connectors in certain cases. Wire splices in the field could become weak when nothing but data was carried by the pairs. Sealing current was applied to the two pairs, Tx & Rx, to help the connection quality over time, without affecting the data. The same principal is applied to power transfer through an Ethernet cable. There are two different modes involving which pairs to use. Equipment is so advanced it is possible to automatically adapt to either standard 802.3af or 802.3at.

Each of the four pairs in a LAN cable terminate at approximately 100 Ohms into 1:1 miniature transformers at each end (**Figure 2**), within a small sealed block on the circuit board. Transformers block longitudinal surges as a balanced circuit. In this case, the interface side of the transformer is center tapped from which power is provided or used. Ethernet circuit equipment is sensitive to lightning

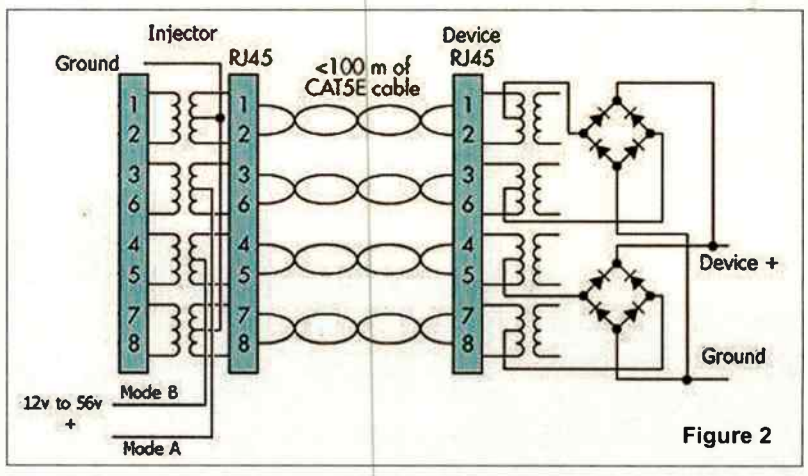


Figure 2

and lots of things get damaged, as you likely have experienced. Fiber isolation does the best job protecting equipment but does not pass any power. Transit protection is built into PoE power inserters but has to have 60 Volt or higher breakdown threshold. The circuitry is very small and delicate. With the input transformer having a wired center tap, it is like bypassing the common mode rejection of a transformer – the surge goes right on in. It takes Ethernet over fiber isolation or a wireless client to protect the interface.

There are surge suppressors for Ethernet runs. Ubiquiti recommends them at the cable entrance coming off a tower. Other methods are coiling up cable, ferrites, and shielded cable with a drain wire. A modular connector not sealed to the weather, outside at a camera, will not last: There are now nice female connectors that come out of cameras. They come with mating covers that twist lock on the camera dongle. (If water gets in the higher DC voltages will burn up the connector.) One of the latest phone company demark improvements was the strange goo in the RJ socket to keep out moisture.

Wiely Boswell is Chief Engineer of Faith Broadcasting, located in Montgomery, Alabama; CBRE, CBNE, and SBE 118 Chairman. He may be contacted at: Wiely@faithradio.org

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Transmission Line Tips

By Steve Callahan

Transmission lines are the "Rodney Dangerfield" of a radio station. As long as they are working properly, they get no respect. Let's take a closer look at them and what they do.

The job of a transmission line is to efficiently transfer the energy from a power source, like a transmitter, to a load, such as an antenna. There are many versions of transmission lines which come in various sizes such as RG-8, 1/2-inch foam, 1-inch hard line, 1-5/8 inch hard line, 3-1/8 inch flex or hard line, 6 and 8-inch hard line, along with wave guides and open wire transmission lines. Naturally, the power needed to be transferred will dictate the physical size and power handling capacity of the transmission line.

When looking at coaxial cable, you can choose from flexible foam dielectric line or flexible air filled line which uses dry air or nitrogen as a dielectric. Another choice available to you is a hard line, which has an air dielectric and a rigid copper outer conductor. The hard lines usually come in long lengths requiring connectors and couplers. They can be used inside or out but make sure you use factory flanges outside and put the required "O" rings in the joints to waterproof and make the connections air tight. If you want to use hard line inside, you can use field flanges and couplings. "O" rings are voluntary but I usually use them out of pure habit.

Field Flange With Bullet

Hard lines used outside require hangers for support, both for horizontal and especially for vertical runs. The hangers are daunting pieces of hardware with springs to maintain proper support. The advantages of a hard line outside is that if you need to replace a short section of hard line due lightning or other damage it may not require a complete replacement of the transmission line. However, if a line section or bullet does burn up, smoke and soot can travel quite a way through a hard line system which would then require swabbing out of the affected length. Not a task to be undertaken by the uninitiated! Also, a hard line has couplings every 10 or 20 feet and every one of them is a potential problem waiting to happen.

If I've scared you away from hard line, then flexible coax is the choice for you. It's usually one piece, from transmitter to antenna, and needs to be supported – but not with all of the hardware needed for a hard line installation. You don't need as many flanges and elbows, just flange adaptors at each end. Those come in gas-block and gas-pass configurations. The gas-pass allow the dry air or nitrogen to pass through the connector and the gas-block connectors prevent the gas from passing through the connector. In a pinch, a gas block can be made into a gas pass with a quick quarter inch hole drilled in the interior Teflon insulator.

Bullet Connector

Personally, I've used both flex and hard line in many applications over the years and I've picked up some tricks that can make your life a little easier. When I specify pressurized flex line in an installation, I usually ask that a gas-pass elbow be installed at the base of the tower when the line goes from the vertical run to the horizontal run. I think it's just good insurance in case you have a catastrophic failure at either end, you can separate the line into two pieces and, if you're lucky, only have to replace one half of the flex line.

Elbow Connector

A lot of folks think that cutting and fitting hard line is a terrifying task. I like working with hard line, especially 1-5/8 inch line, because the parts are smaller, the line lengths are shorter and it's easier to cut and fit. Also, support hanging is a lot easier when you are not juggling a heavy piece of 3-inch copper pipe.

When working with hard line, I start off simply. Make sure you have the right tools and parts for the job. You'll need enough lengths of copper hard line with interior copper conductors held off the wall of the outer conductor by copper nubs or spirals. As an old tower man who started off his career as a plumber once told me, design your system with the least amount of parts so you have fewer places for failure. Lay out your transmission line project and then get the right amount of parts, plus an extra one or two, of field or unflanged elbows, couplings, adaptor flanges and anchor insulators or bullets. Make note of the elements of your project that can't move versus the parts that could move slightly to accommodate the runs of your transmission line.

If you choose to cut the copper lines by hand with a hack saw, have a handful of brand new hack saw blades ready. Some folks use a pipe cutter, a cut-off saw or a power hacksaw to make the cuts, but I've found that the pipe cutter, even though it is fast, leaves quite a burr and has a tendency to spiral away from the original point of the cut if you're not careful. A power hack saw looks like it would be just the thing if you have many repetitive cuts to make. Don't forget to buy a deburring tool which you can find in the plumbing section of your favorite home store. Any time you cut a piece of transmission line, especially with a pipe cutter, you will leave an interior burr which will prevent the solid, flat mating of the inside conductor with the bullet leaving a potential "hot spot."

Start at the point in your system that cannot move or be adjusted and build out from there. Follow the old carpenter's creed of measuring twice and cutting once – in fact, considering the price of copper these days, measure three times before cutting once!

Cut the outer conductor to span the needed distance and then cut the inner conductor short by the amount specified by the brand of bullet you are using. Usually it's 3/4 of an inch on each end but check before you cut. Use a piece of sandpaper to shine up the portions of line and connectors that will be clamped together. Use radiator clamps to clamp on the coupling. I use three clamps per connector per joint rather than two only because I buy radiator clamps by the box lot.

Keep an eye on how you are going to support your work of art. There are several types of supports available from the source that you got your couplings from, or sometimes plumbing supports from the home store can be a cost-effective alternative. As you work yourself around the room, you might have to make some slight adjustments in route. This is where the extra parts could prove to be helpful. Have a carpenter's level handy to keep everything as straight and level as possible. When cutting the interior conductor to length, make sure the interior pipe has some of the needed Teflon insulators. You don't want the interior conductor "drooping" on a long run.

A good looking hard line installation is a truly beautiful thing. Years ago, I knew a proud engineer who would regularly polish the copper hard line in his transmitter room so he could impress visitors ... and other engineers!

Steve Callahan, CBRE, AMD, is a member of the engineering staff at Entercom Boston. Email at: wvbf1530@yahoo.com

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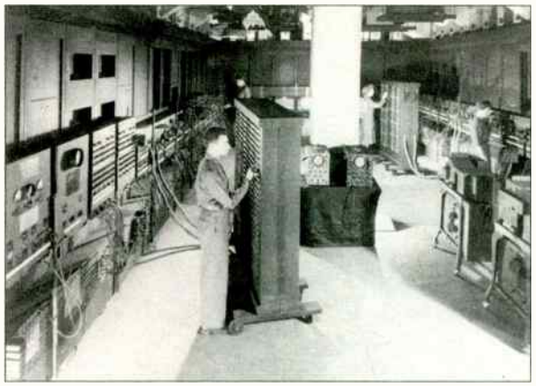
IT Guide

The Linux Connection, Etc!

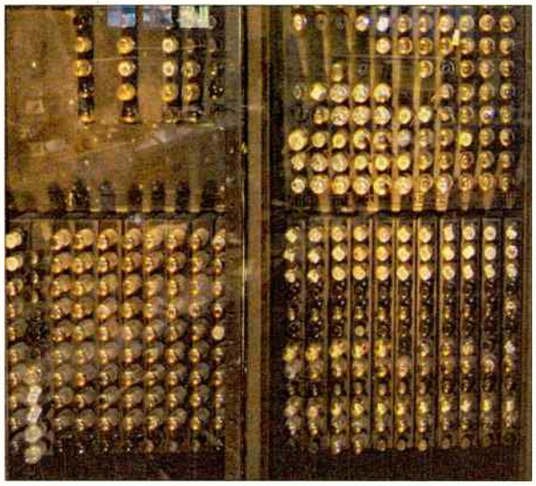
Engineers and IT

by Tommy Gray CPBE CBNE

For those of us who started in broadcast engineering many years ago, this thing of computers and networking was only something people talked about or showed in pictures with rooms full of tubes and equipment in a large building somewhere. The very first programmable digital computer was the ENIAC (which stands for "Electronic Numerical Integrator and Computer"). Below you will see a couple of pictures from the WiKi archives:



ENIAC Programmable Digital Computer



Back Side of the ENIAC Showing the Tubes it Used

The UNIVAC (UNIVersal Automatic Computer) revolutionized the computer world. It was smaller and did not require a team of engineers to run it. People could be trained to operate it and it was becoming a useful tool for business and industry.

UNIVAC Computer Operator Console

These machines, though they may look impressive, had computer power that was not even close to what you have in the personal computer you carry in your pocket – your cellular phone.

"Nostalgia Side Trip"

When I first got into broadcasting there were, of course, no computers or cell phones. There were no dial-up remote controls, or anything even close to that. Transmitter sites were manned around the clock with live engineers. Most transmitter sites had full apartments onsite for the staff to live during their shift. Later on of course, things progressed to the point where an amazing little device was created called a "Pager." If you have been around the industry for any length of time you had one, and can remember being awakened in the middle of the night with a pager going off, requiring you to get out of bed to call in or travel to a station to do repairs, etc. I had microwave sites in mountainous areas many miles away from the station I had to go to, and I would get a page to call in and have to drive miles to the nearest pay phone and call in.

Later on, we got our hands on 2-way radios. This was helpful as long as you were in a vehicle and in an area where you could get signal. After that, cellular phones came along – these were built-in affairs attached to your car or truck. You could call a telephone from your vehicle! Totally amazing! Then came the venerable Motorola™ "Bag Phone" ... and so on. Finally we got cell phones we could even carry around (most were so heavy you could get a hernia if you had to carry them for long!). Finally, as years passed by and phones got to be smaller, "Smartphones" came on the scene. Today we carry powerful computers in our pocket that have the ability to control transmitters and remote servers right from the palm of our hand! Now, we cannot even imagine doing without a computer of some kind to run our stations and transmitter sites. For years, the most user friendly operating system for our computers has been Windows.

Linux to the Rescue

Today there are MACs and there is of course my favorite, "Linux." If you tried it years ago. you probably gave up after realizing that you had to be almost a "Techie" to use it. Not so today. We use Linux Mint cinnamon here in my office and all our laptops and desktops run it exclusively, or at the very least run it on a "dual boot" machine (Dual Boot means it has more than one operating system that can be run on it). Most "dual boots" are Linux and Windows with Linux being the primary,but allowing you to boot into Windows when you desire.

As more and more good computers have been almost obsoleted by newer versions of Windows and MAC OS, these computers have found new life with Linux. I have always felt it was a travesty to have to retire a perfectly good and great functioning machine just because it was not compatible with a newer version of Windows! Well, Linux Mint Cinnamon has eliminated that issue, at least for us. Did I mention that Plug & Play actually works with it? Today, we find that there is very little we cannot do with Linux. The tons of free software and the always free operating system updates, make it a totally viable option and a desirable one. Radio and TV automation systems for Linux are out there and very affordable. Not to mention that Linux is much more stable than most other operating systems (No Blue Screen of Death!). No rebooting for updates, with the one exception of a kernel update. I should mention that there is, for the most part, no need for antivirus software either! We don't use it and have never had a problem.

Moving On

If you have been around Windows computers for any length of time, as a Broadcast Engineer that has to do network "stuff," you are probably familiar with using the Windows command line. In our last issue I discussed briefly, the Linux "Terminal." It is a very powerful tool that to some is scary but to the person with even moderate technical ability it is an indispensable utility. Microsoft has made a Terminal available in Windows. They have seen the value of it as a maintenance and operational tool for technical people. Having said that, let me give you a comparison of a familiar utility you may already be familiar with.

If you have ever wanted to find out information about a network or a machine connected to a network of any kind, when using Windows, you have probably used the utility "ipconfig" Ipconfig stands for "Internet Protocol configuration." It will show you all current TCP/IP network configuration values of your machine, and it also refreshes DHCP and DNS settings. I cannot tell you how many times I have used it when I needed to know a machine's current configuration. Well, in Linux we have a similar tool that is very powerful. It is called "ifconfig" Linux makes it easier by calling it something you can readily understand. It stands for "Interface configuration."

The machine I am writing this article on is a Dell laptop that is connected to my local network. I opened up a terminal and ran "ifconfig." Here is what I got:

```
File  Edit  View  Search  Terminal  Help
tommy@HP-dc5800-Mint:~$ ifconfig
enp0s25: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.188  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 2001:5b0:270b:3cdc:bfdd:274f:2a10:676f  prefixlen 64  scopeid 0x0<
global>
        inet6 fe80::67ac:b3fb:b464:71f4  prefixlen 64  scopeid 0x20<link>
        ether 00:24:81:8d:85:31  txqueuelen 1000  (Ethernet)
        RX packets 1951181  bytes 1393865828 (1.3 GB)
        RX errors 0  dropped 266  overruns 0  frame 0
        TX packets 791293  bytes 123986526 (123.9 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device interrupt 19  memory 0xf0180000-f01a0000

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 41082  bytes 3929482 (3.9 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 41082  bytes 3929482 (3.9 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

tommy@HP-dc5800-Mint:~$
```

The information in this screen gleaned from a simple terminal command of **ifconfig** will give the Engineer or IT person most, if not all of what he or she needs to know, about where this computer is in the network. There is full IPv4 and IPv6 info here plus a lot more.

Time and space has caught up with me once again so I have to stop here for now. All this is leading up to finally getting back to our little Arduino project we started months back so stay tuned!

Until Next Time!

Tommy Gray is a veteran broadcast engineer currently staying busy doing Engineering and IT across the Continental US, through "Broadcast Engineering & Technology LLC", a Louisiana based Consulting and Contract Engineering Firm. www.BEandT.com

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Transmitter Topics

Servicing the Broadcast Electronics AM-1A Transmitter – *Part 1*

by Bob Reite, CBT

Overview and Gaining Access

The Broadcast Electronics AM-1A transmitter is a nominal one kilowatt AM transmitter with five power settings that can be adjusted fro 5 Watts to 1100 Watts output. This allows operation not only at day and night powers but at pre-sunrise and two different post-sunset levels which I have encountered at several class D AM stations. It was one of the first to be light enough to be UPS shippable in two cartons. However, the main power supply and RF stage cabinet weighs slightly over 70 pounds, so you will still need a helper for removal and reinstallation if you need to work on one. First introduced around 1997, this model is still "current catalog" and fully supported by Broadcast Electronics.

While the manual is fairly complete, I worked out a few procedures that make servicing this transmitter easier. Most servicing of the smaller control unit can be done without removing the transmitter from the rack. Hopefully, the last person that worked on it left the extender board inside the top control unit so that both sides of the two (three if the C-QUAM stereo generator is installed) can be accessed for testing. This is the only place that the manufacturer states that it is safe to hook up test equipment and work on it "live." All exposed points here have no more than plus or minus 15 Volts from the small enclosed switch-mode power supply that lives in the lower right corner as viewed from the front.

The single "Class E" RF power module can be pulled from the front – *but not hot!* To do otherwise will damage the connectors and card edges of the module, never mind what may happen to the solid state devices in the transmitter. The manual clearly explains the troubleshooting steps to take for the two RF amp and one modulator boards contained in the module. Note that if the module had been serviced in the past, you may find two different version letters on the two amplifier boards. BE assures me that they have the same characteristics and will combine properly to produce full output. However, I have found that the revision "C" board and earlier will blow fuse F3 seemingly at random, especially if power quality is poor at the site.

To service the other components of the main unit, the transmitter must be turned off, preferably by turning off the front panel breaker and unplugging the NEMA 6-15 connector at the top of the main cabinet. The top cover of the main cabinet cannot be removed without first unplugging the power connector and disconnecting the transmission line.

To get full access to the inside of the main cabinet it will need to be removed from the rack. After having disconnected power and the transmission line, unplug the AC cord from the back of the control unit, the 6 pin brown plug from the back of the meter panel, and plugs P4 and P5 from the side of the control unit. Make sure that these plugs still have readable labels on them! P4 and P5 are both DB-25 connectors and can easily get reversed.

Once the unit is out of the rack, unscrew the top cover and slide it back. You will find it quite cramped inside the power supply section. While I've never found the big electrolytic capacitors to have any charge on them by the time I got it out of the rack and the cover off, play it safe and discharge any caps that can be touched. If there is a charge, these are big enough to make bad burn mark on a screwdriver and the capacitor terminal, so I discharge though a 60 Watt light bulb, at least to start. Place the unit where there will be 12-18 inches of clearance on the left as viewed from the front. Using a #2 phillips screwdriver, unscrew the four screws along the bottom edge and three screws on the back holding the left side panel in place. Now use a 4-inch adjustable wrench to loosen the two nuts holding the side to the front panel. Do not remove the nuts completely it's enough to just loosen them to the point where the side panel can be folded down as shown in **Figure 1** below.

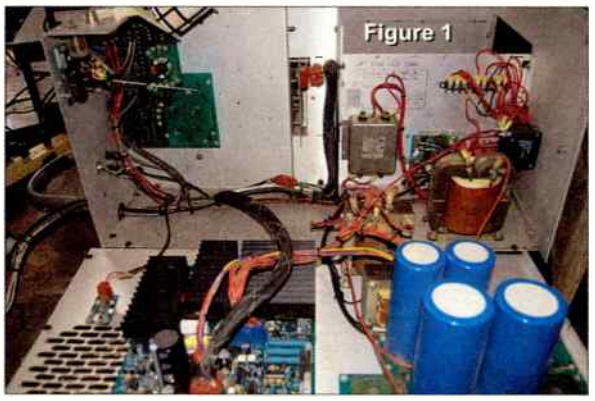
Figure 1

With the side folded down as shown, the circuit breaker and the three metal oxide varistors are now more accessible as well as the directional coupler board and the components mounted near the antenna connector. The reason that there are dire warnings about trying to connect test equipment to this part of the transmitter while powered up is that the main DC Supply for the output modules is direct line operated with no power transformer. Troubleshooting the main power supply board is done by resistance and diode conduction measurements as described in the manual.

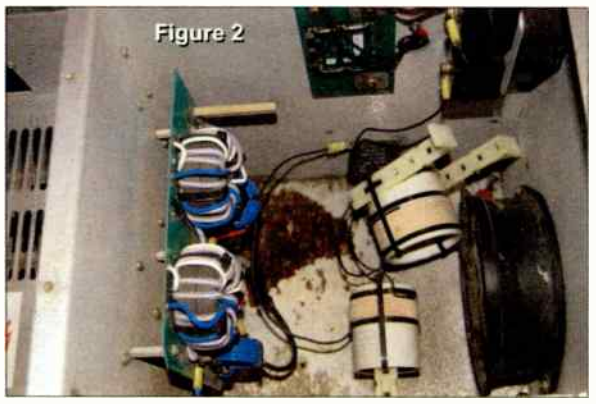
Figure 2

Servicing the fan and the combiner board can be made easier by dismounting the coils for the low pass filter. It is not necessary to disconnect them, just move them out of the way, as shown in **Figure 2** above.

The rust on the bottom of this example is due to the salt air environment, this transmitter site is only a block from the ocean, although a missing air intake filter did not help.

Replacing the Module Sockets

Even if the transmitter has not been abused by trying to "hot swap" the class E PA module, units over 20 years old will suffer pitting of the three card edge sockets. If I notice damaged edge connectors on the boards, I check the sockets and replace them if they do not look "factory fresh" to avoid damage to a replacement module. I usually second source these sockets. They are AMP part number 531353-6.

This is a three to four hour job that requires patience. First open up the transmitter as described above, then remove the RF combiner board. Take photos so that you get all the wires back where they came from. There is no unsoldering here, the tools needed are a #2 "stubby" phillips screwdriver and a nut driver set.

Tip the transmitter to one side and loosen three screws on the bottom holding the center front partition.

Remove the screw holding the small divider between the filter cap boards and the main switch mode power supply board. Back on top, remove the small divider entirely. Remove the other screws holding the front center divider in place and loosen the two nuts holding the divider to the front panel. The divider does not need to be removed entirely, just loosened enough to be able to shift it to the left and get enough clearance to remove the top of the card cage. Once this is done this is what you will see (**Figure 3**).

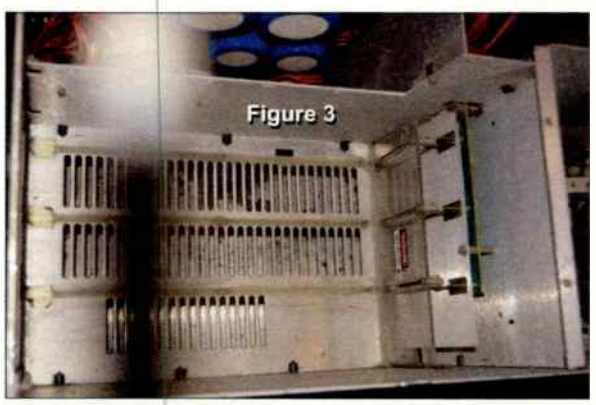
Figure 3

We are out of room for this edition. In part two we will continue to describe the module socket replacement procedure, directional coupler adjustment and how to move the AM-1A to a new frequency.

Bob Reite operates his contract engineering firm, Telecentral Electronics, Inc. servicing radio stations in Pennsylvania and New York state and may be contacted at br@telcen.com

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Small Market and NTR

Finding a fit for NTR in small market stations can be very rewarding to the bottom line.

by Roger Paskvan

NTR or Non-Traditional Revenue, as it is more commonly known, has been one of the main buzzwords in the broadcast world for the past fifteen years. Although a lot of focus has been put on NTR, the concept and several of the practices of NTR for radio stations have been around nearly as long as commercialized radio. By definition, NTR is any means by which a radio station brings in revenue through means other than on-air spot sales. Until about fifteen years ago, this meant that NTR revolved around events and promotions. With the advent of widespread Internet usage and other technological advances several new avenues for NTR have opened.

The advent of "new media," as it has been coined, has been both a blessing and a curse for the traditional forms of media in print, television, and radio. The Internet alone, bringing with it the ability to perform the basic tasks of delivering print information, streaming audio, and streaming video, brought forth a means for non-broadcast enterprises to produce and distribute audio and video content in a far more efficient and cost effective way. These changes challenged traditional media provider's on-air radio stations, newspapers, or television stations. Instant everything makes the old media seem like a dinosaur just waiting for final extinction. If a station wanted to expand its listener base before the Internet, there were limited options. The Internet's potential in bringing NTR opportunities to media outlets is a double-edged sword in that the Internet's ease of access and relatively low costs make it easy for a business to do a large portion of its marketing without involving traditional media outlets to purchase advertising. This has made media selling more difficult nationally as businesses explore other avenues to more directly reach consumers.

Businesses are moving toward the Internet and other New Media for their marketing needs. Instant response, unlimited access and a global perspective make it hard for the small market station to compete. What used to be a viable marketing strategy is now almost obsolete. Flyers, coupon books, direct mail and even the plain newspaper have been replaced with new media ideas via the Internet.

With new media offering venues to market businesses, traditional media has been met with the challenge of how to capitalize on these new opportunities in order to stay viable as a business. This challenge has been met nationally by large radio companies taking advantage of resources in bigger cities, but the adoption of these new media NTR opportunities has been slower in small market radio.

The key element expanding NTR for any radio station is its website. A radio station's website can create a number of NTR opportunities alone. Development of a website for a small market radio station may seem like an inefficient use of time and money due to the cost of developing and maintaining a website. These services are becoming inexpensive and can even be traded out for airtime. The value of a station's website, if used correctly, can far offset the costs with increasing listener interaction and loyalty.

The most basic means of developing NTR opportunities using a station's website is through selling banner ads or sponsoring sections of the website. Some stations also include a business guide on their site that is regularly promoted on the air to drive traffic to the site. This guide is generally basic information for all on-air and on-line clients including the business's name, address, phone number, a link to the business's website, and a feature allowing site-visitors to map the business's location obtaining directions from their current location or a specified address.

Some companies are also offering additional features to this business guide – offering printable coupons in the business guide and/or a feature similar to the familiar "on-line radio station auction" where business goods and gift certificates are sold. Including options like this in a sales proposal provides more of an impression for the client. Many small market stations capitalize on the auction capabilities of the station website.

Along with the basic concepts, a station's website allows a venue for more content and, as a result, more things to sponsor. In a smaller market, it isn't quite as easy to generate on-line content as it is in a larger city. Big market stations usually have a person or team of people in charge specifically managing and developing on-line content. Being budgets are smaller in small market stations, working with existing content is always

(Continued on Page 28)

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StudioHub

Small Market and NTR

– Continued from Page 26 –

a good starting point. Podcasts of popular segments during morning or afternoon drive shows can be developed simply by recording the segment and posting it to the website. Some stations are having jocks create a longer-form version of the segment for the podcast, driving people who enjoy the on-air version to check out the full-length version on-line. These podcasts are generally built with a sponsorship message at the beginning and end of the podcast. Longer podcasts allow messages to be inserted into the middle.

The concept of a podcast has also been used for businesses that use institutional advertising as a means to market their business and also show expertise and offer advice on the subject of their product or service. The podcast would consist of a few minutes delivering a tip or "did you know" type of information in the industry of the sponsor business. Examples of businesses that would benefit most from this type of product would be plumbers, auto dealers, home builders, banks, and mechanics. The concept of networking over the Internet, banner ads, streaming audio, emails, mobile marketing and alternative forms of delivery are taking over traditional radio.

Radio stations that stream their on-air programming have the opportunity to sell around the programming on-line. Most broadcast software enables stations to air a separate set of ads during commercial breaks on-line if they choose to do so. These spots can be sold on-line as a separate ad stream. Stations can also use video and still visual (print-like) sponsor messages around their Internet stream. Stations also develop streams devoted specifically to broadcasting local high school athletics or local news and community events as a means to cover the event without eating up the airtime on the air. Stations will generally have a launch page for these streams with sponsors getting space on the launch page and also getting messages in the web stream during broadcasts.

RBDS anyone? That stands for Radio Broadcast Data service. Yes, with a small inexpensive encoder, your small market station can control the display on every modern car radio. Some stations just display their call letters, others the song titles, and there are many stations that run ads that crawl across the radio display. Just another NTR way of billing your client.

Another viable NTR tool is text marketing. Databases can be created by using popular programs or contests to get listeners to sign up for the service. The service can also be used as a tool for promotions to get registrations for giveaways. After stations have a sizeable database, the tool can be used to deliver station and sponsor related messages about special offers. Some companies like McDonalds and Coca-Cola have used text message marketing to generate text message coupons sent to listeners where a code is sent in a message with the coupon details and it may be used at a participating store. Opportunities like these could be designed for several types of businesses using the on-air portion of a radio station to support the coupons being sent to one.

What about RDS? Defined as that second audio/data channel that any station can use to generate cash. Something that has been played with by some FM stations is using their RDS signal to deliver information about sponsors during their on-air spots as a support for the on-air message. RDS has also been used as a tool to drive promotions by directing listeners to call in to win, visit a website, etc. The drawback to this NTR option, especially for small markets, is that not many radios feature RDS technology yet and as a result many small market stations don't use RDS.

Finally, the most "mainstream" of NTR opportunities for radio stations are promotions and events. These on-site opportunities have been very successful in building listener loyalty, station awareness, and ways to generate revenue by involving sponsor businesses. This type of NTR is far easier and, according to the Radio Advertising Bureau, more heavily used in smaller markets. The types of events that can be created are virtually limitless, with stations organizing concerts, business expos, bridal fairs, amateur sporting events, and more. These events have several ways to generate revenue for the station, and with new technologies the opportunities are expanding. The incorporation of text messaging at these events as well as an emerging marketing technology in interactive Bluetooth messages from sponsors, supplementing other messages at events, is providing a more intense way to get the attention of people and deliver valuable information from sponsors.

The key to success for these NTR opportunities is designing a plan that will blend a number of different options together to help the business better market itself thus helping the station drive more revenue as a result. It's the combination and integration of NTR into mainstream radio that ends up with positive results for your bottom line. With today's depressed radio market place, NTR still remains a viable source of additional revenue for any creative radio station business.

Roger Paskvan is a Professor of Mass Communications at Bemidji State University, Bemidji, MN. You may contact him at: rpaskvan@bemidjistate.edu

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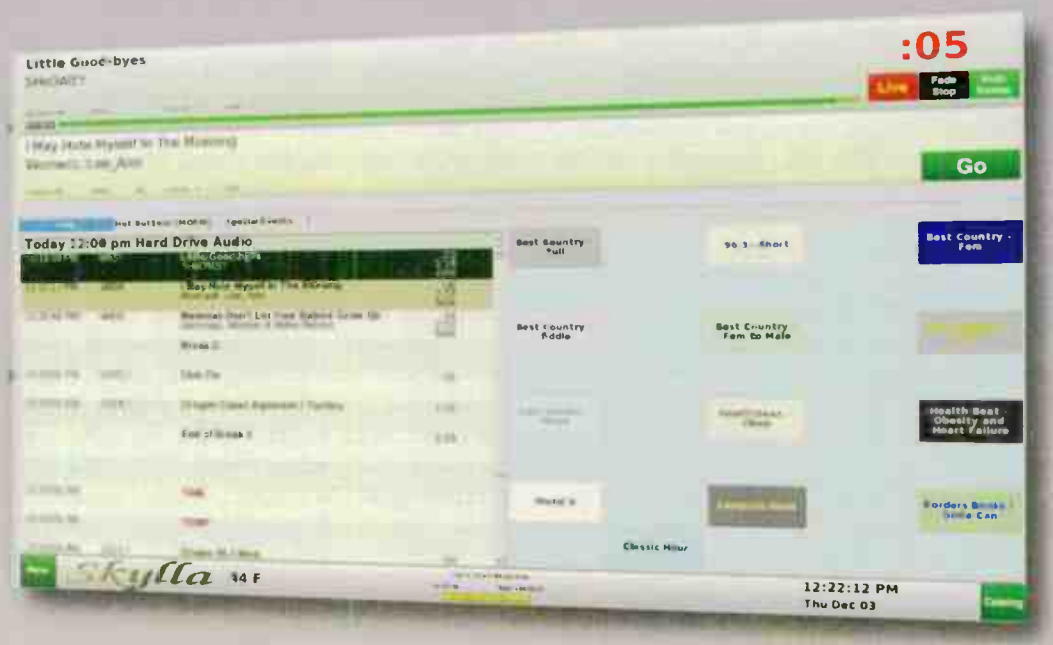

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Engineering Perspective

Never Too Early ... Try Not to Be Too Late

by Jim Turvaville

I've been accused of being *"born after my time"* with my love and appreciation for all things more nostalgic than the typical person of my age. That extends to my taste in music, phones I carry, vehicles that I drive and personal tastes in general. I'm not nearly as behind the times as my wife accuses me so often, but I will readily admit to not being an early adopter when it comes to technology. But to my defense, I do have some valid experience and reasoning to back up that stance, so permit me to share where I draw that line.

I was pretty much drug kicking and screaming into the smart phone world; after all, I despised texting for more reasons than the old keypad alphabet method being so clunky and inefficient. As someone said to me just this week, *"why would I want to waste time texting someone when I could just click a button and talk to them?"* And I pretty much held that position even after the phones with the pop out keyboard came along to get past the slow task of typing even simple texts. Even then, that keyboard was really *tiny* for us more visually challenged individuals; and when that little mechanical keyboard became an on-screen keyboard, it was still really tiny and difficult to operate comfortably. Thankfully, someone realized that the old PDA (who remembers those?) and its stylus were really handy for overcoming those inequities (not to mention the FFS – Fat Finger Syndrome) and then those swag pen manufacturers have even gone to putting the soft tip on the top of their giveaways that let me never be too far from a tiny screen typing assisting tool.

I admit to still having a general disdain for so many apps that clog up one's mobile phone screen, so many of which I find of no use except to hog up the limited system resources on the device. With the travel schedule I have and the constant connection to my clients via phone (the real communications part of that mobile device I carry) then battery life has always been a high priority consideration. When I was last forced to upgrade my mobile device (I have never once chosen to upgrade, but have always done so when mechanical or electronic failure of the previous unit has occurred), the latest whiz-bang version of my smartphone had literally dozens of totally useless (to me) apps pre-installed and fully activated which constantly consumed my brand new battery. Through some extensive research, and trial-and-error, I finally found those sports, news, entertainment, gaming and a myriad of similar things, and either uninstalled them (some flatly refuse that ability) or at least disabled them completely. In some cases, when neither option was viable, I found that I could remove permissions from the apps so they were effectively neutered and stopped killing my resources. Amazingly, I've had no issue at all with battery life since then; if you upgrade to some new version of your current device, watch out for all the "free" stuff that comes pre-installed. That could be your source of an unexplained short battery life in a new device. The same is true of "Bloatware" installed on new computers these days, it will suck resources and limit performance if not carefully checked.

Let's not dive too deeply into PC operating systems, since I'm sure you all can guess where I land on that subject! I still have the Floppy Disc set to install Microsoft Windows 1.0 and one day I'm tempted to find a good 3.1 Ghz computer with 4 Gb of RAM and see if I can get my 3.5 inch floppy interface (I have a USB adaptor for it) to read and install a fresh copy; just for the thrill of watching it run faster than it ever did in its original lifespan. And for the record, I was not an MS Windows fan until around the time version 3.0 came along. I had been a command line DOS guy from the get-go, and appreciated that DOS was under Windows until the turn of the century. At least I could manipulate Windows from the command line until we got into the 2000's and the NT based systems came along.

But to be fair, Microsoft did a pretty good job of making a stable OS with Windows XP, and I thoroughly enjoyed using it for productivity and operations computers for many years – even after the End-Of-Life was announced and came and went. I had an IT professional (one of those guys with all those letters after his name from the various certifications he holds) remind me recently, when the subject of Windows 11 came up in conversation, that Microsoft has this up-and-down history with their Operating Systems that he's not sure is

(Continued on Page 32)

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– Continued from Page 30 –

going to continue to repeat itself. Starting with Windows XP (Good) and then Vista (Not so Good) and then Windows 7 (Good) and then Windows 8 (Not so Good) and Windows 10 (Good). Well, he's not sure that Windows 11 is not going to fall into that cycle and be classified as "Not so Good."

I have just begun the trek into converting my Windows 7 machines to Windows 10, a project almost always done by attrition. I'm a huge *"if it's not broke, don't try to fix it"* kind of guy, apart from some other driving need to replace a perfectly good working computer. The two computers I used to built my first station in the group that I now own was configured and installed in the spring of 2016, and they are still working within acceptable parameters (to quote a well known and distinguished android).

I am wise enough to know that one day they will fail. That's always the axiom – not "if" a computer will fail, but "when" a computer will fail – and I have written plans to have their replacement ready in a few weeks for a possible migration before failure. These are mission critical computers, so developing a planned obsolescence program is wise in those cases, versus an office PC that still works perfectly fine and could be replaced at the time of failure with minimal loss of productivity. Of course, I always keep a couple of newly configured PC's on the shelf to push into service as needed at a point of failure; I keep a daily backup of the data from all my office computers on a NAS device so installing a couple of software programs and copying data from the NAS gets about any PC back into service in a matter of a hour or two, typically.

As for making the leap into new OS when they are released, I have some valid reasons for being a slow adopter in those areas. Besides the general feeling that Microsoft has a long track record of releasing their new OS before they are really ready for prime-time; and that tendency for "every other OS to turn out to be junk" issue, upgrading at any time to a new OS has unintended consequences if not handled carefully.

Specifically, I have to take deep consideration on my software compatibility. While my MS Office Suite is likely not going to have any issues with Microsoft's newest flavor of the day, my 3rd party applications will certainly need careful examination. My mission critical on-air automation system, music scheduling and traffic software needs to be tested extensively by their respective manufacturers to let me have any thought of upgrading the OS on which they are now running satisfactorily. My experience says that even when a manufacturer says it's okay to install their software on a new OS, some time should be allowed for MS to make the inevitable patches and updates to new OS releases, some of which may have detrimental effects on those 3rd party applications which worked fine before the new patch and updates happened. I generally give new OS releases 12-18 months for the string of updates and patches to be made and my software manufacturers have had enough time to do proper testing to make adjustments to their applications to assure full compatibility.

Besides software compatibility, there are hardware compatibility issues that often are a consideration, especially in early OS release versions. Case in point, my wife was just upgraded by her employer to a new Win11 laptop. A couple of immediate hardware issues reared their head, which I'm certain will be addressed in the myriad of constant updates MS is pushing to those new OS machines. Specifically, the dock/port replicator which was provided (and another one which I use on my new laptop) would not let either the Ethernet port or the dock audio input (microphone) function. The speaker portion works, but not the microphone – which is a necessity for her Teams platform used for all of the company's communications. Plugging my Win10Pro into the USB-C port, both of those hardware functions worked fine; but not true on the Win11 unit. An "update driver" process yielded no results from either MS or the dock manufacturer. So the convenience of a single USB-C connection is thwarted by having to plug the LAN cable and Audio plug to the laptop instead. She also had used a Blue Yeti USB microphone for some occasional spot recordings for my radio station, but the Win11 system flatly failed to recognize the microphone when plugged in; Blue says that specific model is not Win11 compatible. Again, I have high hopes that MS will incorporate updated drivers in Win11 to fix these hardware issues, which would be consistent with previous OS releases from them; but in the mean time that "new" OS has some bugs which require a work around.

So you can certainly call me slow to adopt at times, and I will agree with you – and then just smile when others have software and hardware problems caused by being too fast to upgrade. Life is a balance, and technology is one area where careful thought on that subject is still required.

Jim "Turbo" Turvaville is semi- retired from 43 years in full-time Radio Engineering and lives in Rural Wheeler County Texas in a "tiny house" where he maintains a small clientele of stations under his Turbo Technical Services (www.jimturbo.net) operation providing FCC application preparation and field work.

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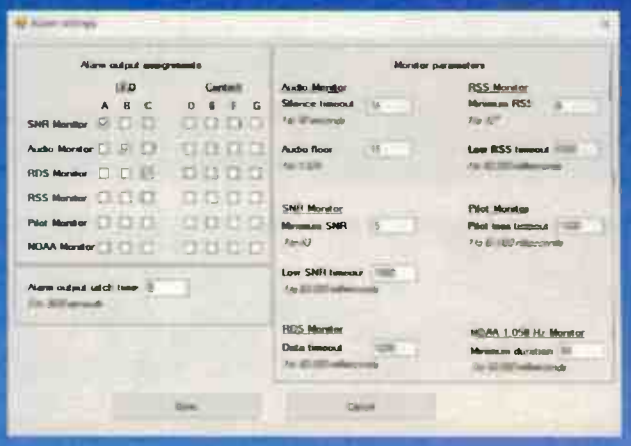

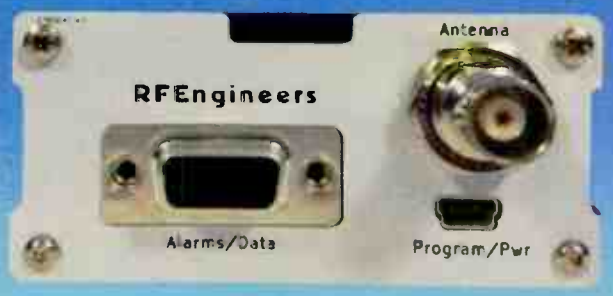

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Shop Talk

by Steve Tuzeneu, CBT

Misc. Tech-Tips and Thoughts

With the busy schedule I have, it's always a challenge to find the time and material to put into this column. One of the sources I have is you, the reader. I always welcome thoughts from readers who can spare a few minutes to send an email. Emails from my readers make writing this column worthwhile.

Gmail Invasion

If you think your Gmail account is a place where your thoughts remain private, guess again. Gmail is a free service, and it has to be paid for somehow. Google has bots that constantly scan your messages and then send you advertisements about nearly everything you write about. I recently watched a video about how to make your Gmail more private. This is a YouTube video worth watching:

https://www.youtube.com/watch?v=TjLd900i3vc

Another way to keep your email private is by switching to another service. Some are free, some cost; it all depends on whether or not you think your privacy is worth the extra effort or money. I receive emails now and then from a guy who uses Protonmail.com. It is supposed to be a secure email service. There is a free service, and there is also a paid service. This isn't the only place you can go – just one of them.

Firewall

Having a firewall at your station is no longer "a nice thing to have" – it's a necessity. If you think you can get along without one, you haven't read any of the national magazines. The first thing that came to my mind was: "This is going to be expensive." Compared to the damage a hacker can do to your radio station, a firewall is cheap insurance. If you get attacked by ransomware, you may find yourself paying one hundred times what you might have spent on a firewall – or more. Then there is the cost of recovery, and you quickly realize a firewall pays for itself in preventing the cost of recovery and the hours involved in returning things to normal.

Almost every month, I continue to read about some company or broadcast entity that has been hacked. An engineer friend told me about a TV station that became crippled by a hacker. It took them months to recover from the attack.

Ask other engineers where you can find affordable solutions to your need for a firewall. Sonic Wall makes equipment that you can purchase new, starting at about $400. Some commercial businesses upgrade their firewall and make the older unit available for a great price. Use your favorite search engine and look for **Sonic Wall Firewall** or other brands.

My older son, who is a security expert for a bank, told me about **PF Sense**. It's open-source software that you load onto a server dedicated to being a firewall. This software is free, but it's not for the newbie. You need to be very comfortable with software and computers to complete this do-it-yourself firewall. In addition, you have to maintain the software as new threats come along. The software is available here: **https://www.pfsense.org/download/** The documentation is available here: **https://docs.netgate.com/pfsense/en/latest/index.html**

IP Chicken

While I am talking about things related to IT, this website is useful in finding out your IP address. It makes me laugh every time I hear the name. IP Chicken, like many of the other websites out there, will tell you what your current IP address is. It's a funny name, so it's easy to remember.

IT Nightmare

If you are a busy engineer and time is valuable, take the time to document everything you can about the service you get from your ISP. One of the companies I deal with is difficult to work with. For legal reasons, I am not going to mention them by name, and it's not important that you know who they are.

Recently my IT guy and I were working with this ISP to get our Internet service working so we could use a VPN to access my transmitter site. The first problem was not having a PIN number they wanted before they could help us over the phone. I was told the PIN number was on our bill. I checked five times and could not find it anywhere on their bill. If your ISP requires a special PIN number to help

(Continued on Page 36)

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Shop Talk

– Continued from Page 34 –

you, and you don't have it, you're in for a lot of fun. Yes, I'm being sarcastic. Search for that information now, while you don't need it. Have all of your static IP addresses documented, and make sure you can tell the tech person on the phone where your transmitter site is located.

Another problem with this company is their history database. It doesn't exist. And most of their support people are all over the world. Calling the tech support person will require rehashing your problem *every* time you talk to someone. I don't expect this company will be around for very long.

We had a technician come out twice, and he said everything was working, but we still can't log in to our router. If you are dealing with a company like this, be patient, because they will try your patience when you are trying to get something accomplished.

Time Calculator

A neat little piece of software that I discovered a number of years ago is a program called "TimeCalc." Written by Marcio Luis Teixeira. It's 36k in size, and uses nearly no system resources and is great for adding up any number of songs to learn how much time they will take. There is no need to remember to carry 60 seconds over to the minute column because this software does it for you. You can also use it to add up segments of a radio program you are producing to make sure the total length of your segments equals the time you need. I have this program pinned to the toolbar of our on-air computer that plays music. All an announcer has to do is click on the program and add up the lengths of the songs needed to be played in an hour to determine if they will fit comfortably. You can find this program here: **https://www.tagg.org/zmisc/TimeCalc.htm** Near the bottom of this web page, you will also find instructions on how to add time. It's a very intuitive little program, and I doubt you will need the instructions, but for the less tech-savvy person at your radio station, you may wish to capture the instructions.

Radio Audio Play-Out Systems

I read several Facebook groups posts about technology. One of these groups discusses on-air computers. Someone asked about updating the operating system on the computer that plays audio on the air. The short answer is: *Don't!* Microsoft Windows updates are often dangerous to the software you use to play sound files on the air. If the company that makes your software that plays your audio on the air hasn't approved updating, then don't do it. Keep your on-air computers isolated from the Internet and don't update your operating system software. Microsoft knows nothing about your software that plays your sound files on the air. You may be using software drivers instead of a sound card. If that's the case, your audio drivers may be rendered useless. If you use a physical sound card to play your audio, the software drivers that make your audio card work may cease to operate.

Always check with the company that wrote your software and have a restore point ready in case the update crashes your software or causes your audio to stop playing. Have a backup audio source ready in case the update makes your on-air computer cease functioning normally. Having backups of your on-air playout software and audio drivers is a smart move. If you ever get attacked by ransomware, you can wipe the drive and install clean audio files and software that is free of malware.

Regular Reboots

While I am talking about on-air computers, scheduling a regular system reboot is a good idea. Remember, you are dealing with Microsoft products, and they have yet to resolve the operating system resource leak. Allowing your production or on-air computers to run continuously without a reboot is asking for trouble. I schedule my computers for a reboot once a month. It takes less than 20 minutes to reboot our server and all of the workstations, and it is worth the effort. When you notice your on-air computers behaving strangely, that should be your signal to perform a system-wide reboot. The Windows operating system is more stable than it used to be, however, regular reboots are still needed.

Computer Environment

Always keep your on-air computers in a clean and cool environment. Heat and dust are your computers' worst enemies. Occasional cleaning is always a good idea.

Looking for Input

Are you an engineer who has learned something new? Maybe you discovered a cool app that you love having on your smartphone. Or perhaps you found some software that is very helpful. Whatever gem you may have discovered, I would love hearing from you. Feel free to contact me at stuzeneu@sbe.org – your useful information will be appreciated by our readers and me.

Thanks for reading my column. I hope you found something interesting or useful. The thoughts, ideas, and opinions in this column are my own, and do not necessarily reflect the views of *Radio Guide* or its publisher.

Steve Tuzeneu, CBT, is the general manager and chief engineer for WIHS 104.9 FM in Middletown, Connecticut. He is a member of the SBE, and engineer licensed by the FCC and an extra class radio amateur.

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Small Market Guide – Extra

Finding An Engineer in a Small Market

by Roger Paskvan

Every station owner has crossed this bridge, and at sometime in their career. You need an engineer, you need them now, and you are located in a small town.

Contract Engineering in a Pinch

There are several ways out of this dilemma. Some of the solutions are not instant but need to be developed over time. If you need an instant engineer, because you're off the air, it's going to cost you – and plan on paying travel time. Many engineers contract out their services on a per hour basis but this will not come cheap.

Contract engineers know you're in trouble before they get there and that's how they make their living. In an emergency they are well worth what they charge.

Think of it from this perspective; a furnace repairman or plumber can easily charge over $150 an hour for their emergency services and they don't help you maintain a revenue stream.

No License Needed

At one time, the FCC required all broadcast engineers to have an FCC First Class license. This was a qualifying bench mark that set the level of par in the big game. Through time and the revamp of the Communication Act of 1996, that requirement went away. So now, anyone that can walk into the station could be an "engineer."

This is fine and good until something serious is wrong, and the wanna-be engineer is over his or her head. With the relaxing of regulations and automatic control of radio stations, many station managers got the idea that you could walk away and everything would run itself.

Computers worked their way into the automation and a lot of computer experts became pseudo-engineers. This was all fine until the actual transmitter went off the air and then the problem became more than a hard drive or Internet problem. So where do we find good, qualified people to do technical work at a small market broadcast station?

Grooming an Engineer

Like I said earlier, the solution may take some time, and it is a good idea to begin solving your problem before a crisis occurs. If your market is large enough, a local ad could bring results and an experienced engineer, either on contract or on your payroll. When this avenue doesn't work, you must get creative. In a small market, comb your resources carefully – there is more to the solution than just a body that can fix computers.

Most transmitters require a trained person to repair, and those people are rare. I would suggest that you check the local tech schools; not for students, but an electronics instructor that wants some part-time income and is willing to learn about your specific equipment.

Worth Taking Time

They may start out rusty, but will develop the skills over time – be patient. One nice thing is that you will not be paying mileage and high hourly wages. Most of the tech school teachers have a college degree and some related work experience. If your small market has a college or university, checkout the possibilities.

Some professors look for industry experience and would treasure a responsibility like your broadcast property. Another avenue at a university is the technical lab people that may not teach classes but are responsible for setting up physics labs/AV materials and repair of electronic equipment on campus. Electronics, Physics, Mass communications, Industrial Technology and electronics maintenance are a few departments to investigate on any campus.

Check These Places Too

The next venue to look for engineering types is the local pool of Ham Radio operators. If you're not familiar with the hobby, all of the Amateur radio operators hold an FCC license and have passed a technical test on radio theory.

Many Hams are very well versed in high voltage, and own kilowatt linear amplifiers not much different than the transmitter in your broadcast station. Some would be very excited to have the opportunity to work in the real world of broadcasting. If you don't know of any Amateurs in your area, just drive around and stop at the first house with a big antenna tower in the back yard.

The rest is a sales job on your part, selling the great opportunity you have for this person. Look in the local paper for the area Ham club meeting. Show up and meet some of the local technical people. Like I said, you need to fit your need to solve your problem. – *Roger Paskvan is a Professor of Mass Communications at Bemidji State University, Bemidji, MN. You may contact him at: rpaskvan@bemidjistate.edu*

Maintenance Guide

The Toasted Dummy Load

by John L. Marcon, CBRE CBTE 8VSB Specialist

Our network recently purchased a new transmitter to replace the 12-year-old flagship transmitter that has gone through much repairs in the past. We also decided not to discard the old unit but instead use it as a standby. It is unlikely that the new transmitter will have a major failure soon but we do not know what the future holds so it is better to have a backup. We thought the new transmitter would be installed by summer of last year but, because of the pandemic and some other issues, it did not happen until September of 2021. With the new one on air, the contractor started working on the RF connection for the standby transmitter so that it can be connected to the dummy load and the RF switch. After they completed the connections, I tested the standby transmitter with the load. The dummy load box is a liquid cooled 25 kW Bird Moduload. It has the heat exchanger in the box itself with large cooling fans. I started testing at low power first and in just a few minutes, I noticed that there was something bubbling out of the relief valve of the dummy load. It sprayed a brownish colored liquid all over the box. I immediately turned off the transmitter and checked what was going on with the dummy load. The spraying stopped but the brownish substance was all over the box. It also had a strong smell, similar to the smell of freshly laid asphalt mixed with the smell of a burning resistor – it was not easy to clean off the substance once it was on the metals.

Figure 1 – Bird Moduload RF load resistor Model 8645-115. Rated 25 kW

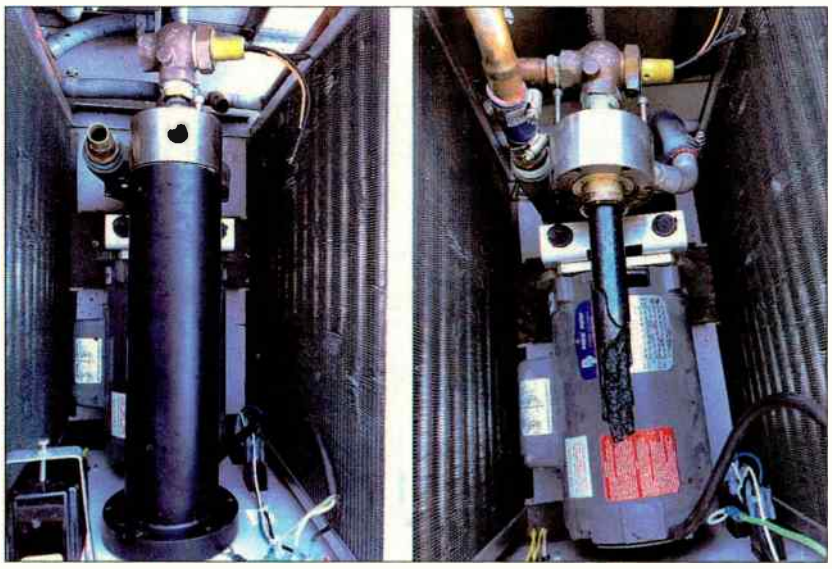

Figure 2 – Inside the dummy load. The left picture shows the casing for the resistor and below it is the pump. The heat exchangers are on the left and right side. Right picture shows the damaged resistor.

At first, I thought this was nothing serious and I stopped testing the dummy load for a few days. I also had to fix some of the power modules on the old transmitter. I was not too concerned about it because I thought there was no chance in the near future that we will need the old transmitter. The burnt smell was too strong inside the building so I took the dummy outside to clean it and remove the smell. I replaced the load temporarily with an air-cooled 5 kW dummy load. It worked well but could not be used at the transmitter power of 10kW.

All seemed well at the transmitter site until the cold weather arrived. The building has a heat pump but the heat strips were not yet installed – the supply chain issue has affected its schedule. The heat pump was having trouble keeping up with the cold that it just stopped working when the temperature was in the low thirties.

We called the air-conditioning contractor and asked them to check the heat pump but they said that it needed the heat strips to work properly in very low temperature.

I realized that if I could fix the dummy load, I could increase the heat inside the building by circulating the hot exhaust of the old transmitter. I could not use the 5 kW load for long hours so I needed to make the 25 kW Bird load work. I started cleaning the box of the load and drained the remaining coolant. I noticed that there was a low level of liquid coolant in the fill tank. I also noticed that the contaminants had permeated the inside wall of the fill tank. Surely, the pump and the coils also had this substance inside. I realized that the whole thing needed to be dismantled so that I could clean it thoroughly.

I called tech support from Bird Inc. and asked them about the substance that came out of the fill tank. I sent them a picture of the dirty coolant and they said it was not a problem.

I disassembled the box and the smell became stronger when I opened the resistor jacket itself. To my horror, the resistor was broken into pieces. The gunk that was coming out of the fill tank was actually from the inside of the resistor itself. The liquid coolant was supposed to flow to the center of the jacket, through the inside of the resistor, out to the inside wall of the jacket and then to the discharge side. The assembly was filled with gunk and instead of the coolant going through the resistor, it went straight to the discharge side. I called the tech support again, send them a photo of the broken resistor and they said that I should send the whole box to them for repair. Either they replace the resistor or we can just purchase a new one. Replacement of the resistor costs $1,600 and a new dummy load of the same model costs $3,600. With the contaminant that was inside the pump and the heat exchangers, we might as well get a new dummy load.

I then remembered that we have dummy load that we took out from another transmitter site during the repack. There were actually two of them and both were rated in the hundreds of kW – they are also water-cooled. It was a 2-hour trip to get to the other transmitter site and when I got there, I was glad to find out that the old dummy load was still intact. However, when I checked the inside of the load, it did not have a resistor. It was actually a column load. A column load acts as a dummy load but has a limited band of frequencies. It looks simple: The rigid line center conductor is shorted at one end and the other end has a cone shaped termination. It is tuned to 50 Ohms at a certain band of frequencies.

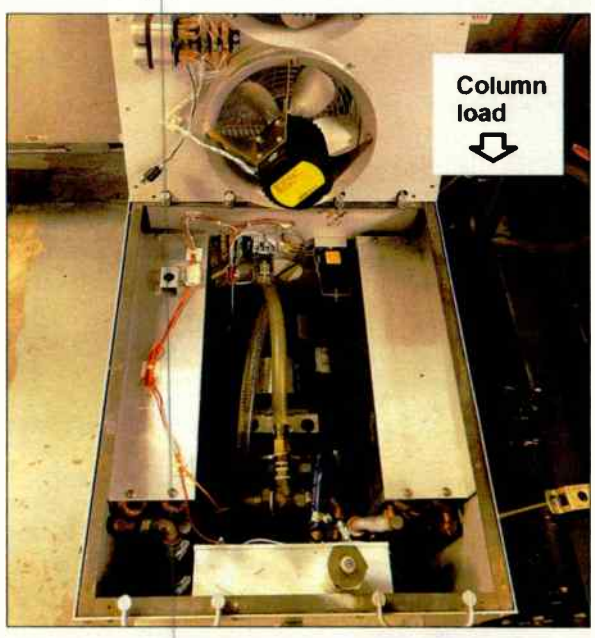

Figure 3 – The new set-up. The pump is connected to the column load with two hoses.

I cleaned up the insides of the column load and brought it to the main site. Before connecting the load, I had to find out first if I could remove all the contaminant from the insides of the fill tank, pump and heat exchanger. The first thing I tried was dishwashing soap mixed with tap water. I poured the mixture into the fill tank, let the pump ran for a few minutes and then flushed out the soap/water mixture.

(Continued on Page 42)

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– Continued from Page 40 –

I did this several times before I poured distilled water in for final rinse. To determine if the coolant in the tank was good enough, I devised a way to measure the resistivity of the coolant. I did this by using a water bottle with two holes on one side. I put some of the coolant in the water bottle and placed it on a table on its side (not standing up, otherwise the coolant would spill out from the two holes). The two holes were for the ohmmeter probe so that I could measure the resistivity. Clean distilled water was around 1 Megohms while the Antifrogen coolant was around 1.1 Megohms. The coolant from the fill tank measured around 500k Ohms and this was not good enough. The contaminants remained in the inside walls of the fill tank, the heat exchanger coils and the pump. The smell was still strong. I needed a stronger solution to remove the contaminants sticking on the metals. A google search led me to a degreaser that is used on the floors of machine and car repair shops and it is available from the local Homedepot. I first tested it outside and the degreaser took only a few minutes to dissolve the substance. It also did not react with plastic, copper or bronze.

I filled the tank with the degreaser and let the pump run so that it circulated inside the pump and the heat exchanger. Then, after two hours, I flushed out all of the dirty liquid. The color turned from yellowish to black, indicating that it dissolved the sticky substance.

Figure 4 – Checking the impedance of the column load with my Pocket VNA.

I filled it with tap water, repeated the flushing out and the filling of water a number of times, until the water was clear. It got rid of the contaminants and the inside wall of the fill tank became sparkling clean. The smell was all gone and the coolant resistivity improved too. Before finally connecting it to the load, I checked the impedance of the load using my pocket VNA. The column load showed 50 Ohms on the Smith Chart of the VNA on its original frequency of 677 MHz but when I tested it on the local frequency, it was showing 43 Ohms and a little bit capacitive. This was after adjusting the tuning bolts.

At any rate, I still decided to connect the transmitter. I also had to wire up a 12V relay from the control system of the transmitter to the pump and fans. Another wiring was needed for the flow sensor interlock relay and this had to be connected to the transmitter interlock so that the transmitter would stop when there was no coolant flow. However, the transmitter will not start when there is no flow. In other words, the pump needed to run first before the flow interlock works and this needed a momentary contact. To solve this problem, I used a contact from a remote relay card using the N.O. contact of one of the relays to briefly latch the flow sensor interlock relay and turn on the pump.

As I mentioned, the column load is not 50 Ohms at the frequency we are using. When I fired up the transmitter, it worked and there was no alarm even though the reflected was up by a bit. The reflected power reading on the modules was also not too bad. I ran it a few times for a few hours and everything was fine. With everything working, I was able to increase the heat inside the building. It also meant that the transmitter was ready for back-up duty anytime.

John L. Marcon, CBTE CBRE 8VSB Specialist, is the Chief Engineer for Victory Television Network (VTN) in Arkansas, with international experience in both Radio and Television Broadcast, and has an Electronics Teaching background.

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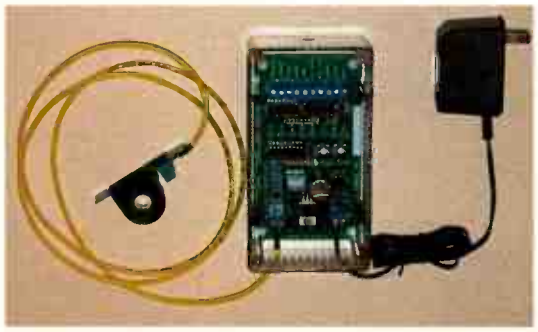

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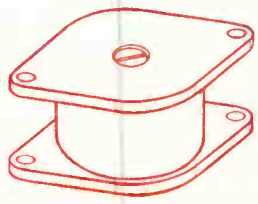

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Gateway 4 Delivers Flexible AoIP Solutions

Tieline's latest codec, the Gateway 4, is a powerful DSP-based 1RU IP codec designed for live remote broadcasting applications, as well as STL or SSL links. The Gateway 4 includes support for AES67, ST 2110-30, ST 2022-7, RAVENNA, NMOS IS-04 and IS-05, Ember+, AES3 and analog I/O as standard, and an optional WheatNet-IP card.

It supports 4 full-duplex audio channels in 1RU to provide two stereo connections, or one stereo and two mono connections, or up to 4 mono connections. The codec also supports multi-unicasting and multicasting.

For larger networks, the Gateway 4 is ideal for transmitter sites, remote trucks or rack-mounted remote kits. For affiliates and smaller stations it can transport studio-to-studio links, or a stereo studio-to-transmitter link signal plus another stereo connection, or dual mono connections for remotes. Customers with higher channel requirements will gravitate towards the Gateway multi-channel codec.

The Gateway 4 seamlessly integrates with all Tieline IP codecs and delivers hitless packet switching using SmartStream PLUS redundant streaming. A primary and 3 redundant streams can be configured for each connection, delivering multiple layers of IP network redundancy. This makes it ideal to pair with the widely used ViA remote codec to deliver rock-solid connection redundancy.

The codec supports Fuse-IP bandwidth aggregation and features dual internal power supplies, dual LAN ports and dual AoIP ports. Automated network failure detection provides automatic switching to a backup IP LAN connection. Automatic silence detection can fail over to alternative audio sources, including file playback, HTTP streaming, and other options ideal for STL applications.

Gateway 4 is also interoperable with all Tieline IP codecs and compatible over SIP with all EBU N/ACIP Tech 3326, 3347 and 3368 compliant codecs and devices.

The Gateway 4 is configurable through an embedded HTML5 Toolbox Web-GUI interface and is also fully controllable using Tieline's Cloud Codec Controller.

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BEXT - 42	www.bext.com
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Broadcast Devices - 3, 48	www.broadcast-devices.com
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Broadcast Software Intl. - 35	www.bsiusa.com
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Coaxial Dynamics - 36	www.coaxial.com
Deva - 34	www.devabroadcast.com
Davicom - 21	www.comlab.com
D&H Satellite - 39	www.dhsatellite.com
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Enco - 26	www.enco.com
ESE - 46	www.ese-web.com
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Inovonics - 1, 9	www.inovon.com
Kintronic Labs - 38	www.kintronic.com
Lawo - 23	www.lawo.com
Lightner Electronics - 45	www.lightnerelectronics.com
Logitek - 37	www.logitekaudio.com
Mega Industries / MCI - 30	www.mcibroadcast.com
Nautel - 5	www.nautel.com
Nicom - 43	www.nicomusa.com
Owl Engineering - 47	www.owleng.com
Phasetek - 47	www.phasetekinc.com
PTEK - 24	www.ptekpower.com
Propagation Systems (PSI) - 32	www.psibroadcast.com
RF Engineers - 33	www.rfengineers.com
RF Specialties / Nautel - 43	www.rfspecialties.com
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Surcom - 44	www.surcom.com
Telos Axia - 19	www.telosalliance.com
Telos Omnia - 15	www.telosalliance.com
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