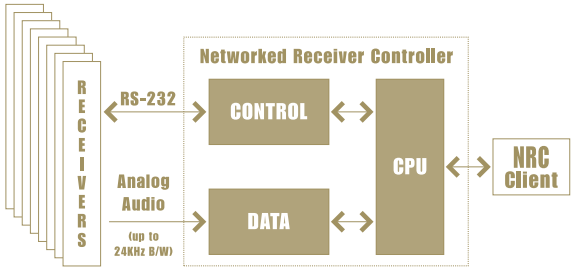
NRC-24

Networked Receiver Controller



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Description

The Network Receiver Controller 24 (NRC-24) builds upon the familiar architecture of the successful NRC 3.0, adding features which allow the NRC to be used to process higher bandwidth signals of interest.

1) The ability to sample channels at up to 48KS/s per channel, which allows each channel's acquisition bandwidth to be increased from 8KHz to 24KHz.
2) Additional channel filter options for the different sample rates
3) Deterministic messaging so that only one message is out-standing to a specific receiver at a given time.
4) An upgrade to the Ethernet output so that it now supports GigE data transfers.
5) The option to pass the kurtosis value of the sample block with the data block.
6) Additional technical support I/O ports for system upgrades.

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The NRC represents the server portion of a network-based client/server architecture. NRC clients connect and communicate with the NRC using a simple socket-based protocol over an ethernet connection. When connected a client has the ability to control, configure, capture and distribute a digitized audio signal from one of up to eight attached receivers.

The NRC focuses on digitizing and processing analog audio signals from standard receivers and other non-receiver analog sources.

The default NRC settings present the receiver's analog audio signal as a digitized 4KHz band-limited, 8KSample/sec signal to connected NRC clients. NRC clients can adjust attributes of the output captured digital audio signal, including the data format, output sample rate, whether filtering is enabled, packet time-stamping, the number of data samples forwarded to the client in a single packet, and how to deal with the data stream during retunes.

Capabilities

Receiver Controllable Settings
- Frequency, Detection Mode, IF Bandwidth, AGC mode, BFO
- Reset / Reboot
- Pass native commands to the receiver (ie. bypass the generic receiver interface to send proprietary commands)
- Receiver Memory Interface Support (save, recall and query receiver configuration memory settings)

Remote NRC System Monitoring
- View current state of receiver configurations and attached clients
- View health and well being of NRC
- View the lock state of external NRC input signals

Receiver Channel Testing:
- Channel Self testing is used at various times to verify that each "Full" receiver's control and audio signal connections are correctly configured and operable.

Network Time Protocol (NTP) Client
- The NRC is configurable to obtain and synchronize time with an NTP server.

Data Acquisition Options
- Sample clock source: DAQ or 10MHz (internal or external)
- Sampling synchronization: none or external 1Hz (rising edge)
- External signal lock-loss handling: stop or continue acquisition
- DAQ channel gain: 1 (default), 2, 4, 8
- Signal input: Differential (default), Single-ended
- Full GLAIVE compatibility.

Output Options
- Sampling Rate: 8KHz (default), 16KHz
- Filtering: 4KHz LPF (default), None
- Data Formats: 16T (default), u-Law, a-law
- Samples/Data Packet: 640 (default), 128-4096
- Packet Time Stamp: None (default), TAI64N
- Retune Samples skipped: 350 (default), variable
- Collection Control: Start / Stop
- Kurtosis Value of Packet: Off (Default)/ ON

Client Connection Options
- Up to 64 simultaneous client connections
- Primary – connection to a receiver when it is free
  - Full control and access to the receiver, the audio data and its configuration options.
- Piggyback – connection to a receiver that already has a Primary client attached
  - Limited connection privileges
  - No control of the receiver but visibility of the receiver's settings.
  - Full access to the receiver's audio configuration and data options.
  - Can be promoted to Primary connection status if the existing Primary client disconnects

Other
- "Blank" receiver configuration options support Null-Modem and Modem pass-thru command and control of receivers.
- The "Analog" receiver configuration option supports the acquisition of analog signals without the need for a receiver command and control link.
- Command-line configuration utility
- Default data packet size setting capability
- Enhanced client GUI

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Receiver Abstraction

The NRC architecture abstracts the user from each of the receiver's proprietary low-level communications protocol by providing a common logical tasking interface to the user. This common software command and control interface allows the user to task receivers at a logical level without the need to worry about how to implement this tasking on a given receiver. This allows a wide range of receivers to be tasked by the NRC in the same manner regardless of the receiver's number, model or configuration and still obtain a standardized digital output.

This receiver hardware abstraction allows the NRC to:

- Easily be programmed to connect to connect to almost any receiver with an audio output.
- Connect with different receivers types simultaneously.
- Control the major functions of any receiver through a simple tasking protocol.
- Provide receiver vendor independence, allowing the user to utilize the most appropriate receiver for a given application.

Receiver XML configuration files are used to define the different receiver protocol profiles. This allows new receiver command and control support to be added to the NRC relatively quickly and simply by generating and integrating a new receiver XML profile file.

System Design

The NRC is extremely reliable and flexible due to the incorporation of:

- Compact Flash (CF) based file system compared to a system hard drive.
  - The NRC file system is contained on a CF card alleviating any hard drive reliability problems from the NRC.
- High Performance, dependable COTS processing cards
  - The NRC internal processing boards are high performance, dependable COTS processing boards with high MTBF. Using COTS boards also aides in keeping the NRC costs down and enhances system support.
- Custom designed Chassis unit.
  - The NRC chassis is designed specifically to robustly and efficiently house and interconnect the NRC internals and provide sufficient air flow through the chassis to dissipate the generated system heat.
- Configurable NRC system XML files
  - The NRC reads a number of different XML system configuration files at boot-up, which allows changes to be integrated into the NRC system without the need for recompilation.
- Remote Software Upgrade Capability
  - The NRC application and software are designed to be remotely upgraded over a network connection. This allows new updates to be uploaded seamlessly into fielded NRC units.

Specifications

Note: When mounting in a 19" rack, it is recommended that the NRC should be supported by rack slides or rack-shelving, and not solely supported by front-panel screws.

System Hardware

- CPU System:
  - PC x86 SBC based system
- Operating System
  - Linux OS, Compact Flash based file system
- PLL Sub-system
  - Custom PLL circuit with on-board FPGA

Physical Inputs/Outputs

- Number of controllable receivers: 1 to 8
- Connections per Receiver
  - 1x Audio Input Port (DB-15)
  - 1x Control Port (RJ-45, RS-232) - optional
- Network Port (RJ-45, GigE)
- Remote Serial Terminal Port (DB-9, RS-232)
- External 10MHz sampling reference (BNC, +/- 10dBm sinusoid)
- External 1Hz sync. (BNC, 50% duty cycle TTL)

A/D Conversion

- Sample Resolution: 16-bit (14.8 effective bits)
- Channel Sampling Rate: 8, 16, 24, 48KHz
- Pre-A/D Channel Gain Options: 1 (default), 2, 4, 8
- 48KS/sec Sampling clock source options
  - Internal DAQ oscillator: 16.512MHz
    - Accuracy: 10ppm 0-85C
    - Stability: 10ppm 0-85C
  - Internal PLL oscillator, 19.2MHz
    - Accuracy: 1ppm 0-70C
    - Stability: 1ppm 0-70C
  - External reference, 10MHz (+/-10dBm sinusoid)
- Analog Signal Input range: -5V to +5V
- Input Types: Single-Ended / Differential

Power

- Nominal power: 25 W
- Max power: 32 W
- Operating Range: 100-240VAC, @47-63Hz (Auto-Select)

Supported Receivers

- Full Receivers:
  - DRS WJ-8723 HF Receiver
  - Ten-Tec RX-331 HF Receiver
  - WJ Nanocepter
- Analog Reciever
- Blank Receiver (RS-232, 19.2K)
  - RxModem & RxNullModem configurations with transmit/receive string terminations of:
    a) transmit: CR receive: CR
    b) transmit: LF receive: CRLF
- Additional Recievers available upon request

Support Software

- Java and C++ programming APIs, Python Command Line, NIP Protocol
- Example Client Program
- Remote software upgrade capability

Documentation

- Programmers Manual
- Users Manual
- Protocol Interfacing Document

Chassis

- 1RU (19" x 20" x 1.75"), Fits standard 19-inch racks
- Jonathan 375QD-20 slide mounts fitted
- Direct KVM Access I/O Port
- Weight: 10 lbs
- Ventilation: Positive internal pressure
- Internal Heating Profile:
  - Fully loaded NRC,temperature increase <+15F above ambient
- Connector Interface Shielding (reduce emissions)
- FCC Part 15, Class B Certification (reducing electromagnetic emissions)
- Power Switch on front panel
- External Signal Sync Indicators
- Power Inputs fused - active and neutral lines
- Chassis earthing stud on rear panel

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