TVC-15

Broadcast Watermark Analyzer & Monitor

Installation and Users Guide

For product P/N: 2001-00367

25 seven ®

THE TELOS ALLIANCE®

TVC-15 Installation and Users Guide

About 25-Seven Systems®

25-Seven Systems specializes in audio technologies and products that address the unique problems of radio broadcasters, networks and content providers. The company was launched in 2004 by a group of veteran broadcasters with extensive audio experience and a significant portfolio of intellectual property. 25-Seven joined The Telos Alliance® in 2012. Its products are designed and built in the United States.

NOTICES AND CAUTIONS

The installation and service instructions in this manual are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified personnel

This instrument has an autoranging line voltage input. Ensure the power voltage is within the specified range of 100-240v. The ~ symbol, if used, indicates an alternating current supply.

This symbol, wherever it appears, alerts you to the presence of uninsulated, dangerous voltage inside the enclosure – voltage which may be sufficient to constitute a risk of shock.

This symbol, wherever it appears, alerts you to important operating and maintenance instructions.

CAUTION: HAZARDOUS VOLTAGES

The instrument power supply incorporates an internal fuse. Hazardous voltages may still be present on some of the primary parts even when the fuse has blown. If fuse replacement is required, replace fuse only with same type and value for continued protection against fire.

WARNING:

The product's power cord is the primary disconnect device. The socket outlet should be located near the device and easily accessible. The unit should not be located such that access to the power cord is impaired. If the unit is incorporated into an equipment rack, an easily accessible safety disconnect device should be included in the rack design.

To reduce the risk of electrical shock, do not expose this product to rain or moisture. This unit is for indoor use only.

This equipment requires the free flow of air for adequate cooling. Do not block the ventilation openings on the rear and sides of the unit. Failure to allow proper ventilation could damage the unit or create a fire hazard. Do not place the units on a carpet, bedding, or other materials that could interfere with any panel ventilation openings.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

"USA CLASS A COMPUTING DEVICE" INFORMATION TO USER WARNING:

This equipment generates, uses, and can radiate radio-frequency energy. If it is not installed and used as directed by this manual, it may cause interference to radio communication. This equipment complies with the limits for a Class A computing device, as specified by FCC rules, part 15, subpart j, which are designed to provide reasonable protection against such interference when this type of equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference. If it does, the user will be required to eliminate the interference at the user's expense. Note: objectionable interference to TV or radio reception can occur if other devices are connected to this device without the use of shielded interconnect cables. FCC rules require the use of shielded cables.

CANADA WARNING:

"This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the radio interference regulations of the Canadian department of communications."

"Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques (de Class A) prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des communications du Canada."

CE CONFORMANCE INFORMATION:

This device complies with the requirements of the EEC council directives:

- 93/68/EEC (CE MARKING)
- 73/23/EEC (SAFETY – LOW VOLTAGE DIRECTIVE)
- 89/336/EEC (ELECTROMAGNETIC COMPATIBILITY)

Conformity is declared to those standards: EN50081-1, EN50082-1.

Trademarks and Licenses

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All versions, claims of compatibility, trademarks, etc. of hardware and software products not made by 25-Seven which are mentioned in this manual or accompanying material are informational only. 25-Seven makes no endorsement of any particular product for any purpose, nor claims any responsibility for operation or accuracy. We reserve the right to make improvements or changes in the products described in this manual which may affect the product specifications, or to revise the manual without notice.

Updates

Features and operations of TVC-15 are determined largely by software. 25-Seven Systems strives to provide the most stable and feature-rich software available. We encourage you to check for software updates from time to time by visiting our website or by contacting us directly.

Feedback

We welcome feedback on any aspect of our products or this manual. In the past, many good ideas from users have made their way into software revisions or new products. Please contact us with your comments or suggestions.

We support you…

By Phone/Fax

You may reach our 24/7 Support Team in emergencies by calling +1 216-622-0247. For billing questions or other non-emergency technical questions, call +1 216-241-7225 between 9:00 AM to 5:00 PM USA Eastern Time, Monday through Friday.

By Email

Non-emergency technical support is available at Support@TelosAlliance.com.

By Web

The 25-Seven Web site has a variety of information that may be useful for product selection and support. The URL is http://www.Telosalliance.com/25-Seven

SERVICE

You must contact Telos Alliance before returning any equipment for factory service. We will need your unit's serial number, located on the back of the unit. We will issue a return authorization number, which must be written on the exterior of your shipping container. Please do not include cables or accessories unless specifically requested by the Technical Support Engineer. Be sure to adequately insure your shipment for its replacement value. Packages without proper authorization may be refused. US customers, please contact 25-Seven Technical Support at +1-216-622-0247. All other customers should contact local representative to make arrangements for service.

Warranty

For the latest Telos Alliance warranty, visit: telosalliance.com/warranty

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Register your product today to get the full benefits of our warranty, support, and product updates. telosalliance.com/product-registration/

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TVC-15

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Background and Overview

Electronic Measurement and Your Ratings

Broadcasting is a numbers business. Your success depends on what kind of audience you attract and hold. Audience size and composition is measured primarily by reports from private ratings agencies, and for most broadcasters, there's a direct link between those reports and a station's revenue.

How Watermarking works

Ratings agencies base these reports on *listener panels*, where each panelist represents many people in a market. In electronically measured markets such as the top 48 markets in the USA, panelists wear portable devices called meters. These meters register unique digital codes broadcast by each cooperating station. Thousands of these codes can be created in the course of an hour. In theory, whenever a panelist hears a station—on their car or home receivers, in a store or restaurant, or even from the next cubicle—the meter hears the station's code, and the ratings system registers the listening.

The codes themselves sound something like a fax signal, and aren't pleasant to the ear... so they're deliberately 'masked' under louder sounds in the programming, in a process called *watermarking*. Masking is a psychoacoustic phenomenon that keeps us from hearing certain combinations of sounds, even though electronic meters can still detect them. But there are more than a hundred possible digital code symbols used by the meter based system, and each requires slightly different characteristics in the masking sound.

A proprietary watermarking encoder provided by the ratings agency sits in your air chain, and looks for masking opportunities where it can embed hidden codes. When it hears a potential mask for a current digital code symbol, it generates the symbol and mixes it with the programming. Unfortunately, masks are evanescent, appearing and disappearing as your content changes... sometimes, many times per second. So the number of codes you can broadcast is also constantly changing, depending on your programming. Some content is a lot better at supporting watermarks than others. Silence doesn't support them at all.

- Got a talk show with a musical introduction? *Chances are the intro will have more encoding opportunities than the talk.*

- Running a sports show or drama? *Scenes with just play-by-play or dialog probably won't be encoded as well as those with crowds or other busy backgrounds.*

- Playing a commercial or promo? *Our research indicates a sung jingle usually encodes better than a dry voice-over... even though the spoken words might be more important to the selling message.*

Furthermore, masking requires the code symbol to be significantly softer than the masking audio. As your content gets softer, the encoding hardware has to make the codes softer. Environmental noise around the listener can interfere with those softer codes, even if your listeners don't mind the noise: Humans are very good at tracking meaningful voice or music in a noisy environment. Meters, unfortunately, aren't as smart: It's possible that a watermark signal, sent by the encoder at levels where it wouldn't be annoying in a quiet environment, doesn't get detected by panelists' meters in the real, noisy world.

Bottom line

The viability of your station's watermarks is constantly varying, depending on your programming, the panelists' environments, and other variables. Changes can happen as quickly as individual syllables in an announcer's voice, or traffic noises on the highway.

Having good tools—ones that help you understand the entire electronic measurement ecosystem—is essential to your station's competitive picture.

What can be done?

25-Seven put years of research and testing into the technical issues with watermarking, and our groundbreaking Voltair processor works with your station's encoder to enhance watermarking codes as they're being generated. Voltair's enhancement can be varied by the station to accommodate different programming styles, and controlled by station automation for different dayparts.

Many stations have found Voltair effective to help make their electronically derived ratings a better match for the audiences they know they've got, and more reliable during hard-to-encode programming.

But to really manage this kind of problem, you have to be able to quantify it.

Both Voltair and hardware provided by ratings agencies include ways to measure how encodable a program stream is. Voltair's can be particularly helpful, with a minute-by-minute front panel display of code reliability, techniques to reduce randomness when calibrating Enhancement settings against ratings reports, and optional downloadable history reports and Excel graphs of a station's coding activity.

But neither system can give you moment-by-moment measurements of how well each element in your programming supports watermarks.

And neither system takes this information to the next level, *actually adjusting enhancement levels in real-time* to compensate for the wide variety of sounds that keep a radio station interesting.

You need to understand the entire electronic rating system. You need tools that can quickly and precisely measure how it works. And you need efficient ways to apply this knowledge so it can optimize your station's product.

That's why we developed TVC-15.

TVC-15 Benefits

TVC-15's tone verification codec constantly analyzes actual code symbols encoded in any audio you feed it[1].

■ Raw symbol amplitude is displayed on a constantly changing bar.

The symbols that make up a complete station identification message are then processed through our proprietary algorithms.

■ Every 400 milliseconds—150 times per minute—TVC updates a graph of your station's watermark reliability. You can read this graph from the front panel, or as a password-protected page on any networked computer.

■ 400 milliseconds is fast enough to track individual program elements, or style changes in a song, or even the difference between a host and a call-in guest.

It takes 4.8 seconds for the ratings watermark system to assemble enough code symbols into a complete station identification message. So under ideal circumstances[2], TVC will decode a complete message every 4.8 seconds.

Each time TVC sees a complete message:

■ Appropriate message details are displayed on its screen

■ A front panel timer resets, and starts counting the seconds until the next complete watermark message.

■ Some programming (such as silence, spoken word, or music formats that don't have enough energy in the critical watermarking band) doesn't contain a continuous 4.8 seconds of masking material. When this happens, complete messages can't be encoded… lowering the likelihood that a station will be properly identified. TVC's timer changes color if there's been a long time between messages, to alert you to the lower reliability.

TVC-15 doesn't pair to a specific encoder. It doesn't even need to be connected to the encoder. All it needs is a signal that's had watermarks applied.

■ You can connect TVC to an air monitor. Or to an Internet radio, an HD receiver, or any other way listeners are getting a signal with watermarking codes. Or to recordings made from any of those sources. Analyze any convenient analog source, and get an instant reading of how strong its codes are.

■ TVC can be switched to read different encoding formats: Layer 1 (used in US radio and some non-US regions) or Layer 2 (used in other regions).

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1 This can be your signal or any other station's, off-air or by direct connection. TVC can analyze the reliability of standard ratings service watermarks in any audio signal.

2 Ideal circumstances depend on programming with lots of watermark-masking opportunities, low levels of environmental and transmission noise, and possibly a bit of Voltair enhancement. Our users have been able to reach this ideal frequently.

- You can equalize or distort the signal going to TVC, to simulate low-quality radios. Or you can feed TVC from a microphone pointed to any radio or loudspeaker, in a quiet test room or noisy public space[3].

- You can bias TVC's measurements using our statistically constant noise simulation, to simulate challenging listening conditions while providing a level playing field for comparing signals. Or you can record actual environmental noise and other possible interference, and mix it with the signal you're feeding TVC.

- You can feed it other stations' signals, to assure consistent code reliability across a broadcast group… or even see how your competition is encoding. Analysis happens in the privacy of your own local network: nobody else can see how you're using TVC to make programming decisions.

- TVC's front panel and reports will even identify different encoders, using nicknames you've set, so you can scan multiple signal sources and sort them out later.

TVC-15 works from any encoded audio source, real-time or recorded.

- You can feed TVC with your own or other stations' audio, whether it's from your program line, off-air monitors, an Internet stream, or recordings from public spaces.

- Master Control operators can use TVC to detect source audio material (for example: elements or music recorded off-air or from an internet stream) that may have already been encoded. This can help broadcasters detect potential "double encoding".

- You can use it offline with a spare encoder, to analyze program segments or production elements. TVC's fast response lets you compare different sub-elements within a program stream.

- You can use it with an automated switcher to cycle among various stations and program streams in your group, to verify that encoders are working.

- Operation is completely flexible: Input can be switched between program sources or among different encoders, with no need to recalibrate or reboot.

- You can use TVC to verify that STLs aren't corrupting codes on the way to your transmitter.

- You can use TVC to help tune on-air processing for optimal watermarking performance[4].

3 You'll need a mic and preamp, but probably have plenty of those.
4   In fact, we use TVC-15 in our own labs while developing Omnia processing algorithms and evaluating presets.

TVC-15 gives you downloadable reports and remote readouts.

■ You can access TVC's real-time display from any computer or smart phone, via LAN or over the Web. You'll know in an instant how well your programming is supporting watermark codes.

■ TVC's internal server is password protected, with different passwords for different access levels. Nobody else can see how you're using TVC, or the information it generates to help with your programming decisions.

■ You can download csv[5]-formatted daily history reports of minute-by-minute actual code reliability, for custom analysis or for display in a program like Excel. Reports are private and you control who sees them.

And if you want, there's a <u>big</u> benefit for Voltair users:

TVC-15 can control your Voltair in real-time!

TVC-15's Intelligent Adaptive Enhancement [AE] closes the feedback loop. It lets TVC automatically and dynamically control how Voltair is processing your signal in real-time, based on moment-by-moment analysis of your actual air signal.

AE is tunable and customizable. You can set:

■ how much the connected Voltair will enhance your watermarks during hard-to-encode passages;

■ how much it can lower enhancement during easy-to-encode segments, to reduce code artifacts and distortion;

■ how much it averages results from rapidly changing program elements, to reduce radical shifts that may be too abrupt for listeners or meters.

AE reports what it's doing.

■ A front-panel display shows actual enhancement commands being sent to your Voltair, updating more than twice a second.

■ A graph traces how much TVC's AE is boosting or reducing Voltair enhancement, giving you a fine-grained picture of what the system needs to do to assure optimal watermark reliability.

■ You can look at the past two minutes' worth of commands on a single screen, to see how much enhancement each different element of your programming needed to meet desired confidence levels.

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5 The CSV [Comma Separated Values] text format is readable in any word processor, and can be imported into most spreadsheet and graphing programs.

TVC's AE can work with your existing Voltair. You don't even have to change the signal path. All it needs is a network connection to Voltair, and a real-time audio feed from Voltair's output[6]. You can put Voltair in a rack room while TVC is in the PD's office. Or keep both at the transmitter, with full control over both via password-protected Web access.

AE takes coding enhancement beyond simplistic "set and forget" or daypart-setting strategies. It reacts to your air signal while you're on the air! TVC and Voltair work together like a continuous, intelligent automatic gain control on your hidden watermarks!

- Have male and female hosts in a conversation?

- Got a call-in guest on a very compressed cell phone?

- Airing a stopset with jingles, dry announce, and produced sweepers?

Just feed TVC-15 your encoded air signal, and give it your Voltair's network address. The two units will form a closed loop that continuously adjusts for real-world program conditions.

> **TVC-15 and Voltair work together to give you just the right amount of enhancement for watermark confidence, while reducing listener annoyance from code artifacts, based on custom settings you make for your station. You get the best combination of watermark enhancement and a quality on-air sound.**

About 25-Seven, Watermarking, and You

25-Seven has been following electronic audience measurement since its introduction. We've spoken with program directors and engineers around the world, getting their perspectives on the overall system architecture, and on the results of their optimization efforts. In 2014 we introduced Voltair, which revolutionized how stations optimized their airchains.

To develop Voltair, we also relied on the collective expertise of our colleagues in the Telos Alliance. Their knowledge of audio processing, coding technology, and ancillary data streams relates directly to audio watermarking.

But our experience goes deeper than Voltair. The head of our research and development team, Dr. Barry Blesser, is considered one of the founders of digital audio technology. Blesser, a former President of the AES and professor at M.I.T., invented the first commercial digital reverb product for EMT in 1976. He has been a technical and management consultant for more than 40 years, and is recognized for contributions to a wide range of professional disciplines, including audio signal processing, auditory perception, pattern recognition, and architectural acoustic analysis.[7]

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6 Adaptive enhancement provides constant control based on real-time analysis of your encoded programming. Delays between the audio Voltair is processing, and what's applied to TVC's input, can produce unpredictable results. If your station's signal incorporates a delay, TVC should be fed directly from Voltair or the low-latency monitor output of any processor that follows Voltair. (Short delays—say, less than a few dozen milliseconds—don't cause problems. So TVC is fully compatible with low-latency STLs or AoIP systems.)

7 In 2006, MIT Press published Blesser's book Spaces Speak, Are You Listening? Experiencing Aural Architecture.

Benefiting From TVC-15

Monitoring & Analysis of Station Encoding

It's vital to know that your watermarking system is working properly. It's almost axiomatic that "If you aren't encoding, you might as well be off the air."

The monitoring facility in Voltair is powerful. Its front panel and optional downloadable reports give a minute-by-minute analysis of coding confidence, and lets you simulate how various forms of environmental noise will affect it[8]. Voltair will send initial warnings when 15 seconds have gone by without a valid message, and adds more warnings as the condition gets longer.

But Voltair can look at codes only at the point of generation or enhancement. Before those codes get to a listener, they'll often pass through a composite clipper or some data compression. Then they can be hit with transmitter issues or RF interference. In some installations, watermarking is also affected by airchain equalization or multiband compression.

You wouldn't consider your audio setup complete without a tuner, internet receiver, or some other form of *real-world* monitoring.

TVC-15 lets you do the same thing for your encoding.

TVC-15 doesn't need an encoder. It can analyze any audio signal from a monitor receiver, or to a consumer radio tuned to your station—or to any other station using electronic ratings. You can even analyze a signal from a microphone that's picking up a station in an office or public space. TVC doesn't need a real-time signal: it can analyze a field recording or an internet stream. All it needs is a source of analog audio, from a router or patchbay or AoIP node, or hardwired into your airchain.

On top of that, our sophisticated algorithms bring confidence analysis to levels that were never before possible with any system.

- TVC gives you near-instantaneous response:
  - TVC-15's signal strength bar continuously shows you how much power is in the tones used by watermarking.
  - It takes 400 ms for the encoder to create a valid code symbol, so TVC's front-panel graph updates that quickly: 150 times per minute. That's fast enough to indicate encoding differences when two on-air hosts have a conversation, or distinguish a sung jingle from a donut voice-over. The most recent two minutes of confidence measurements are displayed on a scrolling graph.

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8 Of course, most stations also use Voltair's primary function: Enhancing the watermarks even during marginal programming, to give their signal a better chance of being recognized by real-world panelists' meters.

But even when you're using Voltair for enhancement, it still can be a valuable analysis tool.

- A complete identification message requires 12 valid code symbols, carried on a combination of 10 different frequency channels. TVC's Decode Interval display times how long it's been since the last valid message. If it takes too long for a new identification message to be broadcast—whether it's because the programming isn't supporting sufficient codes, or because watermarks are being damaged downstream—the display changes color as a warning.

- *TVC gives you detailed information:*

  - A bar graph shows a precise, 0 – 100% display of the likelihood each of the last 300 potential symbols will be received. Bars are color-coded, to make it easy to spot encoding issues.

  - The display identifies the encoder currently being received. You can tell at a glance which of your streams—or your competitors'—is being analyzed9.

  - The display shows the timestamp of the current message. You can tell at a glance if your encoder's clock isn't accurate.

  - A line graph shows each Adaptive Enhancement command TVC has sent to your Voltair over the past two minutes. You can see which program elements required extra enhancement because they're hard to encode, and which ones stayed reliable while letting TVC reduce enhancement to avoid listener annoyance. Even if you're not using AE at the moment, TVC can report the command that would have been sent.

  - The Decode Interval timer shows how many seconds have gone by since the last successfully received message. Continuous low numbers mean your station has a better chance of being successfully identified.

- *Complete remote access:*

  - TVC has a built-in, password-protected web server, with two distinct levels of access: full control, or monitor-only. You can assign different access depending on what users need, letting engineers control TVC settings, while program staff can't make changes but can see actual on-air watermark confidence during different segments.

  - TVC's server uses HTML5. It's compatible with any modern browser on any computer, tablet, or phone. Flash or other plug-ins are not required.

- *Downloadable full reports:*

  - TVC's internal web server also lets you download a complete analysis of every signal TVC has received, available for any day it's been turned on.

  - TVC reports are available as detailed files of each 4.8 second complete message analyzed over the course of a day, or as one-minute averages. They're in csv format, so you can analyze them with your own software, display them as an Excel spreadsheet, or compare them with station ratings reports.

  - Reports are available only by password-protected log-in. You control who sees the data.

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9 The watermark system uses arbitrary IDs that don't include station call or frequency. So TVC assigns a simple letter code to each new Encoder it recognizes, and then displays that code whenever it sees watermarks from that Encoder. You can rename any encoder for convenience: *Main, HD2, 103.5,* or whatever else makes sense.

Controlling Voltair Enhancement in Real-time

Voltair caused a revolution in station processing. For the first time, it let users enhance watermarks, so their station would have a better chance of being recognized by panelists' meters… even when a signal didn't support watermarking perfectly, or when a panelist was in a noisy environment. Voltair processing doesn't create 'phantom panelists' in the ratings system, but it does help make sure you get credit for the listeners you really have.

Unfortunately, too much enhancement can override the psychoacoustic masking phenomenon that normally hides watermark codes. When this happens, the digital messages may become audible in the program stream. Listeners can hear this as extra noise or distortion. In extreme situations, they can be chased away.

It's a question of balance: You need enough enhancement to make codes reliable even during hard-to-encode program segments, or when there's a lot of environmental noise. But you don't want to annoy listeners.

How much enhancement is "too much"? It depends on the program material, the listening situation, and even listener expectations…

- Voices are often harder to encode than music. Enough enhancement for a news show could be too much for a high-quality music set. Listeners might hear this extra enhancement as distortion during the music.

- But the right enhancement for the music might be too *little* enhancement during air talent's talk around the music or interviews with artists. Even though these features can set your station apart, your ratings may suffer during them… because watermarks aren't being encoded optimally!

Voltair includes tools to approach the right level of enhancement. One diagnostic function automatically rotates through different enhancement levels at preset times, giving you a log that can be compared with actual numbers when you get the ratings service report. You can preset three different Enhancement levels under GPIO control, so you can have an "emergency watermark boost" button in master control, change enhancement when the host turns on his microphone, or have your station's automation system change enhancement for different dayparts.

But these schemes are limited by the granularity of daypart or even "mic-on" control and preset enhancement levels, and hampered by the delay waiting for a ratings report to arrive.

For the highest level of control you'd need an ideal trained operator:

- One who can constantly monitor every watermark message in your actual broadcast signal, and continuously adjust Voltair's enhancement for different air talents, audio sources, noise levels, and quality requirements.

- An operator who knows the personality and sound you want to present.

- An operator who's subtle enough to constantly control watermark enhancement, while avoiding abrupt or annoying shifts because of transitory audio changes.

- An operator who'll follow your instructions and pay perfect attention, 24 hours a day, 7 days a week…

TVC-15's Intelligent Adaptive Enhancement can be that skilled, always-attentive operator, fine-tuning your enhancement every moment you're on the air!

TVC-15, together with Voltair, closes the feedback loop around your watermarking ecosystem. It acts as a "smart AGC" for Voltair enhancement, monitoring actual encoding, and adjusting the amount of enhancement as quickly as twice per second. Just like a good transmitter processor, you can fine-tune TVC's behavior to preserve your station's unique sound. You can set minimum desirable confidence levels, maximum enhancement to avoid annoying artifacts, how quickly enhancement changes, and more.

Finally: complete, full-time control over watermark enhancement levels!

TVC-15 Operator Features

TVC-15 gives you a live, highly detailed display of actual watermark symbols, evaluated every 400 ms. for confidence, completeness and reliability.
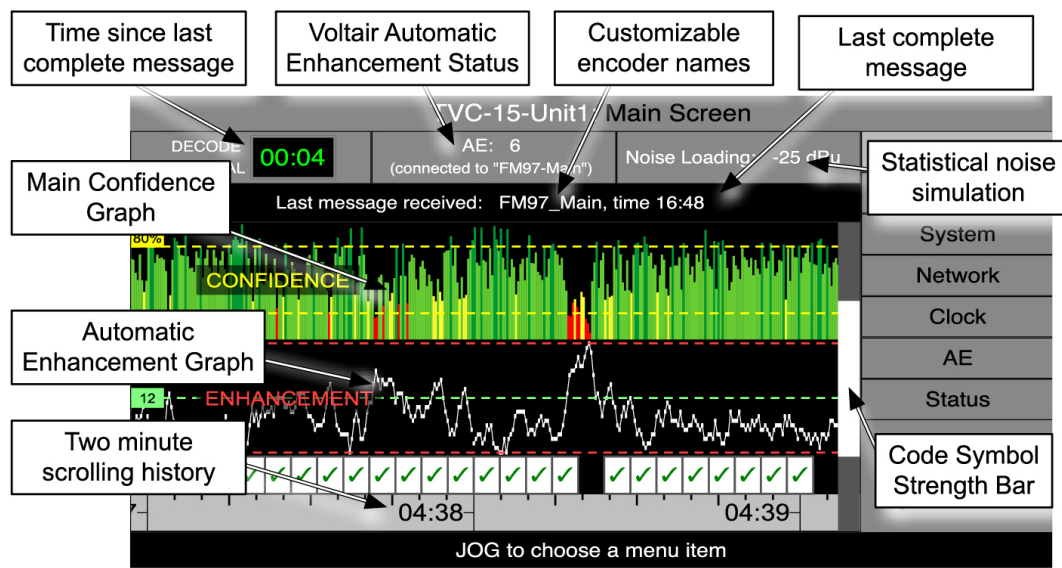

Our proprietary algorithms constantly analyze the input signal, looking for valid code symbols that the system combines to build meaningful station identifications. The input can be any real-world source: your off-air signal (or a competitor's), a test file from a production studio, an Internet stream, or even a live mic listening to a sample radio or a public space[10]. If there are symbols hidden in the audio, TVC-15 will report their details.

The front panel LCD[11] is arranged for maximum usability:

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10 If you're using a remote rig to put a live mic in a distant space, particularly one that uses cellphone connections, be careful. The compression used in these systems may distort or destroy code symbols. Run some controlled tests to compare remote versus wired connections first.

11 Or remote version in a connected Web browser.

Decode Interval
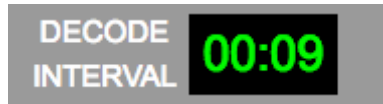
This reports minutes and seconds since the last successfully decoded message. It flashes green and restarts from 00:00 whenever a complete and coherent message is received.

- Continuously short timings are good. They mean the program includes a lot of reliable messages. The display will be green.

- Longer times between restarts mean the programming doesn't support codes well. If ten seconds go by with no complete messages, the display changes to yellow as a warning. It turns red after thirty seconds of "no message" have gone by. While there may be exceptions, chances are a station won't be identified during those times.

- The Interval Display is constantly updating, and gives you a quick go/no-go indication of the current signal.

Intelligent Adaptive Enhancement [AE] status

25-Seven's Voltair is a powerful tool for making the most of the audience measurement watermark your station broadcasts. But don't just dial up the maximum and walk away. Some program sources, like talk segments, require a lot of watermark enhancement to be reliably read. Others, like properly processed contemporary music, already support the watermarks; adding too much enhancement to them may be heard as an annoying distortion and be overkill.

TVC can analyze the codes in your off-air signal. AE then computes the most appropriate enhancement level based on parameters you've specified. Then it directs a network-connected Voltair to apply this enhancement.

> **AE requires low-latency monitoring of Voltair's or your processor's output, so it can make timely adjustments. A few dozen milliseconds' delay is acceptable. But several seconds for HD compensation or Internet streaming will cause problems. If your signal chain includes a delay, feed TVC from an undelayed monitoring output rather than an off-air receiver.**

The AE status window shows the name of the connected Voltair, the current Adaptive enhancement level, and the network connection status. Additional AE settings are described in the AE Chapter of this manual.

Last Complete Message Received

This is based on the actual Encoder ID that accompanied the last valid message, along with an optional display of the time stamp that accompanied it[12]. Encoder IDs are arbitrary and set by the ratings agency, and don't include a station's call letters or frequency. So TVC-15 identifies them simply as Encoder A, Encoder B, and so on. You can rename them with call letters, frequency, HD stream, or any other useful tag by using a page on the Web interface. TVC will then use that name every subsequent time it sees that specific encoder.

You can use TVC's ability to identify encoders as a sanity check, to make sure you're analyzing the audio stream you want! First, connect TVC directly to an encoder or Voltair output. Once TVC begins recognizing the watermarks, give that encoder a specific name based on its stream[13]. From then on, anytime TVC sees watermarks from that encoder—whether received off the air, via router from your airchain, or even played from a recording—it'll display that name.

Simulated Environmental "Noise Loading"

If everyone listened to broadcasts using headphones, the signal would go straight from the receiver into human ears. If they also used an adapter cable, it could go straight into a panelist's portable meter as well. But most listening is done with speakers, and in a variety of acoustic environments. Whether a panelist is driving their car, attending a sports event, or in a bar that has radio or TV for background, ambient noise is a factor that can affect how portable meters receive your code. So, to help gauge the impact of different noisy environments, we let you apply various levels of simulated noise.

Don't confuse the statistically stable Noise Loading in TVC with the simulated environments available in our Voltair watermark enhancer. Voltair's environment system applies actual recordings of typical listener surroundings (such as traffic with car honks, households with baby cries, dishes clattering in restaurant) to its real-time, minute-by-minute measurements of your watermark confidence. It's a statistically valid way to evaluate ongoing encoding during different dayparts or programs. But because the sounds themselves contain random honks, cries, and other noises, you can't use them for direct comparisons between encoded programs or even short elements within a single program.

Instead, TVC generates an artificial signal that simulates environmental noise in a repeatable way, without the second-by-second changes of real-world recordings. This lets it act as a constant "load" on the watermark energy, so you can compare different programs under noisy circumstances, without worrying about the noise having different effects on individual readings.

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12 The timestamp, in HH:MM format, is based on a code broadcast by the Encoder. For real-time signals, it should be within a minute of real-world time. If this isn't accurate, check your Encoder.

13 You can name encoders through TVC's Web remote control, as described in a later chapter of this manual.

These different Noise-analysis techniques underscore an important distinction between Voltair and TVC-15: TVC is a high resolution analysis tool, and as such, its noise injection needs to be highly uniform over time. Voltair's analysis tools are modeled over longer time averages, and can use more random "real world" environments.

You can also use TVC's Noise Loading to scale TVC's measurements for more convenient analysis and graphing. If confidence levels are usually so high that the bargraph looks like an overgrown lawn, more Noise Loading can move the bars down to the middle of the graph. If the graph is a barely readable red line around 0%, reduce the Noise Loading to make the bars bigger.

Noise Loading is calibrated as dBu mixed with TVC's analog input signal, between -60 dBu (appearing as Noise Loading Disabled) and +10 dBu (considerably louder than normal air monitors).

If you want, you can substitute your own noise source instead. This can be recorded environmental noise that you mix with the test signal before feeding to TVC. Or it can be a live mic in a real-world space, picking up both your program and the location's actual noise.

Neither TVC's Noise Loading, nor any real-world noise source you mix with TVC's input, will pollute your on-air program stream. These signals are used only as factors in TVC's measurement algorithms.

Noise Loading *does* affect TVC's Adaptive enhancement. You can still use it to scale readings while AE is running, but be aware that its effect will be factored into what AE sends to your Voltair.

TVC Graphic Displays
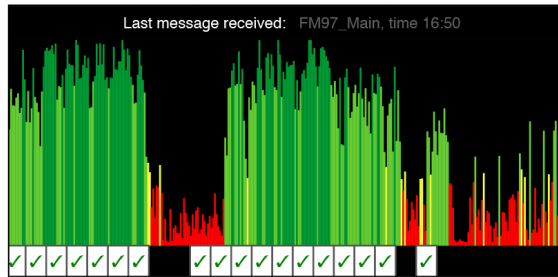
Confidence-only Graph
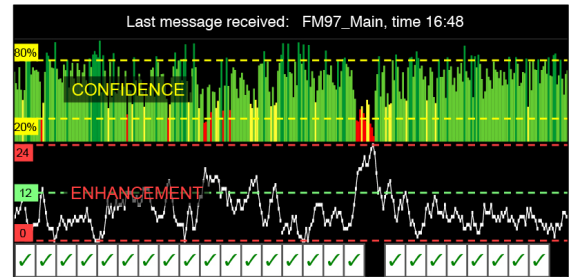
Confidence and Enhancement Graphs

TVC-15 can show just its Confidence graph, or its Confidence and Enhancement graphs, on its front panel and connected remotes.

■ From the front panel, change the display mode by tapping the Jog wheel when the Display menu is highlighted. On a connected remote, change mode by clicking in the Toggle Display menu item.

■ Even if you're not using AE for real-time Voltair control, you can still check the Enhancement graph to gauge how much a Voltair might have helped the signal you're measuring.

TVC-15 can display different modes to different users. You can choose freely between graphic display modes at the front panel and any connected remotes, without affecting what other users see.

Confidence Graph

This graph shows the confidence level for complete messages during the past two minutes. A complete message consists of twelve individual code symbols in a valid pattern, so TVC-15 draws a new Confidence line every 400ms. The line height displays zero to 100% confidence, and its color provides a quick visual reference:

■ Dark green lines indicate 80% confidence or better. This can be the result of programming choices, Voltair enhancement, or a combination of both.

■ Light green lines show at least 40% confidence. Many of your watermarks will probably get through, unless there's a lot of environmental noise.

■ Orange lines show at least 30% confidence. Watermarks may be getting lost.

■ Red lines show less than 30% confidence,. There's a good chance panelists' meters won't register your station at all, even if they're actively listening.

■ No line at all is rare, but can occur during prolonged silences.

Two dashed yellow horizontal lines appear when TVC is also showing the Enhancement graph. The top line shows the level you've set for AE to reach a minimum enhancement you specify. Confidences above this level won't cause any additional decreases in enhancement.

The bottom horizontal dashed line is the level for AE to send the maximum enhancement you've specified; if confidence falls below this line, it won't increase the enhancement.

Both these levels, and how much enhancement they trigger, are settable on the AE screen. There's more about AE setup in this manual's chapter on Adaptive enhancement.

Enhancement Line Graph
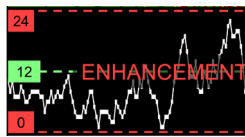
The bottom line graph, when both graphs are showing, displays Adaptive enhancement commands TVC has sent to your Voltair over the past two minutes. Lower levels on the graph generally indicate program material that was easy to encode, so less enhancement was needed. Higher levels correlate with program material that doesn't support watermarking well, so TVC had Voltair add more enhancement. There are setup details in the AE chapter.

Three dashed horizontal lines appear on this graph. The top and bottom red lines indicate upper and lower enhancement limits you've specified on the AE screen's sets enhancement to lines. TVC's commands to Voltair will always fall between these limits[14].

The green dashed line shows the Enhancement Medium Preset, which is set at the connected Voltair. For most users, this will be a comfortable middle enhancement level; the line helps you determine whether Voltair is providing more or less enhancement than that value.

Code Symbol Strength Bar

This white line constantly changes height to show the strength of potential code signals in watermark channels. This bar reacts instantly, to provide visual feedback that encoding *could* be taking place. Actual code symbols require 400 ms to broadcast, and they're measured and displayed as the vertical bars in the Main Confidence Graph.

Checkmarks

The boxed √ symbols at the bottom of the display each represent complete watermark messages successfully received by TVC. Full identification in electronic ratings systems consist of twelve characters, each taking 400 ms, so there's potential for a new checkmark every 4.8 seconds (or 12.5 checkmarks in a minute). If there's no complete message during one of those periods, its space is black and without a checkmark. Most programming has a few moments where messaging can't be masked, and the watermark encoder suppresses code symbols during these times to avoid broadcasting an ugly digital signal. So having a few black spaces on this line may be nothing to worry about.

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14 If you've recently changed these limits, the graph might still be showing old commands based on previous limits.

Two Minute History

The time display on the bottom of the Confidence Graph is calibrated in minutes:seconds, based on TVC's real-time clock[15], to help you correlate confidence readings with moment-by-moment changes in your programming. This is *not* the same as the time-stamp encoded on watermark messages.

If you're looking at your live encoding stream and notice a significant discrepancy between the Graph's time and that in Last message received, there may be a problem with your encoder's clock. Check the encoder setup instructions.

Other user controls

TVC-15 includes complete, flexible control over its operation. Clock and system settings, network access, how TVC controls a connected Voltair, and remote passwords can be set from the front panel. Most of these settings, along with maintenance and customization functions, are also available remotely using any web browser.

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15 TVC's clock can be set manually, but we recommend pointing it to a Network Time Protocol server.

INSTANT GRATIFICATION[16]

TVC-15 Quick Hookup Guide

This section explains, very briefly, how to get TVC up and running so you can monitor watermarks.

TVC is a versatile device, with other setup options we couldn't include here. So these instructions might not be best for your specific setup. More information about menus and commands, technical installation details, and web access appear later in these pages.

In other words, we urge you to read the rest of this manual. You'll learn the best ways to use TVC-15 in your station, how to get the most reliable watermark analysis, and how TVC can be paired with a Voltair—if you have one—for complete, continuous on-air Enhancement control.

1. Give it a home

Mount TVC-15 in a rack that has adequate power, a wired connection to your data network, and access to the audio signal(s) you want to test. Proper cooling is important: make sure the vent openings aren't blocked, and don't mount TVC immediately above or below other equipment that generates heat.

TVC-15 does *not* need to be close to your encoder or other airchain processors. You can put it in master control, a production room, or even the PD's home.

2. Connect the analog input
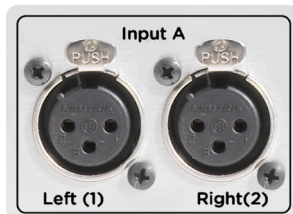
Use the Input A Left (1) jack for mono signals, and both Input A jacks for stereo. TVC accepts +4 dBu balanced analog on XLR3 male. This can come from a routing switcher, AoIP node, small mixer, or any other standard audio source. Input B is reserved for future expansion.

If you need to analyze unbalanced computer outputs or mic-level signals, use an external preamp or mixer. Too low a signal level will give you incorrect readings.

TVC's input gain is *not* adjustable. If you have doubts about what you're feeding it, check the signal with an audio analyzer or meter. The level should be close to +4 dBu, with occasional peaks no more than 10 dB higher, during normal programming.

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16 Most of us got into this business because we like to play with equipment. Feel free, and use this chapter as a quick guide. But when you're done, read the rest of this manual… there are plenty of TVC features you can't discover just by poking around.

We recommend flexibility! TVC can analyze the watermarks in a program chain, an off-air signal, recordings, internet streams, elements being tested with a spare encoder, or any other audio signal. Most users will feed TVC from a patchbay or routing switcher for convenience. You can switch among signals freely, without having to recalibrate or change any settings on TVC.

The only exception is this:

> **Warning! If you're using TVC as an intelligent controller for Voltair Enhancement, you must analyze the signal Voltair is currently enhancing.**
>
> **If there's no delay in your air signal, you can feed TVC from an off-air monitor. But if your airchain has a delay of a few dozen ms or more, sending the delayed signal to TVC will defeat AE's real-time enhancement control. This can cause unpredictable results.**
>
> **Short latencies (on the order of several milliseconds) aren't a problem for AE, so TVC can be connected via AoIP or a modern fast STL.**

If you're giving a TVC multiple roles—having it control Voltair for optimum enhancement of your broadcast stream at some times, and using it to analyze the watermarks in different material at other times—a flexible routing or patchbay approach is best. Just remember to turn off AE whenever TVC isn't seeing the real-time Voltair signal.

### 3. Connect it to your network

Connect TVC-15's RJ-45 Ethernet Network jack to an appropriate data network, via Cat5 cable or higher. This connection is used for AE control of a Voltair, to synchronize TVC with an NTP server, for browser-based remote control, for downloading data reports, and for maintenance. It doesn't carry IP-based audio.

If TVC is set for its default DHCP addressing, it will attempt to register with your router.

TVC can be operated from its front panel at any time, regardless of whether it's connected to a network.

4. Power up

Connect TVC-15's to 110-240 volts, 50-60 Hz, nominal draw 55 watts. You can use the IEC cord provided, or any other standard cord. TVC has a rear-panel power switch; you can leave it on, if you have other ways of switching the rack's power.
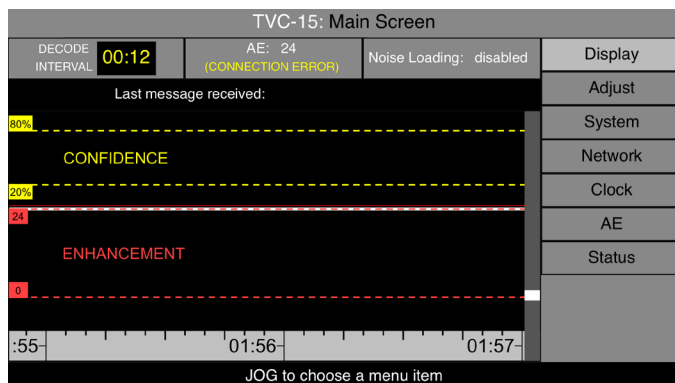

Turn TVC-15 on. After an initial boot sequence of approximately 30 seconds, the front panel LCD will look something like this. If an encoded signal is being fed to the unit, the Main Confidence Graph will also show vertical bars scrolling in from its right side.

5. Start analyzing!

TVC-15 will respond to any encoded signal being fed to it. You can feel free to experiment now, changing its settings from the front panel. Then read the rest of this manual for details on what those settings do, how to extend control over your network and to your station's Voltair, and how to retrieve TVC's data for further analysis.

6. Try some adjustments

Most TVC operations can be controlled from the front panel[17].
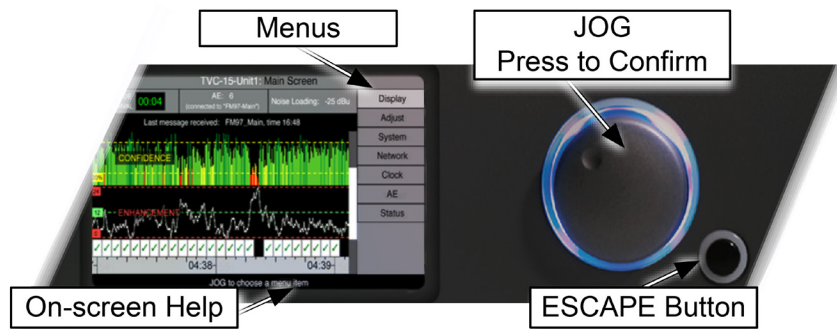
The **JOG** wheel can be turned to scroll through menus and fields on the screen, highlighting each. It's also a button: if you press the wheel, it acts as a Confirmation command to select the highlighted menu or screen area. Once you've confirmed a selection, turning **JOG** will scroll you through the selected item's possible options.

The **ESCAPE** button returns you to next higher level. If you've been entering values in a field, it stores the value, exits the field, and takes you back to selecting other fields in the area. If you've been selecting fields, it takes you back to selecting menus on the right side of the screen.

Unless you've assigned TVC-15's Intelligent Adaptive Enhancement to a specific Voltair[18], it won't affect your air signal. So feel free to make an initial exploration of settings and options.

But remember: there's a lot more TVC-15 can do. Read the rest of this manual for details.

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17 Most functions can also be controlled from a password-protected web browser (see chapter on Browser based Remote Control). A few functions, such as those that transfer files to or from TVC, must be done from a connected computer.

18 TVC-15's intelligent Adaptive Enhancement function is too powerful to summarize here. There's a full chapter on it, later in this manual.

TVC-15 Operation

Here's a full description of how to use TVC's front panel controls and LCD screen for normal setup and operation.
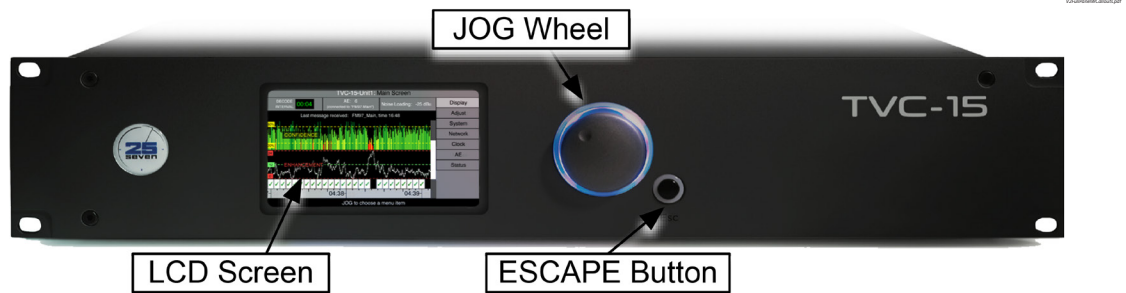

Front Panel Controls

The **JOG** Wheel can be turned to navigate among menu items and fields, pressed to focus on a screen area, and turned to change a selected field's value[19]. If you're entering text, the wheel has additional functions; see later in this chapter.

The **ESCAPE** button can be used to exit a field and save its value, or to exit a screen area and go back to the menu.

---

19 These operations are slightly different if you're controlling TVC-15 from a password-protected browser: Click the computer's mouse to choose a menu item or field, use the up and down arrow keys to select a value for the field, and press the computer's Escape key to confirm when you're done.

LCD Screen

This is TVC's "Dashboard", where you use various screens to control operation and monitor watermark confidence. A few features are common to every screen:
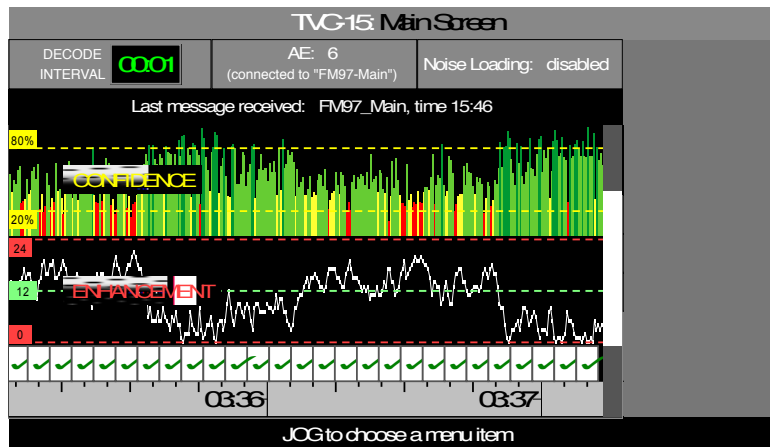
The TVC's name, in white letters, is an identifying name you've assigned to this specific hardware. These names can be helpful if you're using multiple TVCs on a network. The Screen Name (black letters) identifies that Screen's function.

You choose which screen should be active—and what function you want to adjust—by scrolling through the Menu on the right of the LCD. Scroll by turning the **JOG** wheel, and then select your choice by pressing the wheel[20].

Every screen has a dynamic HELP area along the bottom. Help messages are context-sensitive and will change depending on what you're doing. The messages are sometimes shortened to fit on one line, but their meanings are always obvious.

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20 If turning **JOG** selects other fields in the middle or top of the screen (rather than menu items) it means your Voltair is in Adjustment mode. Press **ESCAPE** to get back to the Menu.

Jog wheel and Escape button

These let you select menu items or individual fields on a screen, and then change their settings.

- Turn the **JOG** wheel to select a menu item, and press the wheel to see the related screen.

- Now you can turn **JOG** to select a specific field on that screen, and press it to enter that field.

- Once you're in the field, turn **JOG** to change its value. When you're satisfied with the change, press **ESCAPE** to save the data and go back to selecting fields, and escape again to return to the menu.

- You can also press **JOG** to save data *at most times*. But pressing the wheel has a slightly different function when entering text (see "Entering Names", below), so it's best to use the **ESCAPE** button for to leave a field and save its value, instead.

TVC's Function Screens

Each screen displays or lets you control a different function. During normal operation, you'll probably leave it on the Main screen most of the time[21]. The others are for maintenance and system monitoring.

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21 Some stations have their processor racks visible to casual visitors. If you don't want "tourists" to see the confidence screens, you can have TVC display something less informative to competitors, such as the Clock screen.

Main Screen

Choosing either Display or Adjust on the menu shows a version of the Main Screen.
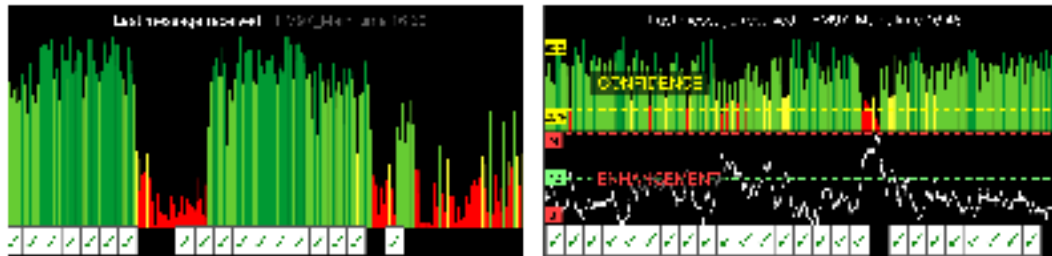
Confidence-only Graph   Confidence and Enhancement Graphs

You can toggle between these screens by tapping the Jog wheel when Display is selected on the Menu. Display is the normal 'resting' mode, and lets you evaluate watermarks while guarding against accidental parameter changes.

Adjust lets you control the amount of noise loading.

The Main Screen is described further in the chapter on Operator Features.

System Screen

This screen lets you configure TVC's name and access passwords, and toggle the Timestamp on the Main screen.
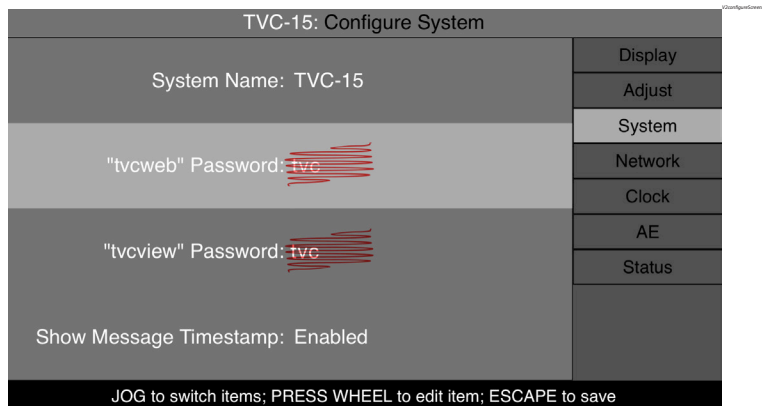
The red squiggles in this screenshot are our reminders that you should change TVC's default passwords as soon as practical.

System Name:

The name you set here will appear at the top of each screen, both on the LCD and on connected computers. Use it to identify different machines in a facility that has multiple TVCs in a rack or being controlled over the same network, and as a guide for users who might be reading TVC analysis on their smartphones or tablets. The name also appears on downloaded TVC reports.

Entering names and other text in TVC-15:

This is easiest from a browser using your computer keyboard. But you can also enter text or change text fields from the front panel, using just the **JOG** wheel and **ESCAPE**.

First, turn the wheel to select a field, and press it to enter that field.

Names and passwords can be any length up to 20 characters. You can use upper and lower case letters, numerals, and the punctuation characters – [hyphen] _ [underscore] and . [period]. *Spaces are not allowed: names and passwords must be continuous.*
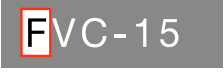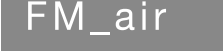
You choose the character you want from a scrolling list. The last character in the list is a blank. Blank does not work as a space, but as a specialized delete key:

- When [blank] is hit in the scrolling list, it erases every letter that follows it in the word; if you then scroll to a different character on the list, those letters come back.

- If you press **ESCAPE** while [blank] is selected, it stores the shorter word.

Use [blank] for fixing mistakes, or when replacing a long name or password with a shorter one.

Here's the general procedure for text entry: When you press **JOG** on an item, the first letter of that item is highlighted. Scroll to select the character you want to use, then press the wheel to confirm it and move to the next letter. When you're done, **ESCAPE** to save the new name.

Or step-by-step: Let's say we've selected System Name, and want to change it from TVC-15 to FM_air…

User Action	Screen looks like	Notes
Press **JOG**	T V C - 1 5	Selects first letter position
Turn **JOG**	F V C - 1 5	Scroll until desired character shows
Press **JOG**	F V C - 1 5	Sets that letter, moves to next position
Turn, press, turn…	F M _ a i r	As above, to complete name
ESCAPE	F M _ a i r	Saves name and exits. **JOG** now selects other lines on the screen.

To correct errors:

(existing)	FM_zir	This is what you want to change.
Press **JOG**, press **JOG**, etc.…	FM_zir	Advance to letter that should be changed. Replace it with something else. The letters that follow won't be affected.

If you **ESCAPE** after changing a letter to something else, the other letters aren't affected and the new version is stored.

If you **ESCAPE** while [blank] is showing, the letters that follow it are also erased; the new shorter name is stored.

You can also change the System Name at a connected web browser. Letters and numbers are provided by the keyboard; [blank] is provided by the space bar and works like the front-panel version. The list of usable characters is the same.

The main difference is that on a computer, you select a field by pointing and clicking, and then you can enter text from the keyboard.

tvcweb and tvcview Passwords

These offer separate protection for the two different levels of remote operation. These levels are described in the chapter on Browser Control.

Full Web Access and control appears on the screen as tvcweb. Restricted View-Only Access appears as tvcview. Use tvcweb or tvcview as the login names, respectively, to access these levels from a remote computer.

The factory default password is tvc for both levels. We recommend changing each to a different password as soon as you've put the unit on a network.

Show Message Timestamp

TVC can read the timecode that's added by a station's watermark encoder, and display it with the Last Message Received text at the top of the Confidence Graph. This time display should be thought of as the encoder's internal "time meter" rather than a real-time clock, and might be confusing. Depending on how you're using TVC, the time displayed on the bottom of the Confidence Graph might not match the Timestamp.

- Select Enabled to show the timestamp, to get full information you're analyzing real-time analog broadcasts. You'll also see instantly if the Encoder's clock has been properly synchronized, which can be helpful in trouble-shooting.

- In some situations where you're analyzing pre-recorded programming, or monitoring with very high latency, operators might be confused by the difference between displayed timestamps and the real-time clock on the bottom of the Confidence Graph. In this case, set Show Message Timestamp to disabled.

Network Screen

This screen tells TVC how to communicate with your data network for remote control, maintenance, and synchronization with a Network Time Protocol clock. Its appearance depends on how you've set the first line [DHCP]. You change that line's setting by using **JOG** and **ENTER**, just as you would on other screens.

DHCP: Enabled

With DHCP [Dynamic Host Configuration Protocol] Enabled, TVC gets its network settings automatically from your router. In that mode, the Configure Network screen looks like this:

To use DHCP, select Enabled on the top line and press Escape. If your network has been configured for this mode, the router will supply an IP address automatically. The other fields are blank when DHCP is on, because you can't change those addresses manually.

If you want to control TVC from an external browser while DHCP is enabled, you'll need to know the IP Address your router has assigned. This can be found on TVC's Status screen (below).

DHCP: Disabled

If Disabled is selected in the DHCP field, the Configure Network screen looks like this:

TVC-15: Configure Network	
DHCP: Disabled	Display
	Adjust
IP Address: 192 . 168 . 1 . 14	System
	Network
Subnet Mask: 255 . 255 . 255 . 0 (/24)	Clock
	AE
Gateway: 192 . 168 . 1 . 1	Status
DNS: 192 . 168 . 1 . 1	
JOG to switch items; PRESS WHEEL to edit item; ESCAPE to save	

You'll need to set the four number lines manually:

IP Address: A unique network IPv4 address for this TVC.

Subnet Mask: A subdivision of an IP network that will include TVC.

Gateway: The router or proxy server that shuffles data between networks. In simpler networks, this will often be 255.255.255.0.

DNS: A constantly updating Internet service that translates readable domain names to numeric IP addresses.

Services that access the Internet, such as Network Time Protocol, require valid Gateway and DNS settings.

Each number in the IP Address, Gateway, and DNS lines are separate fields; Subnet Mask is a single field with preset choices. Navigate to a field with **JOG**, press the wheel to enter it, and **JOG** to the desired number. Then you can press the wheel again if you want to jump to the next field on the line, or **ESCAPE** to save the data and navigate to another line.

DHCP or not?

If DHCP is enabled, TVC's IP address may change when you restart. This affects how users will log in for remote control. If DHCP is disabled, you'll need to manually enter valid numbers on the four lines. These numbers are determined by how your network is set up[22].

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22 It gets complicated. If you're not sure what's best in your station, contact your IT department. Many small business networks use DHCP and never worry about addresses.

Clock Screen

TVC's clock should be accurate so you can correlate watermark confidence values with the signal source or with programming you were running at a particular time. Turn the **JOG** wheel to highlight the Clock menu, and then press the wheel to enter the page.
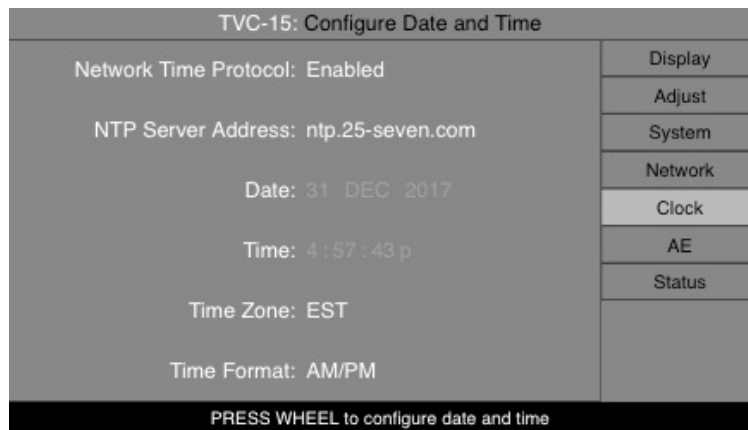
Network Time Protocol

You can enable Network Time Protocol to automatically set the date and time, or you can disable it and set them manually.

- If you're enabling NTP, you must provide a valid server address. It can be our default server at ntp.25-seven.com, or a different master clock your station prefers. Enter the server name using alphanumeric control as described above.

When you first enable NTP, TVC-15 sends a message to the server specified on the screen. Then it synchronizes with the server's clock. The process takes slightly less than a minute. You can check NTP login and synchronization status on the Status screen.

- If you're disabling NTP, you should set the Date and Time manually.

Whether or not you're using NTP, you can specify time zone and standard or 24-hour (military-style) time display. The **JOG** wheel, **ESCAPE** button, and fields work as you'd expect from other screens.

Adaptive Enhancement screen

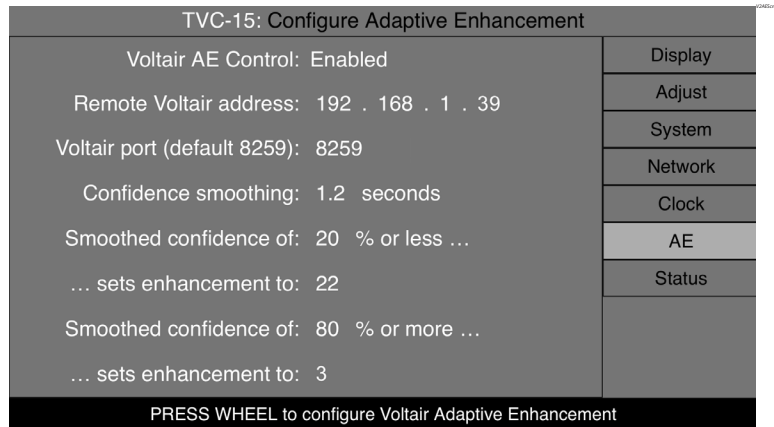If your station uses 25-Seven's Voltair to enhance watermarking, TVC-15 can make it work even better!

Pairing Voltair and TVC can give you optimum watermark strength at all times, with a minimum of annoying artifacts. The combination can react to moment-by-moment content changes, always keeping your signal in the watermarking "sweet spot"

Think of it like a very tunable, constantly responsive AGC for your encoding.

In this configuration, TVC constantly analyzes the actual codes embedded in your on-air signal. It computes the most appropriate enhancement for each moment of your signal, based on parameters you've set for your station. Then, every 400ms, it sends Enhancement instructions to your Voltair.
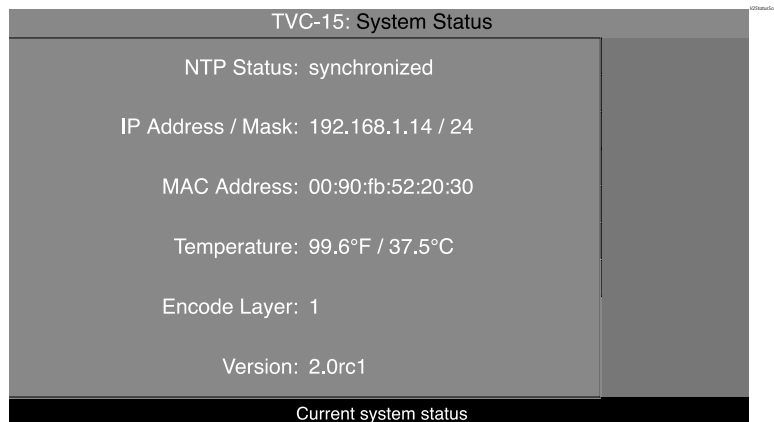
- AE can raise the enhancement during those moments when your programming doesn't have a sonic signature that supports watermarks well. For example, most air talents' voices are hard to encode; AE and Voltair can enhance their watermarks.

- AE can lower enhancement when it isn't necessary, to reduce the chance of listeners being annoyed by audible codes. This can give your music a higher perceived quality, or reduce the audibility of tones on "noisy" material such as sustained periods of applause or crowd ambience.

- AE can react quickly enough that it enhances announcer copy in a jingle donut, while not over-enhancing the music. Each individual talent can get just the level of enhancement they need, even when multiple voices are in the same segment.

- AE lets you specify a target range for your station's watermark reliability, and constantly adjusts for that target.

- AE lets you set limits so enhancement never goes higher or lower than you specify.

- AE lets you fine-tune its responsiveness to your programming. Are you playing music that alternates between singing or instrumentals and speaking? Slow AE down to prevent abrupt shifts in a song's sound. Airing a call-in show? Speed AE up so it can respond differently for studio and telephone voices. Just be realistic: if you set AE to respond too quickly for the program material, it may introduce annoying changes based on individual syllables in an announcement, or a half-bar drum fill in a song.

The Adaptive Enhancement screen is where you connect TVC to a Voltair, and adjust AE's settings for your station's goals.

TVC-15: Configure Adaptive Enhancement	
Voltair AE Control: Enabled	Display
Remote Voltair address: 192 . 168 . 1 . 39	Adjust
Voltair port (default 8259): 8259	System
Confidence smoothing: 1.2 seconds	Network
Smoothed confidence of: 20 % or less …	Clock
… sets enhancement to: 22	AE
Smoothed confidence of: 80 % or more …	Status
… sets enhancement to: 3	
PRESS WHEEL to configure Voltair Adaptive Enhancement	

AE is powerful and sophisticated. Its controls are interactive. We suggest you read this manual's detailed chapter on Adaptive Enhancement.

Status Screen

TVC-15: System Status
NTP Status: synchronized
IP Address / Mask: 192.168.1.14 / 24
MAC Address: 00:90:fb:52:20:30
Temperature: 99.6°F / 37.5°C
Encode Layer: 1
Version: 2.0rc1
Current system status

This read-only screen is for checking TVC's operational state. It reports changes in real-time.

NTP Status shows if TVC's is using a Network Time Clock. It can display disabled, searching, or synchronized. To change the status, go to the Clock Screen.

The IP Address should be noted if you plan to log in remotely; it's where you'll point your browser. This address is displayed correctly, regardless of whether you're using DHCP or not. You can change IP settings on the Network Screen. Web access uses port 80.

Mask, a number that follows the IP Address (24 in this screenshot), is used for network configuration.

The MAC Address identifies TVC's networking hardware, and is unique for each system. You may need this information to set up your network router.

Temperature shows the TVC hardware's internal temperature.

Encode Layer refers to the encoding protocols used in your market. All US radio markets use Layer 1. If you're using the system in a different country, your local standard might be Layer 2. If in doubt, ask your dealer. You can switch layers by using TVC's Web remote control, and then rebooting the hardware.

Version identifies the firmware currently running on your TVC.

Adaptive Enhancement [AE]

Use TVC-15 with your Voltair for optimum watermark enhancement… every moment of your broadcast day!

25-Seven invented watermark enhancement, and introduced it in our groundbreaking Voltair processor. We know how electronic measurement codes work, have continued our research into how they interact with different kinds of programming, and have used that knowledge in designing our Omnia processors.

In the thousands of cases we've analyzed, both at stations using Voltair and in our own labs, one lesson has stood out:

There is no one ideal enhancement setting for a station. Don't just set it and forget it. Too little, and ratings may be impacted because panelists' meters don't register your watermarks. Too much, and listeners may be chased away by a perceived harshness in your signal.

Unfortunately, "just right" is a constantly moving target.

A lot of factors influence the optimum enhancement level during your broadcast day. Some songs naturally encode better than others. Some talent voices don't support watermarking as well as others. Studio and airchain processing can affect what the encoder does. Data compression—either before or after watermarking—can affect the reliability of individual messages.

Voltair gets calibrated to a specific encoder, and then measures its output on a minute-by-minute basis to suggest how much enhancement might be needed. But a single minute may contain lots of different content. Multiple instrumental and vocal styles, dry voices, sports and concert backgrounds, dramatized commercials, morning-show bits… each can encode differently, and require different levels of enhancement.

On top of that, Voltair has no way to measure things that happen to your signal after it's enhanced. Controlled clipping in a final processor, different modulation methods, RF noise, low bitrate streaming, and other factors can effect watermark reliability.

So finding the "right" enhancement level has been as much art—or voodoo—as it is science.

We invented TVC-15 to put more science into the equation. It reads actual watermark messages from real-world encoded audio. TVC analyzes the code symbols in an audio stream 150 times a minute—fast enough to catch any program changes—and reports the reliability of complete watermark messages as they happen.

Panelists' meters don't need to be calibrated to a particular encoder, and neither does TVC. It can be used with any audio signal. The signal can be real-time or recorded. It can come from your airchain, your mod monitor, a consumer receiver tuned to some other station, a web stream, a spare encoder being used to evaluate songs or production… or even be picked up by a microphone in a space where the signal is playing. If there are codes, TVC can analyze them.

And then we added one more feature, which can make a big difference in optimizing your station's watermarking:

- We gave TVC-15 the intelligence to continuously determine how much enhancement your signal needs, to meet your station's goals for watermark reliability and audio quality.

- And we gave TVC-15 the ability to constantly send this enhancement information to your Voltair.

With TVC-15 and Voltair working together, enhancement never has to rely on guesswork.

- TVC takes control of your Voltair, constantly changing the amount of enhancement to give you the best results.

- The combination works like a super-alert operator, with one eye on TVC-15, and one hand on Voltair: an operator who knows exactly how you want to fine-tune your watermarks for the most reliable encoding and the happiest listeners, and who works every minute you're on the air!

- TVC's AE can compensate almost instantly—within ½ second, if needed—for changes in talent voices and styles, program features, production, spots, or even solo sections in a song.

- AE is fully tunable. You set the desired confidence range and how your Voltair will respond to it.

- You can even set it up to analyze dynamic real-world environments, like the crowd at a ballpark, and compensate for changes as needed.

Processors like Omnia give you tight, responsive control of your on-air sound…

TVC-15 and Voltair can work together to give you the same tight, responsive control of your watermark enhancement.

AE is included with every TVC. All it needs is a properly installed Voltair[23] and a few connections.

---

23 You point AE to a specific Voltair's network address, and feed TVC a real-time version of that Voltair's output signal.

How Adaptive Enhancement "thinks"

To control a Voltair, AE starts with a fairly simple goal: If it sees watermark confidence go down, it adjusts Voltair's enhancement up; if it sees confidence go up, it adjusts Voltair's enhancement down.

At the same time, AE's other goals are maintaining a station's artifact-free sound to help keep listeners, while maintaining robust codes that help keep a station profitable. It takes a lot of processing for TVC to meet all these goals at once.

Some of the things AE does 150 times per minute:

1. It measures the per-symbol encoding confidence of any compatible watermark signals it finds in the test audio, across all ten channels of the watermark system.

2. It runs this and previous confidence measurements through our weighted averaging process, smoothing the numbers over a timeframe you set. This creates an accurate, constantly updating analysis of your watermarks' reliability, without glitches that might be caused by momentary content changes.

3. It applies these smoothed confidence readings to a series of user-specified comparisons and enhancement goals—

    a. if confidence is equal to or higher than your specified target, AE sets its desired enhancement value to the bottom of your specified range,

    b. if confidence is equal to or lower than the target, AE sets the desired enhancement value to the top of your range,

    c. if confidence is between the targets, AE interpolates an enhancement value from your specified limits.

4. AE measures the difference between its current desired control value and the previous one, and limits the rate of change to prevent abrupt shifts.

5. AE issues commands to the connected Voltair, setting watermark enhancement to the calculated desired value.

400 ms later, AE repeats the process:

6. If there hasn't been a change in step 2's smoothed value or your specified limits, it continues the step 4) process and approaches the desired enhancement value at your specified speed.

7. If there *has* been a change, it adds that factor to the result.

The fictional ever-vigilant operator from our analogy—the one who has one eye on TVC and one hand on Voltair—would have beads of sweat by now.

TVC does it all, easily and reliably.

AE Signal Path

Because AE controls Voltair in real-time, it needs real-time access to Voltair's audio output. Any significant delay in the audio path will mean TVC may be trying to compensate for short-duration events long after Voltair can do anything about them. This can cause unpredictable oscillations in enhancement, unrelated to your programming.

Non-delayed broadcasting

Conventional analog AM and FM broadcast paths are fast enough that you can feed TVC with the signal from an off-air receiver or modulation monitor. This lets AE compensate for RF and transmission issues as well as changes in your programming. (The short latencies in modern STLs and AoIP systems won't introduce an error.)

We've found that the best AE installations for non-delayed broadcasts have Voltair connected to the insert point of the airchain processor, and TVC-15 connected to an off-air monitor. The entire hookup looks like this:
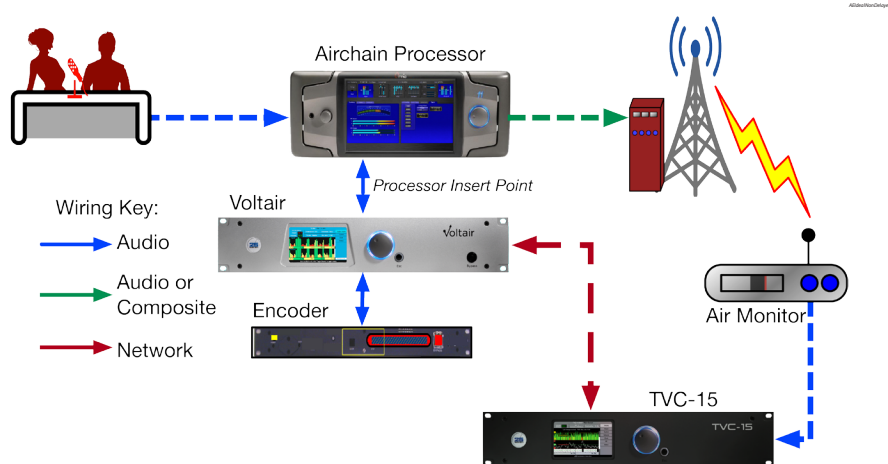
Delayed broadcasting

HD radio codecs introduce a delay, and many stations intentionally delay their analog signal to prevent problems in listeners' HD receivers. *Either of these delays will prevent proper AE operation.*

If your signal is delayed more than a few dozen milliseconds for any reason, don't feed TVC from an off-air receiver!
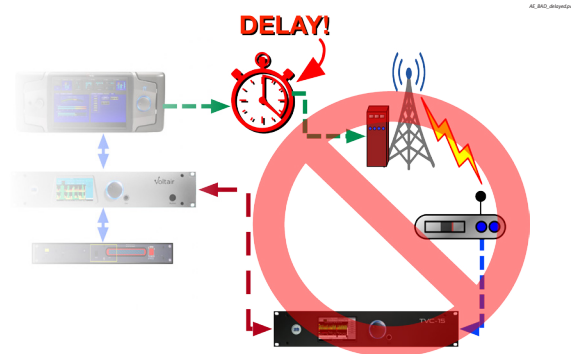
Instead, feed TVC from a monitoring output of your processor, the same way you might feed talents' headphones. If this kind of output isn't available, split Voltair's output through a DA or router and send one of its signals to TVC:
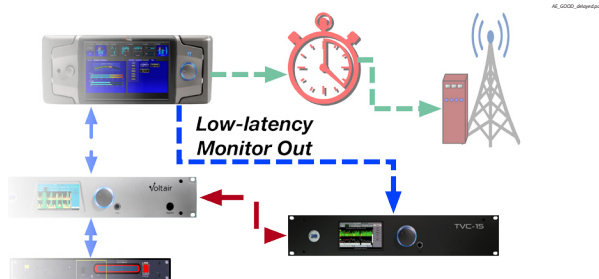
No calibration required.

TVC does not have to be calibrated or matched to a specific Encoder. All it needs is a non-delayed balanced audio signal at nominal +4 dBu line level from the receiver or monitor feed, and a network data connection to Voltair.

TVC-15's Adaptive Enhancement Screen

You can control Adaptive Enhancement [AE] from the front-panel menu or via password-protected Web interface. Each adjustment has a specific and important purpose.

TVC-15: Configure Adaptive Enhancement	
Voltair AE Control: Enabled	Display
Remote Voltair address: 192 . 168 . 1 . 39	Adjust
Voltair port (default 8259): 8259	System
	Network
Confidence smoothing: 1.2 seconds	Clock
Smoothed confidence of: 20 % or less …	AE
… sets enhancement to: 22	Status
Smoothed confidence of: 80 % or more …	
… sets enhancement to: 3	

Voltair AE Control:

The first line lets you Enable or Disable the Auto Enhance function. When it's disabled, Auto Enhance settings are still visible and can be adjusted.

Remote Voltair address:

TVC reaches across your local network to control a specific Voltair[24].

You can have multiple TVCs controlling multiple Voltairs on the same network. The only management required, other than keeping track of IP addresses, is that you make sure TVC is analyzing the output of its associated Voltair[25].

Voltair's address is IPv4 format with four numbers separated by periods. Each number must be between 1-255. Get these numbers from the Status screen of the desired Voltair unit, either at the machine or via Voltair's Web remote.

FM97-Main: System Status
NTP Status: synchronized
Calibration date: Feb 18 11:23AM 2016
IP Address / Mask: 192.168.1.39 / 24
MAC Address: 00:30:18:c2:3f:7e
GPIO Inputs: 000000

---

24 TVC can communicate with Voltairs running firmware version 2.5 or higher. Updates are at www.telosalliance.com/25-Seven; installation instructions are in the Voltair manual.

25 Otherwise you might have your talk show's Voltair being controlled by a TVC that's analyzing your new-age folk show. That would be silly… and it could harm your talk show's enhancement.

If you're reading an address from a Voltair Status Screen, copy its IP Address(192.168.1.39 in these screenshots). Enter it as the Remote Voltair address on TVC's AE screen. You may also be able to get Voltair's address from your network router or IT department.

If your Voltair is configured for DHCP, its address may change during a reboot. TVC has no automatic way of knowing the new address, and will lose control. See the Voltair manual or contact your IT department for more information on setting a static IP address.

Voltair port:

This will usually be 8259, the port on which Voltair accepts enhancement commands. In special networking situations, your IT department may ask you to enter something else.

At this point, you should be able to confirm the connection:

On TVC-15

Escape back to TVC's menus, and select Display. The top center of the Main screen should look something like this. The name you've assigned at Voltair will appear in this section of TVC's screen.
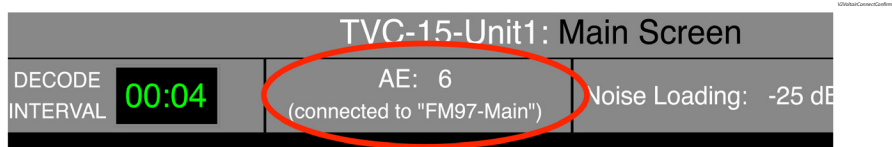

If TVC cannot connect to Voltair, you'll see CONNECTION ERROR instead of Voltair's name. This can happen if you entered the wrong address on TVC's AE screen. If the address is correct, the problem might be that Voltair is offline for any reason (including calibration), Voltair's address has changed because DHCP has restarted, or a there's network problem, such as a firewall issue.

If you see Control Disabled instead of the Voltair name, it means AE is turned off. Go to the top line of the AE screen and set Voltair AE Control to Enabled.

On Voltair

Escape back to Voltair's menus, and select Display. The top center of the Main screen should look something like this, with the TVC-15 logo and the name you've given the TVC that's controlling Voltair. Enhancement will be the value TVC has sent to Voltair, and will change as your program requires more or less enhancement.
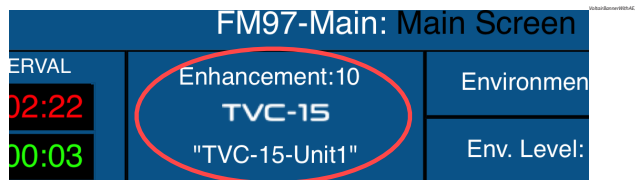
If Voltair isn't receiving commands from TVC, you won't see the TVC-15 logo or machine name. Enhancement will report the value currently set within Voltair.

So much for the basic setup. Now we get to fine-tuning.

> **These interactive controls influence how robust your watermarks are, and also affect subtle aspects of your station's sound. To use them properly, you need a basic understanding of our control algorithms.**
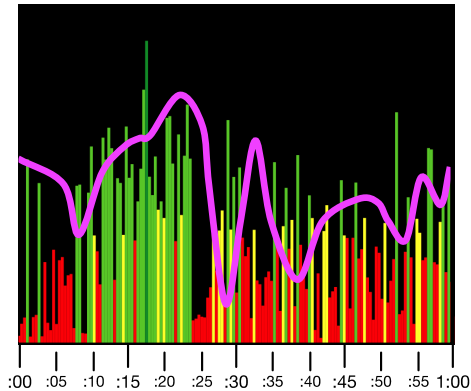
Confidence smoothing: xx seconds

TVC applies a continuous, logarithmically decaying average to the individual 400 ms. symbol confidences it detects. The setting tells it how much weighting to apply to past symbols: effectively, how slowly the smoothed result changes based on new information. It uses the result to control the rest of the Automatic Enhance function.

Choose a duration between 1 and 60 seconds.

A short duration will react almost instantaneously to program changes. This can give you the fastest, tightest control over watermark enhancement. While the functions are totally different, you may think of smoothing as being similar to the attack and decay timings on an audio compressor.

For example, this drawing illustrates 2 second smoothing[26]:

The thin vertical lines are individual 400ms confidence levels on the Main Confidence Graph. The horizontal scale is sixty seconds of continuous broadcasting. The thick purple line is the result of 2 second smoothing. It reacts tightly to the measured density of code symbols, but not so fast that Enhancement changes radically depending on talent's individual syllables. It could be a good setting for a talk station.

Slightly longer settings may be appropriate for music formats where songs have spoken passages, for live concerts or sports that may be interrupted by short commercials, for talk shows that are interrupted by noise-like bursts of applause or similar sounds[27], or for other situations where you want TVC to ignore momentary changes.

Long settings should *not* be used as a workaround when you can't avoid delays between Voltair's output and TVC's input. This kind of smoothing may protect enhancement levels from oscillation, but it won't guarantee the right enhancement levels are applied to your program.

Control range pairs:

Smoothed Confidence of aa % or less…

…sets enhancement to bb

and

Smoothed Confidence of cc % or more…

…sets enhancement to dd

In these two pairs of controls, *Smoothed Confidence* refers to the result of TVC's confidence analysis as processed through the Confidence Smoothing you've set. It's a percentage, reflecting the most recent Confidence TVC has been able to measure, averaged with decreasing amounts of previous Confidences during the number of seconds specified.

---

26 It's a very simplified figure. Our algorithms are more complex.

27 Pink noise, large audience applause, and other constant sounds with significant midrange energy are much easier to encode than normal speech.

These four controls work interactively. They determine when, and how much, TVC changes Voltair's Enhancement. They set the minimum and maximum enhancement levels, and where on the scale of confidence metrics increases or decreases are triggered. They're best understood with a few graphs.

The first and third lines, Smoothed Confidence of nn %… , set the range TVC uses to adjust the Enhancement value. Within that range, TVC will make adjustments to Voltair's enhancement. When Confidence goes beyond that range, TVC freezes at the last enhancement value it calculated… until Confidence returns to being within the range.

If you couldn't set the Smoothed Confidence range—that is, if TVC responded linearly to every change in the Smoothed Confidence, with no limits—you could graph its behavior like this[28]:
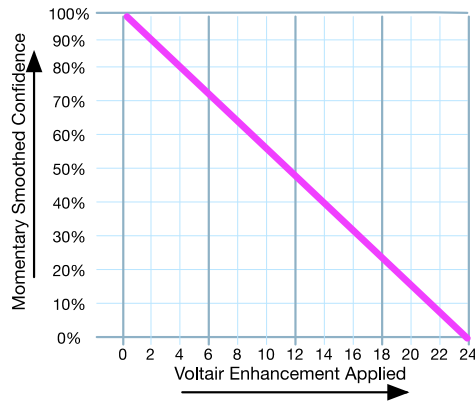
The vertical scale shows the Smoothed Confidence value, from zero to 100%. The horizontal is the amount of Enhancement that TVC tells Voltair to apply.

The slanted purple line shows a constant relationship across the whole range of confidence: at 100%, Voltair applies zero Enhancement; at 50% confidence it applies 12 units of Enhancement; at zero confidence, Voltair unleashes its full 24 units of Enhancement.

But in our experience, code symbols are more likely to fall into the middle of that range than at the extremes. We take advantage of that, squeezing more of the control activity into the center.

28 These are also simplified graphs and numbers for explanation, not a detailed reflection of everything TVC does.

If we set Smoothed Confidence of 80% or less as a practical maximum, and Smoothed Confidence of 20% or more as a minimum, the graph now looks like this:
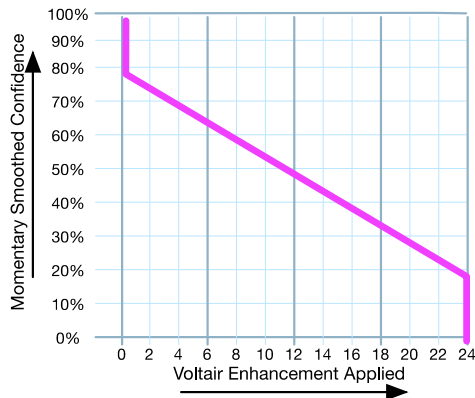
At any value of 80% or higher (vertical purple line on the extreme left), TVC sets Voltair to minimum Enhancement. At any value of 20% or lower (extreme right), TVC sets Voltair to the maximum.

In between (diagonal section), Voltair responds with a full range of Enhancement values.

…sets enhancement to:

For a lot of programs, zero enhancement is never enough, and 24 enhancement is always too much. These sets enhancement adjustments are like Goldilocks: they let you specify "too little" or "too much" enhancement for your programming. TVC will then interpolate between your values as needed, to get enhancement that's "just right".

For example, let's keep the two Smoothed Confidence settings at 80% and 20% as above.

We'll apply enhancement limits of 18 at the lowest confidence, and 6 at the highest. Your screen would now look like this:
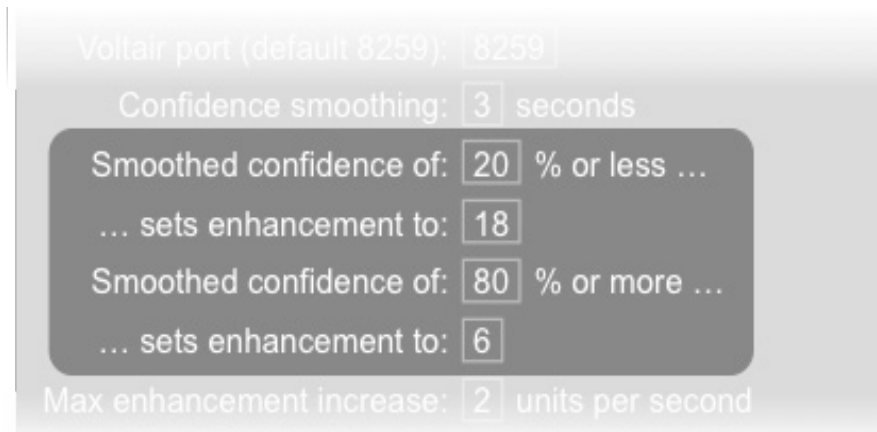
With these four settings, the graph looks like this:
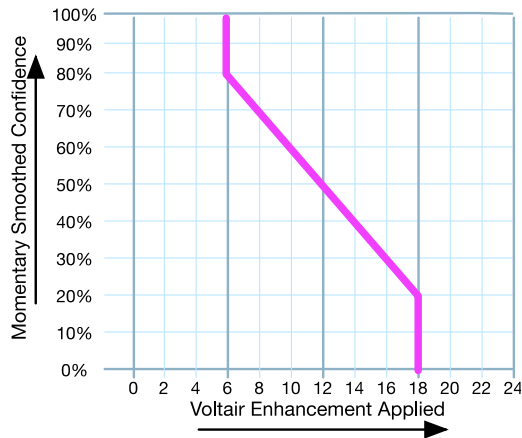
At any confidence of 80% or higher, AE has Voltair apply 6 units of Enhancement. That minimum amount won't bother listeners of most programming, but provides enough boost to enhance watermarks in moderate environments.

Between 20% and 80% confidence, AE sends Voltair commands for more enhancement when it's needed, and less when it isn't.

But no matter how low the confidence gets, AE never specifies more than 18 units of Enhancement… a limit that should keep code symbols from becoming annoying in many formats.

That's just for the example above, of course. You'll be tuning your TVC to get the best results with your programming and your audience.

Bear in mind:

- The Smoothed confidence of nn% or less… (upper pair) must be a lower percentage than the % or more… percent value.

- The % or less …sets enhancement number should always be *higher* than the or more number.

This becomes intuitive when you understand how AE thinks. TVC also posts an **error** warning if you try to reverse these values.

These settings, together with TVC-15's ability to quantify the confidence of each 400 ms. code symbol, give you unprecedented control over your how robust your station's watermarks are… with a minimum of listener annoyance!

The numbers in this manual are just a tutorial. They're based on typical formats and circumstances, and your station should be anything but typical.

- **Use our numbers[29] only as a starting point.**

- **Do your own fine-tuning.**

- **Compare the results against your own judgment of air sound, and ultimately against your own ratings reports.**

Note: if you are using AE to control a Voltair, and the network connection between these machines is disrupted, Voltair will default to its own Medium Enhancement preset as a static setting. This prevents Voltair from being left at an extreme enhancement level that might have been briefly appropriate but would be a problem if used continuously. Once the connection is re-established, AE control resumes.

---

29 We ship TVC with default values of 1 second smoothing, a minimum enhancement of 6 if confidence reaches 80%, and a maximum enhancement of 18 if confidence falls to 20%. Those values are there simply as a starting point for your experimentation.

Browser-Based Remote Control

Almost all of TVC's front-panel functions can be controlled remotely, by logging into its internal password-protected server with a modern browser. The Confidence Display can also be monitored on tablets or smart phones.

TVC supports three different kinds of Access:

- Front Panel Access uses TVC's LCD, **JOG** wheel, and buttons. It does everything required for normal operation. Full details are in the previous chapter.
  - Some maintenance functions require a keyboard and file storage and access on a connected computer, and don't appear on the Front Panel.

- Full Web Access lets you control a remote version of the front panel, using the web browser in any networked computer. It's password-protected for security.
  - Normal analysis functions, Intelligent Adaptive enhancement settings, and basic system configuration are accessible from the browser. The user interface is almost identical to TVC's front panel, except keyboard and mouse are used instead of the **JOG** wheel. If you're accessing these functions from a smart phone or tablet, you may need an accessory hardware keyboard[30].
  - Network-critical functions, such as assigning passwords, must be done from the front panel. This is for security and to prevent accidental disconnection.
  - Updating firmware and downloading Confidence History reports require a connected computer. These functions aren't available at TVC's front panel.
  - Some factory support situations may require you to be connected with Full Web Access while you talk to our technical team.

- View-Only Web Access uses a web browser to mirror the LCD's Confidence and Real Time Analysis displays. It's intended for operators and management who want an ongoing view of how well the system is performing.
  - This access level can be used on many smart phones and tablets, as well as on full computers.
  - View-Only does not give the user any control over TVC. Settings cannot be changed.

- View-Only and Full Web Access can have different passwords, which are both programmed from TVC's front panel. You can use separate passwords to restrict Full Access control to engineering and station management, while letting producers and programmers view encoding confidence in real-time.

A summary of available functions, by access level, appears after the following log-in instructions.
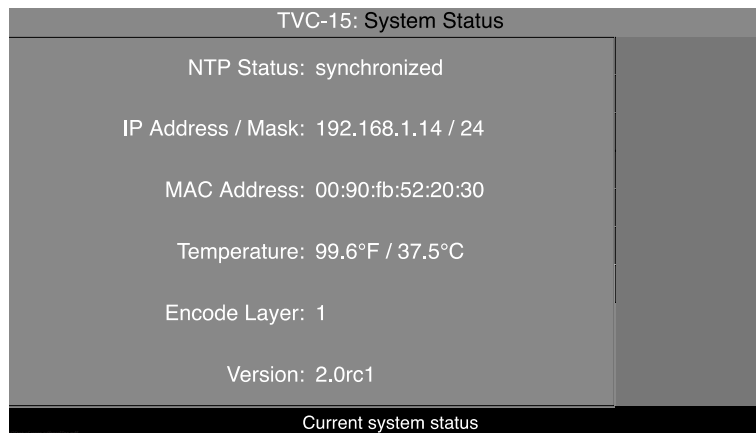
---

30 There are plenty of low cost Bluetooth mini-keyboards that can be used for this function.

Logging in

The procedure is the same for Full Web and View-Only Access. The only difference is the user name and password, which change depending on the access level you want.

1. Point your browser to TVC's IP address. This appears on the front panel's Status screen. If you have multiple TVCs on your network, each should have a different address.

```
                    TVC-15: System Status

          NTP Status:  synchronized

   IP Address / Mask:  192.168.1.14 / 24

        MAC Address:  00:90:fb:52:20:30

         Temperature:  99.6°F / 37.5°C

        Encode Layer:  1

             Version:  2.0rc1

                    Current system status
```

2. The Mask number, which appears after the IP Address, is for system maintenance and not used during log-ins.

3. After your browser contacts TVC, it displays an authentication request:
   `A username and password are being requested by` *[IP address]*`. The site says: TVC Web`

   d. If you want to use Full Web Access, enter tvcweb as the user. Then enter the password you'd assigned for Full Web on the TVC's front panel System screen.

   e. If you want to use View-Only Access, enter tvcview as the user. Then enter its password.

   These user names (tvcweb or tvcview) must be entered as all lower-case, exactly as shown here and on the System screen.

   Passwords are set by you on the front panel System screen. You can use upper- or lower-case, numerals, and some punctuation, but they must be entered exactly as you set them. Passwords can (and probably should) be different for the two access levels.

   After you've entered the user name and password, the computer will finish logging in and you can use TVC remotely. When you're finished, you can log out using the button on the upper right corner of your browser's screen.

Access System Requirements

A single TVC will support multiple remote users, in any combination of access levels and functions. You can have Full Web Access running in the operations center and engineering shop, View-Only on the program producer's computer, and another View-Only on the General Manager's phone. All functions work in real-time, and parameter changes made on one computer or the front panel are reflected on every other screen.

You can also have more than one TVC running on the same data network. Make sure they have different IP addresses[31], and access each with its specific IP address. If you've assigned a machine name (such as TVC_FMHD1), you'll still log in with the IP address. The machine name will show up at the top of its remote pages.

Full Web and View-Only Access run as dynamic web pages from TVC's internal server. They are HTML5-compliant and don't require Flash or other plug-ins, so virtually any modern web browser on any current computer or mobile operating system will work.

Functions and Access Levels

This table summarizes what you can control or view at each of the three access levels.

	Front Panel	Full Web Access	View Only Access
Login Name	*none required*	tvcweb	tvcview
Login Password	*none required*	*passwords are set by you, using TVC's front panel*	
Keyboard/Mouse	no	required	optional (suitable for smart phones)
FUNCTIONS			
Main Screen	Full	Full; adjust parameter by clicking with mouse	Yes
Adjust Screen	Full		no
System Screen	Full	Limited: no passwords	no
Network Screen	Full	no	no
Clock Screen	Full	Full	no
AE Screen	Full	Full	no
Status Screen	Full	Full	no
ADDITIONAL FUNCTIONS (see below)			
Available Tabs	none	All	History, Encoders (view only), Information
Update Software	no	Yes	no
Maintenance Logs and Settings	no	Yes	no

31 If you're using DHCP (page 57), this happens automatically.

Additional Control Functions

Both Full Web Access and View-Only can do more than just mirror TVC's front panel LCD. Both feature tabs across the top of their web pages. You can click them for additional functions.
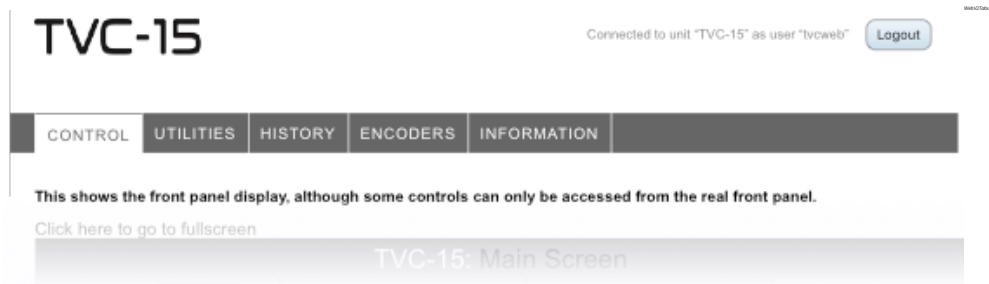
CONTROL

This tab shows a live picture of TVC's Front Panel LCD. Menus and specific screen functions vary according to access level, as described in the chart above.

Since your computer has a mouse and keyboard, but doesn't have a **JOG** Wheel, we made navigation on these screens a lot more computer-like:

- To choose from the menu on the right side of the screen, point to the item name and click.

- To set any parameter that can be adjusted from the front panel, point to the parameter field on the screen, and click. This enters the field.

    - If the parameter is normally set by scrolling through possible values (such as Time on the Clock screen), use the up- and down- arrow keys to increment though the list32.

    - If the parameter requires an alphanumeric entry (such as machine name or the URL of a time server), just start typing. Use the left- and right- arrow keys to navigate through the name, if necessary.

    - When you're finished entering something, press Escape **ESC** on your keyboard to save it. Or use the mouse to select anything else on that screen, or click a menu item for other screens. Those actions will also save the setting.

TVC's other tabs present other functions as web pages and forms, in a style that's intuitive to any computer user. You can click on links, type data in fields, and use the **DELETE** key to correct mistakes.

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32 Depending on your browser, this might also rock the page up or down slightly. Ignore it.

UTILITIES

This tab is available only for Full Web Access, and lets you perform system maintenance.

System Software Upgrades

■ Copy upgrade package lets you upload new firmware releases. Clicking this function takes you to a page where you can select the firmware package on your computer, copy it to TVC's internal storage, and then install it. The new software won't be activated, however, until you do the next function:

■ View or switch running firmware version lets you manage current and previous releases. You can switch to the latest version, revert to a previous version if there's ever a reason, or erase obsolete versions from TVC's storage.

■ Switching firmware versions takes about 40 seconds. TVC automatically returns to run mode as soon as switching is complete.

Logs

TVC keeps internal track of operating parameters and software conditions. If there's a problem, you may be asked to download and forward them during a support call.

Maintenance

■ Decommission unit erases all user settings and history files. These can't be recovered, and you'll have to start from scratch.

■ Switch encoding to Layer… lets you set TVC's watermark recognition protocols for encoding standards in different countries. For US radio, this should be left on **Layer 1**. In some non-US markets, Layer 2 should be used. "Layers" are differing groups of center frequencies that encoders utilize when generating watermark tones. Some countries use alternate or even concurrent layers to interleave different information on the same audio. TVC must be set to analyze just one of the two possible layers, but the layer can be changed anytime you want. Changing layers requires a system restart.

HISTORY

You can download detailed or one-minute averaged confidence files for any day TVC has been running.

The files are in .csv format, and can be opened by any text program or imported into spreadsheet programs like Excel or and database managers.

Available information for each report includes:

■ Time: This is a timestamp from TVC's internal clock, not necessarily what's broadcast by the encoder.

■ Noise loading: Indicates whether this feature is disabled, or the noise level being used.

- Message Name: This is the name of the encoder detected by TVC. Encoder IDs are obscure and proprietary, with no relationship to a station's call letters or frequency. For convenience, TVC identifies each unique encoder it encounters with a name like Encoder A, Encoder B, etc. You can change these names to something more memorable on the next tab. Names stick to an encoder: if TVC sees the same encoder again it'll use the same name—even if other encoders have been encountered in the interim.
  If there is a blank field in this column, it means a complete message was not received at that time. The confidence was most likely too low to be usable at that time, because of programming issues or environmental noise.
  If more than one encoder was detected during a period, then this column will be set to (mixed).

If you're looking at a detailed report, the other columns are:

- `Message TS`: This is the timestamp being broadcast by the encoder. It takes the format HH:MM, but might not relate to real time.

- `Message Conf:` This is the confidence of each input message as analyzed by TVC. It's a four-decimal-place number from 0.000 to 1.000, representing the average of many variables that TVC looks at. You can multiply by 100 to get a percentage range from 0.00% to 100.00%.

- `Minute Name:` This is a summary of the Message Names, reported once per minute.

- `Minute Good:` How many times a message was successfully received during the minute.

- `Minute Possible:` station encoders transmit a message every 4.8 seconds, which means there may be either 12 or 13 complete messages in a perfectly encoded minute. This field tells you which of those two maximums apply to that minute, for convenience when calculating.

If you're looking at a minute-by-minute report, the other columns are:

- `Message Good` and `Message Possible`: these are identical to Minute Good and Possible, above.

- Symbol Average: this is a floating point average of how many symbols were received during each message slot, divided by the possible message slots in that minute.

Available days are listed by month, with the most recent ones at the top of the list. Click on a day, and your browser downloads a file called TVC_*MachineName*_History_*Date*.CSV. The filename is the same no matter which type of file you choose, so if you're grabbing both a detailed and minute-by-minute version from the same date, change the names to keep them identifiable.

ENCODERS tab

This is a list of all the encoders this particular TVC has seen. Encoders are identified with a proprietary code, rather than with the call letters or frequency. TVC replaces them with a simple internal ID: Encoder A, Encoder B, and so on, incrementing each time it encounters an encoder it hasn't seen before.

The list also reports the most recent time TVC has seen this encoder, based on its internal clock. Every time a new message is received, the corresponding encoder in the list will flash.

If you're looking at the tab via the `TVCWeb` user, you can rename the internal ID with something more convenient, like `WECB 640` or `Classical 102 HD1`. You can also delete all on-screen references to an encoder.

If you're looking at the tab via the `TVCView` user, you can see the name and most recent encounter, but can't make any changes.

In either case, you can sort the encoder list by clicking the triangles next to each column header. Clicking a triangle a second time will reverse the sort on that column.
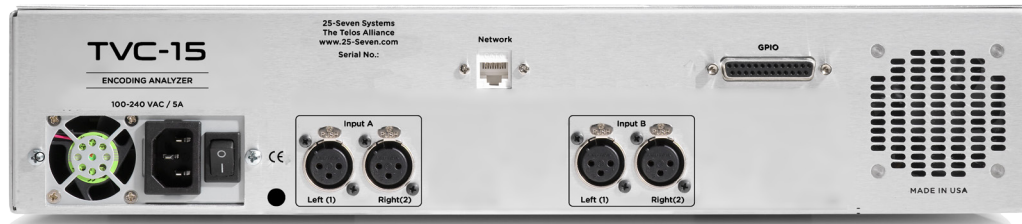
INFORMATION tab

This displays TVC status on one page for convenience, where it can be copied or printed for your records and when contacting the factory. The same information is available in multiple screens on the front panel.

Installation

Step-by-step installation details are in the Instant Gratification chapter.

Rear panel connections

Analog audio connections

TVC is wired for line-level balanced analog audio with XLR female connectors. Like almost all other modern equipment, pin 2 is hot, pin 3 is return, and pin 1 is ground. The connection scheme is unterminated or "bridging". Nominal level is +4 dBu, with 20 dB headroom.

We do not recommend unbalanced operation or other levels, which may affect accuracy. If you want to hook it up to a computer or hifi-style output, use a buffer amplifier.

Use the Input A connectors, left(1) for mono and both for stereo. If you're analyzing a stereo signal, make sure the inputs have consistent polarity.

Input B is reserved for future expansion.

There are no output connections. TVC is a monitor only.

> **Important Note!**
>
> **If you plan to use TVC-15's Adaptive Enhancement feature for real-time control of a Voltair,**
>
> **and your broadcast signal is delayed (for data compression, HD sync, or other reasons),**
>
> **TVC must be fed from a non-delayed source while AE is in use. See the Adaptive Enhancement chapter for details.**

If you then want to use TVC to analyze a non-realtime signal, or one from a different Voltair, disable AE (from the AE screen) before switching the input.

Ethernet connection

The 100M/1G LAN connector provides access to TVC's internal Web server for remote control, report downloads, firmware uploads and for AE control of Voltair. It also connects to NTP servers when this function is enabled.

Connect it to your router or nearby switch with standard Ethernet Category 5 or Category 6 cable, using an RJ-45 connector. This is standard for most modern computerized gear.

TVC supports auto MDI-X, so you can use a straight or crossover cable.

LiveWire or other IP audio formats are not carried over this connector.

GPIO (25-Pin DB25)

This connector is provided for future expansion.

AC Power

Connect to 60 cycle source between 100 and 240 volts. TVC is internally fused at 5 Amps, but will typically draw much less: peaks of about 100 watts on startup, and under 50 watts when running.

When you turn TVC ON, it goes through a startup procedure of about 30 seconds. The system's fans will run at high speed during startup, but then slow down to normal operating level. Multiple cooling fans help ensure the processing systems stay at optimal operating temperature, insuring a long life, and significantly lowering risk of heat related device failures.

Ventilation

Keeping the unit cool will prolong its life, and protect your warranty. Make sure the vents on both sides of the rear panel have a free flow of air at reasonable temperatures. TVC doesn't generate much heat, but it can be affected by heat from equipment around it. Do not mount TVC directly above or below equipment that runs hot, or that blasts hot air from its vents.

Troubleshooting and Updates

TVC-15 is solidly built, with rigorously tested hardware and software and collective years of successful run time. Nonetheless, no electronic equipment is immune from occasional problems. These pages will help you identify which ones can be fixed quickly and locally, and which require your contacting us.

In an emergency, you can reach our Support Team anytime, by calling +1 216-622-0247.

TVC has an extensive internal logging system, engineered to ensure system integrity and help us get to the bottom of any problem quickly. When contacting customer support, you may be instructed how to retrieve log files so they may be emailed to us for analysis.

For non-emergency technical questions, email Support@TelosAlliance.com or call +1 216-241-7225 between 9:00 AM - 5:00 PM USA Eastern Time, weekdays. There's full contact information at the end of this chapter, and at the end of this manual.

Features and operations of TVC are determined largely by software. 25-Seven Systems strives to provide the most stable and feature-rich software available. We encourage you to check for software updates from time to time by visiting our website or by contacting us directly.

Contacting Us…

By Phone/Fax

You can reach our 24/7 Support Team in emergencies by calling +1 216-622-0247. For administrative questions or other non-emergency technical questions, call +1 216-241-7225 between 9:00 AM to 5:00 PM USA Eastern Time, Monday through Friday.

By Email

Non-emergency technical support is available at Support@TelosAlliance.com.

By Web

The Telos Web site has a variety of information that may be useful for product selection and support. The URL is http://www.TelosAlliance.com. See the 25-Seven section for TVC-15 news and updates.

Technical Specifications

We are constantly working to improve our products.
Specifications and features are subject to change without notice

ANALOG LINE INPUTS:

- Input Impedance: >40 k ohms, balanced
- Nominal Input Range: +4 dBu
- Input Headroom: 20 dB above nominal input
- A/D Conversions: 24-bit, Delta-Sigma, 256x oversampling

POWER SUPPLY AC INPUT

- Auto-ranging supply, 100VAC to 240VAC, 50 Hz to 60 Hz
- IEC receptacle, internal fuse, on/off switch
- Power consumption: 55 Watts

OPERATING TEMPERATURES

- 0 degree C to +40 degree C, <90% humidity, no condensation

DIMENSIONS AND WEIGHT

- Chassis Dimensions (ex protrusions):
  19" (48.2 cm) wide
  3.5" (8.9 cm) height
  11.75" (30 cm) depth
- Chassis Weight: 14.5 lbs. (6.57 kg)
- Shipping Dimensions & Weight: Contact customer support

Warranty

Telos Alliance Limited Warranty

For the latest Telos Alliance warranty, visit: telosalliance.com/warranty

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THE TELOS ALLIANCE®

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