Signal-and-Noise Voter Comparator All IP Backhaul Implementation

SNV-12 Voter for Receive Audio with Backhaul over IP Only

**General/Environmental**

QMT-1
- RX Audio Input: Level adjustable - 0 dBm nominal; range: -20 to +10 dBm, Impedance - Balanced 600 ohms or unbalanced 47k ohms; Transformer coupled
- COR Input: Polarity Active low or High, selectable, Impedance: 47k ohm pullup to +5V
- TX Audio Output: Level adjustable - 10 dBm nominal; range: -20 to +10 dBm, Impedance - Unbalanced Hi Z, AC coupled, Keying - EIA Keytones or PTT
- PTT Output: Output Type - Open Drain, 47k ohm pullup to +5V, Maximum Sink Current - 100mA Max., Open Circuit Voltage - 100mA
- Network Interface: Type: 10/100 Base-T Ethernet, 100Mbps, RS-45, Video Codec - 711 (64 Kbps)

**Front Panel (SVM-3)**
- (3) sites per module; each site has its own Select/Normal/Disable Switch, and transmit indicators: Voted LED/Unsquelched /TX /TX Select LED/Fault. 12 SVM-3s create a 36 site system.
- Delay time Rx Unsquelch to Tx: typically below 400 msec (approx. 350 ms + network delay)

**Network Interface:**
- Open Circuit Voltage - 100mA.
- PTT Output: Hi Z, AC coupled, Keying - EIA Keytones or PTT
- TX Audio Output:
- COR Input:
- RX Audio Input:
- Delay time Rx Unsquelch to Tx: typically below 400 msec (approx. 350 ms + network delay)
- these indicators: Voted LED/Unsquelched /TX /TX Select LED/Fault. 12 SVM-3s create a 36 site system.

**Console**
- SVM-3 modules can be plugged into existing SNV-12 chassises alongside current SVM-2 modules for flexible, low cost upgrades.

**Benefits**
- Bring voter audio to/from your remote sites using your network or IP infrastructure
- Allows use of existing private network infrastructure, thereby eliminating the need for leased lines
- Multiplexes voice audio and data over a standard Ethernet network
- IP backhaul sites do not require idle tones
- IP backhaul sites use loss of multiple consecutive audio packets as the trigger for faulting an RX site, removing it from voting consideration until the next unsquelch event
- SNV-12 interfaces easily with standard dispatch consoles
- Detects and generates EIA key-tones in addition to hard PTT
- Can repeat voted audio
- Controllable locally, or remotely via IP
- Wide range of automatic and manual transmit steering features
- Digital audio delay ensures no loss of initial syllables
- System expansion to 36 sites
- 5.25" high by 19" wide rackmount modular card cage
- System statistics and ability to monitor voted audio available via IP
- Dispatcher’s audio takes precedence over voted retransmissions, or may be set to mix with the repeat audio
- Front panel LEDs assist easy setup and ongoing system diagnostics
- Enables the formulation of low cost, extremely flexible radio communications networks

**Overview**

The SNV-12 uses Digital Signal Processors to continuously monitor multiple remote receiver sites and select the receiver with the best signal quality. A typical application is an LMR system in which mobiles and portables can hear a repeater, but the repeater can’t hear them, due to their lower transmit power and/or the antenna size or placement.

Remote receivers can be positioned in the communications dead spots, with audio from each receiver linked to the voter via IP or T1 microwave, IP Fiber, twisted pair, RF link, or fiber optics. The voter will select the best quality signal from all unsquelched remote receivers and forward this signal to the repeater for rebroadcast or monitor by a dispatcher, thus providing greater talk back range for the radios.

**New SNV-12 IP Backhaul Capability**

The new SNV-12 IP Backhaul capability is a major advancement, and is backwards compatible with SNV-12 analog voters already deployed. The new SVM-3 module, along with a new QMT-1 unit (for Quality Measurement & Transport) allow the use of IP networks for transport of receive and transmit audio. The SVM-3 module can coexist in an SNV-12 chassis along with the current SVM-2 modules. The SVM-3 allows front panel force vote and force disable, just like the SVM-2. The chassis must also have a CPM-3 with latest firmware.

**DPS Voting**

The SNV-12 uses a spectral approach to continuously monitor the audio signals from each receiver site, using proprietary speech detection and measurement algorithms. These algorithms continuously calculate a 31-discrete step Signal Quality Number for each voting receiver. The SNV-12 monitors all SVM’s and votes the site with the best Signal Quality Number. This thorough voting process ensures the best site is voted even if the received signal is transmitted by a vehicle currently moving behind buildings or between remote voting receiver sites. The QMT-1 performs these detection and measurement operations, sending the results digitally to the SVM-3.

The SNV-12 voting criteria may be easily optimized to suit individual systems. DSP voice detection capability allows automatic faulting of receivers with inappropriately open squelches. The voting process is initiated whenever any receiver is unsquelched, signaled either by loss of pilot tone or by a hardwired COR output or multiplexer E-lead; individually configurable on each SVM-2. The SVM-2 accepts pilot tones of either 1950 or 2175 Hz. The QMT-1 uses only the hardwired COR approach for unsquelch detection.

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SNV-12™
Voter Comparator Legacy Backhaul Implementation

The SNV-12 chassis will select from up to 12 individual receiver sites (or 36 in an expanded, 3 chassis system), the input with the best signal quality. This voted signal is sent to a dispatcher and can also be retransmitted. Above is a two channel, 2 remote receive site system using SVM-2 modules and non-IP legacy backhaul (RT line or phone line, RF link, T1 telco or T1 microwave).

Voting Comparator
Switching Time Between Sites: Less than 1 msec.
Unselected Output Rejection: Greater than 60 dBm.
Delay time RX Unsquelch to TX: Less than 150 msec.

Voting Comparator General/Environmental
Console Interface Module Front Panel (CIM-2A): Speaker Off/RF/ RX and TX, Volume control, Norm & Peak audio level LEDs, Fault LED, Remote LED, Adjustments; Console TX audio in & Voted audio out.
Network Interface: RJ-45 Connector; 10/100 Base-T Ethernet.
Ethernet (built in web page). Telnet.
Network Interface:
AC Input Power: 115 or 230 VAC +/- 15%, 47-63 Hz, 130 VA maximum for “fully loaded” chassis.
DC Input Power: +11 to +15 VDC @5A nominal.
Size: 5.25”H x 19” W x 11” D (13.3 x 48.3 x 28 cm).
Temperature: Operating: -20 to +60 degrees C, Storage: -40 to +85 degrees C.
Certifications: FCC Part 15; Class A.

SVM-2 Voting Audio Output
Output Level adjustable: +30 to +11 dBm;
Output: Balanced 600 Ohms.
Frequency Response: 200 to 3200 Hz +/− 2dB.
Keying: EIA Keytones, PTT, or E&M.
Frequency Response: +30 to +11 dBm;
Keying: EIA Keytones, PTT, or E&M.
SVM-2 General
Front Panel: Select/Normal/Disable Switch, Voted LED, Unsquelched LED, TX LED, TX Select LED, Fault LED, Norm and Peak input audio level LEDs, test point, and adjustment port.

SVM-2 Voting Audio Output

Audio Inputs:
• Radio RX Input: Balanced 600 Ohms or 10k Ohms, unbalanced 10k Ohms.
• Input Level: +30 to +11 dBm, adjustable.
• Unsquelch: Indicators: 2175 Hz pilot tone, 1950 Hz idle/pilot tone, E-Lead input (hardwired COR).

Pilot Tone Generator Accessory
Provides pilot tone capability to receivers that lack it. The PTG-10 is installed at the receiver site and uses receiver COR to create pilot tones. With the PTG-10, any receiver with a COR output can interface the SNV-12 over a single pair of wires.

The SNV-12 Voter can now operate in environments with packet-based IP backhaul for some sites, operating alongside sites that employ traditional analog voter backhaul methods. The new SVM-3 digital backhaul Site Voter Modules can coexist in a standard SNV-12 chassis along with the current SVM-2 modules. The result is backwards compatibility, an opportunity for a phased-in transition of existing systems to all digital backhaul where desired, and maximum flexibility overall.

JPS Interoperability Solutions builds on its industry leading SNV-12 analog receiver voter, now allowing a customer’s IP network to transport receiver and transmitter audio between the SNV-12 voter chassis and remote RX/ TX sites. This made possible by our new QMT-1 remote units and SVM-3 three-channel IP backhaul Site Voter Modules.

When an unsquelch condition occurs, signaling that receiver audio should be sent to the voter, the QMT-1 measures signal quality and converts the analog audio to IP for transfer to the SVM-3. Each SVM-3 module can service three receivers, and works in conjunction with the CPM-3 to monitor the arrival timing of incoming audio. This allows the voted signals to be resynchronized for accurate voting and switching between sites during a voting sequence.

The remote RX audio, whether interfaced by analog means to an SVM-2 or by an IP network to an SVM-3, is buffered up by the site voter modules until the CPM-3 determines that all unsquelched sites have reported in. The CPM-3 then coordinates re-alignment of the various signals.

Initial Network Requirements (may be relaxed upon successful testing)
• Bandwidth 300k min per channel per direction (RX/TX))
• Packet loss less than 0.1%
• Overall latency less than 30ms
• Differential latency between RX audio and PTT
• Full duplex audio with superior sound quality
SNV-12 Voter for Receive Audio with Traditional T1/RF Link Connections

The SNV-12 chassis will select from up to 12 individual receiver sites (or 36 in an expanded, 3 chassis system), the input with the best signal quality. This voted signal is sent to a dispatcher and can also be retransmitted.

Above is a two channel, 2 remote receive site system using SVM-2 modules and non-IP legacy backhaul (RT line or phone line, RF link, T1 telco or T1 microwave).

Voting Comparator
Switching Time Between Sites: Less than 1 msec.
Unselected Output Rejection: Greater than 60 dBm.
Delay time RX Unsquelch to TX: Less than 150 msec.

Voting Comparator General/Environmental
Console Interface Module Front Panel (CIM-2A): Speaker Off/RX and TX, Volume control, Norm & Peak audio level LEDs, Fault LED, Remote LED, Adjustments; Console TX audio in & Voted audio out.
AC Input Power: 115 or 230 VAC +/- 15%, 47-63 Hz, 130 VA maximum for “fully loaded” chassis.
DC Input Power: -11 to +15 VDC, @5A nominal.
Size: 5.25”H x 19” W x 11” D (33.3 x 48.2 x 28 cm).
Temperature: Operating: -20 to +60 degrees C, Storage: -40 to +85 degrees C.
Certifications: FCC Part 15; Class A.

SVM-2 Voting Audio Output
Output Level adjustable: -30 to +11 dBm.
Output: Balanced 600 Ohms.
Frequency Response: 200 to 3200 Hz +/- 2dB.
Keying: EIA Keytones, PTT, or E&M.
Output Level adjustable:
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Pilot Tone Generator Accessory
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JPS Interoperability Solutions builds on its industry leading SNV-12 analog backhaul to provide a new, advanced backhaul system for use in any environment. The SNV-12 Voter can now operate in environments with packet-based IP backhaul for some sites, operating alongside sites that employ traditional analog voter backhaul methods. The new SVM-3 digital backhaul Site Voter Modules can coexist in a standard SNV-12 chassis along with the current SVM-2 modules. The result is backwards compatibility, an opportunity for a phased-in transition of existing systems to all digital backhaul where desired, and maximum flexibility overall.

When an unsquelch condition occurs, signaling that receiver audio should be sent to the voter, the QMT-1 measures signal quality and converts the analog audio to IP for transfer to the SVM-3. Each SVM-3 module can service three receivers, and works in conjunction with the CPM-3 to monitor the arrival timing of incoming audio. This allows the voted signals to be re-synchronized for accurate voting and switching between sites during a voting sequence.

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SNV-12™
Signal-and-Noise Voter Comparator All IP Backhaul Implementation

SNV-12 Voter for Receive Audio with Backhaul over IP Only

Network
IP Microwave or IP Fiber

CONSOLE
SVM-3 IP
Backhaul Voting

CONSOLE
SVM-3 IP
Backhaul Voting

Channel 1
RX1
RX2
RX3
QMT-1
(Signal-and-Noise Voter Comparator)

Channel 2

Overview
Our new QMT-1 modem, along with the QMT-1 unit (for Quality Measurement & Transport) allow the use of IP networks for transport of receive and transmit audio. The SNV-12 modules can coexist in an SNV-12 chassis along with the current SVM-2 modules. The SVM-3 allows front panel force vote and force disable, just like the SVM-2. The chassis must also have a CPM-3 with latest firmware.

The SNV-12 uses Digital Signal Processors to continuously monitor multiple remote receiver sites and select the receiver with the best signal quality. A typical application is an LMR system in which mobiles and portables can hear a repeater, but the repeater can’t hear them, due to their lower transmit power and/or the antenna size or placement. Remote receivers can be positioned in the communications dead spots, with audio from each receiver linked to the voter via IP or T1 microwave, IP Fiber, landline, twisted pair, RF link, or fiber optics. The voter will select the best quality signal from all unsquelched remote receivers and forward this signal to the repeater for rebroadcast or monitor by a dispatcher, thus providing greater talk back range for the radios.

Benefits
• Bring voter audio to/from your remote sites using your network or IP microwave
• Allows use of the private network infrastructure, thereby eliminating the need for leased lines
• Multiplexes voice audio and data over a standard Ethernet network
• IP backhaul sites do not require idle tones
• IP Backhaul sites use loss of multiple consecutive audio packets as the trigger for faulting an RX site, removing it from voting consideration until the next unsquelch event
• SNV-12 interfaces easily with standard dispatch consoles
• Detects and generates EIA key-tones in addition to hard PTT
• Can repeat voted audio
• Controllable locally, or remotely via IP
• Wide range of automatic and manual transmit steering features
• Digital audio delay ensures no loss of initial syllables
• System expansion to 36 sites
• 5.25” high by 19” wide rackmount modular card-cage
• System statistics and ability to monitor voted audio available via IP
• Dispatcher’s audio takes precedence over voted retransmissions, or may be set to mix with the repeat audio
• Front panel LEDs assist easy setup and ongoing system diagnostics
• Enables the formulation of low cost, extremely flexible radio communications networks

Overview
The new SNV-12 IP Backhaul capability is a major advancement, and is backwards compatible with SNV-12 analog voters already deployed. The new SVM-3 module, along with a new QMT-1 unit (for Quality Measurement & Transport) allow the use of IP networks for transport of receive and transmit audio. The SNV-12 modules can coexist in an SNV-12 chassis along with the current SVM-2 modules. The SVM-3 allows front panel force vote and force disable, just like the SVM-2. The chassis must also have a CPM-3 with latest firmware.

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SNV-12™
Signal-and-Noise Voter Comparator
Now with IP Backhaul Capabilities

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The industry-leading SNV-12 modular receiver voting system uses individual Digital Signal Processors to measure receiver audio quality for fast and accurate determination of the best signal.

Our new SVM-3 modules, along with the QMT-1 modem at the receiver sites, allows transport of receiver audio via customer’s IP network, reliably handling the challenges that network delays and jitter add to the voting process.

The SVM-3 modules can be plugged into existing SNV-12 chassis alongside current SVM-2 modules for flexible, low cost upgrades.

General/Environmental
Programming: HTTP (web)
Front Panel: Power, Busy, Link Active, and Channel Active LEDs
Input Power: +11 to +15VDC @ 0.5A max.
Open Circuit Voltage: 100mA
Network Interface: Type: 10/100BASE-T Ethernet, 100Mbps, RS-485, Audio Codec - G.711 (64 Kbps)

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SVM-3
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TX Audio Output: Level adjustable - 10 dBm nominal, range: -20 to +10 dBm, Impedance - Unbalanced 50 Ohms
COR Input: Polarity Active low or high, selectable, Impedance: 47K ohm pullup to +5V

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QMT-1

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