SNV-12™

Signal-and-Noise Voter Comparator
Now with IP Backhaul Capabilities

JPS Interoperability Solutions

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.

Benefits

- **SNMP Coming 3rd quarter 2019**
- Bring voter audio to/from your remote sites using your network or IP microwave
- 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 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

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www.jpsinterop.com

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, 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.

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 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.

DSP 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 SVMs 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 and QMT1 accept pilot tones of either 1950 or 2175 Hz and hardwired COR for unsquelch detection.

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Voter Comparator Legacy Backhaul Implementation

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SNV-12 Voter for Receive Audio with Traditional T1/RF Link Connections
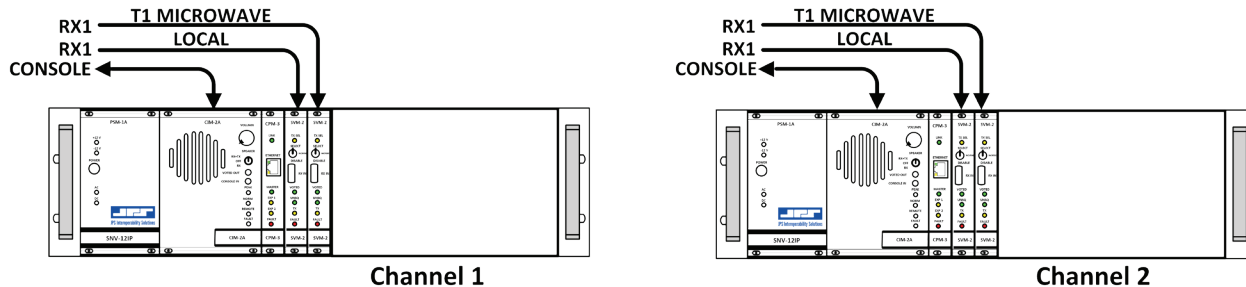
Channel 1

Channel 2

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.
Voting Thresholds: 31 steps.
Delay time RX Unsquelch to TX: Less than 150 msec.

Voting Comparator General/Environmental

Console Interface Module Front Panel (CIM-2A): Speaker Off/RX/ 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.
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.

Site Voter Module SVM-2

Audio Inputs:
- **Radio RX Input:** Balanced 600 Ohms or 10k Ohms, unbalanced 10k Ohms.
- **Input Level:** -30 to +10 dBm, adjustable.

Unsquelch Indications: 2175Hz idle/pilot tone; 1950 Hz idle/pilot tone; E-Lead input (hardwired COR).

SVM-2 Voting Audio Output

Output Level adjustable: -20 to +11 dBm;
Output: Balanced 600 Ohms.
Frequency Response: 200 to 3200 Hz +/- 2dB.
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.

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.

SNV-12™

Voter Comparator Combination IP and Legacy Backhaul

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SNV-12 Voter for Receive Audio with Backhaul over IP, and Traditional T1/RF Link Connections
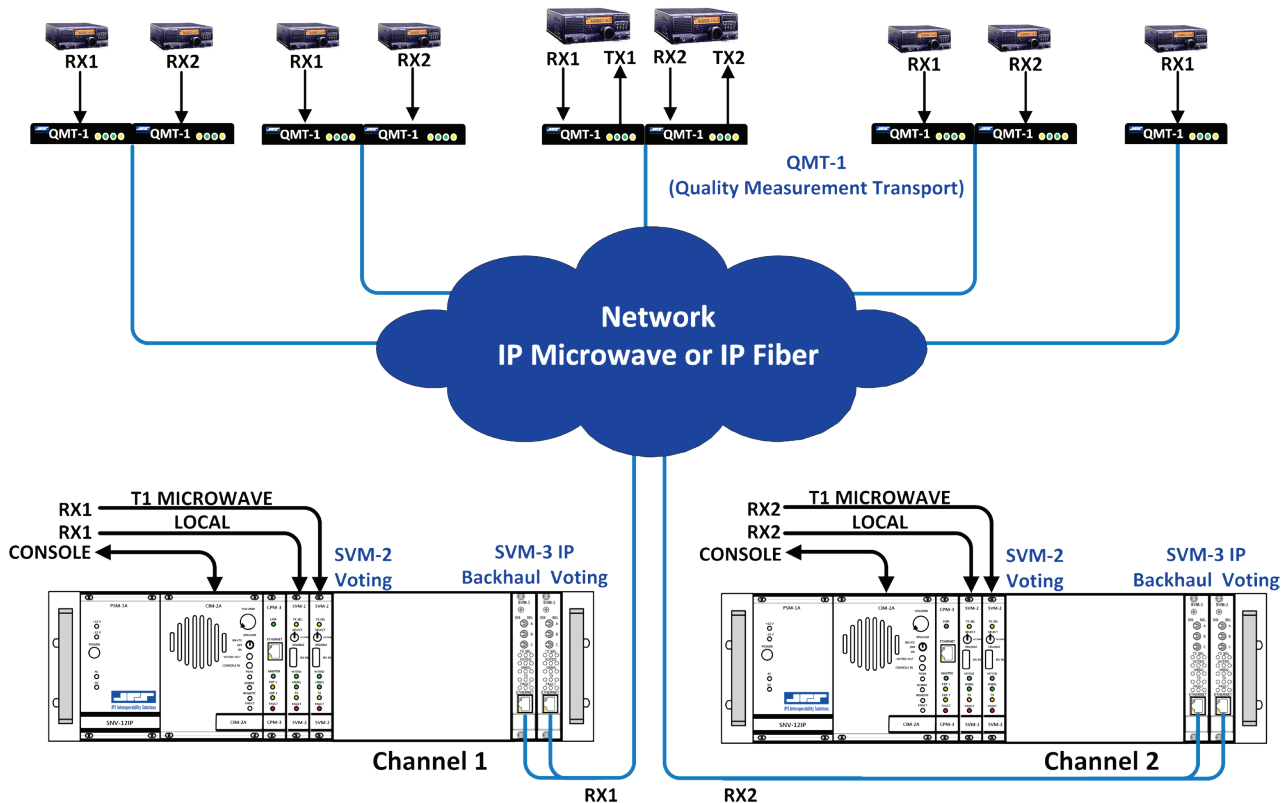
The SNV-12 Voter can now operate in environments with packet-based IP backhaul for some sites, operating alongside sites that employ traditional analog voter backhaul methods. The new SVM-3 digital backhaul Site Voter Modules can coexist in a standard SNV-12 chassis along with the current SVM-2 modules. 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.

Network delays and jitter create challenges to traditional analog voting which requires time-synchronized signals from multiple voting receivers. These challenges are capably handled by the combination of the QMT-1 and the SVM-3, in conjunction with updated software in the SNV-12 's CPM-3 Control Processor Module.

The QMT-1 single-channel voting receiver modem interfaces remote receivers and transmitters to the SNV-12, performing these functions:
- Audio signal time stamps
- Accurate Signal Quality Analysis performed on analog RX audio
- Analog to digital translation of RX audio and COR as well as digital to analog translation for TX audio and PTT
- Full duplex audio with superior sound quality

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.
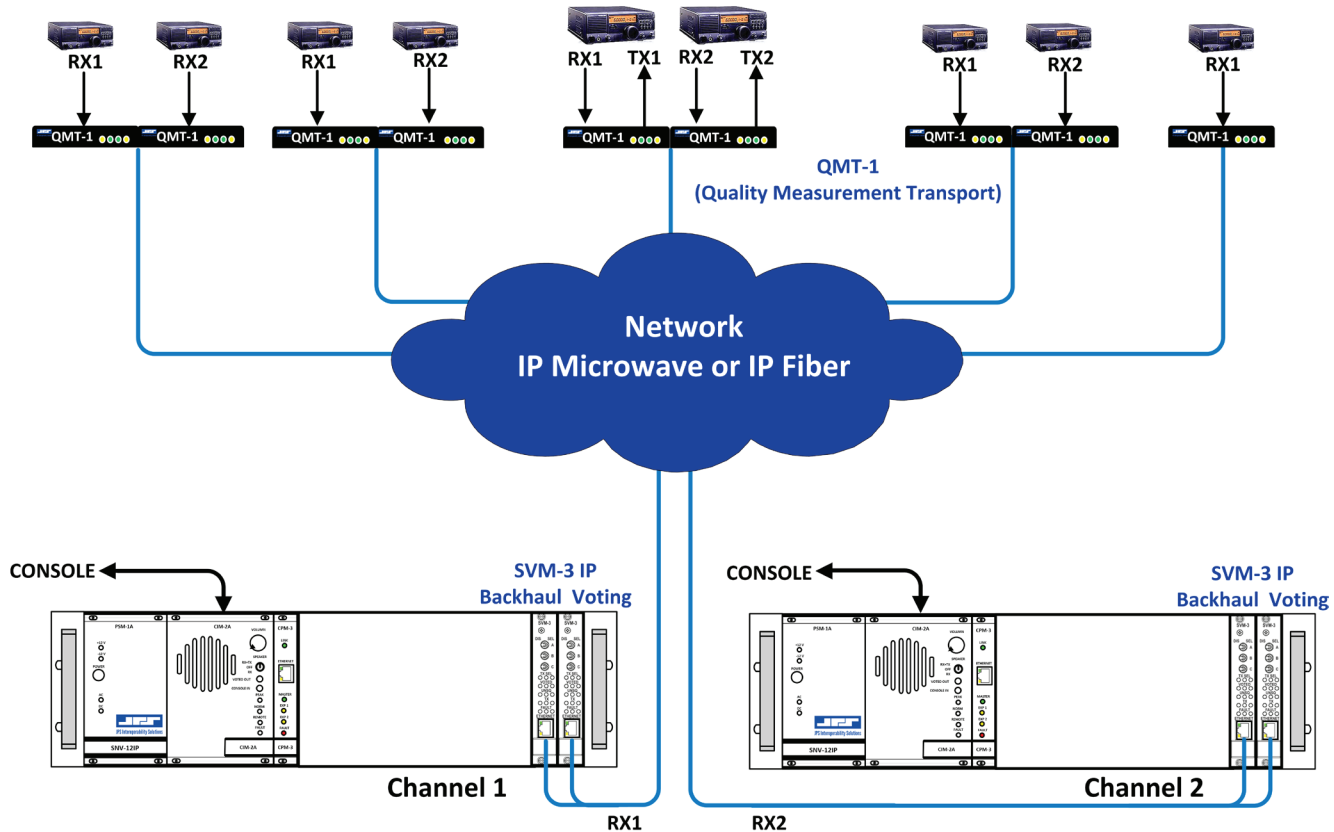
Network Requirements:
- Bandwidth 100k min per channel per direction (RX/TX)
- Packet loss less than 0.1%
- Overall latency less than 30ms
- Differential latency between Rx sites less than 10 ms
- Jitter less than 5 ms

SNV-12™

Signal-and-Noise Voter Comparator All IP Backhaul Implementation

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

RX1 RX2   RX1 RX2   RX1 TX1 RX2 TX2   RX1 RX2   RX1

QMT-1 (×11)

**QMT-1
(Quality Measurement Transport)**

**Network
IP Microwave or IP Fiber**

CONSOLE ←   **SVM-3 IP
Backhaul Voting**   CONSOLE ←   **SVM-3 IP
Backhaul Voting**

Channel 1   **Channel 2**

RX1   RX2

SVM-3

Front Panel (SVM-3): (3) sites per module; each site has its own Select/Normal/Disable Switch, and these 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)

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. The QMT-1 CAN NOT transport outgoing audio precisely or consistently timed to support simulcast operation. TX Audio is suitable for single transmit site operation, TX steering, and multisite (different freq from different sites) TX.
PTT Output: Output Type - Open drain, 47k ohm pullup to +5V, Maximum Sink Current - 100mA Max., Open Circuit Voltage - 100mA.
Network Interface: Type: 10/100BASE-T Ethernet, 100Mbps, RJ-45, Audio Vocoder - G.711 (64 Kbps)

General/Environmental

Programming: HTTP (web)
Front Panel: Power, Busy, Link Active, and Channel Active LEDs
Input Power: +11 to +15VDC @ 0.5A max. 12VDC wall cube supplied
Temperature: Operating -20 to +60 degrees C. Storage: -40 to +85 degrees C
Size and Weight: 1.7"H x 6.75" W x 8.25" D (4.3 x 17.5 x 21cm) 1.1lbs (2.4kg)

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