Requirements and Architecture Models for Amateur Radio HT (Handi Talkie) Transceiver

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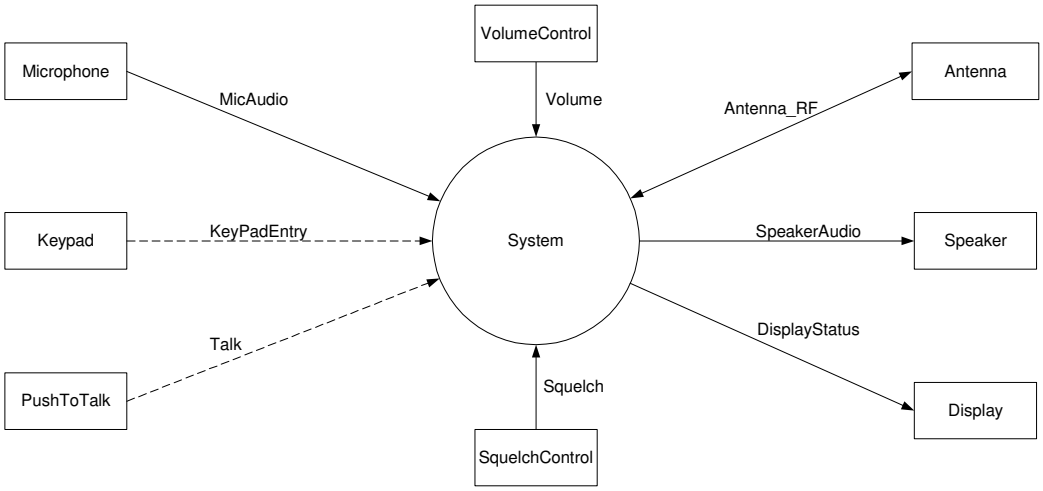
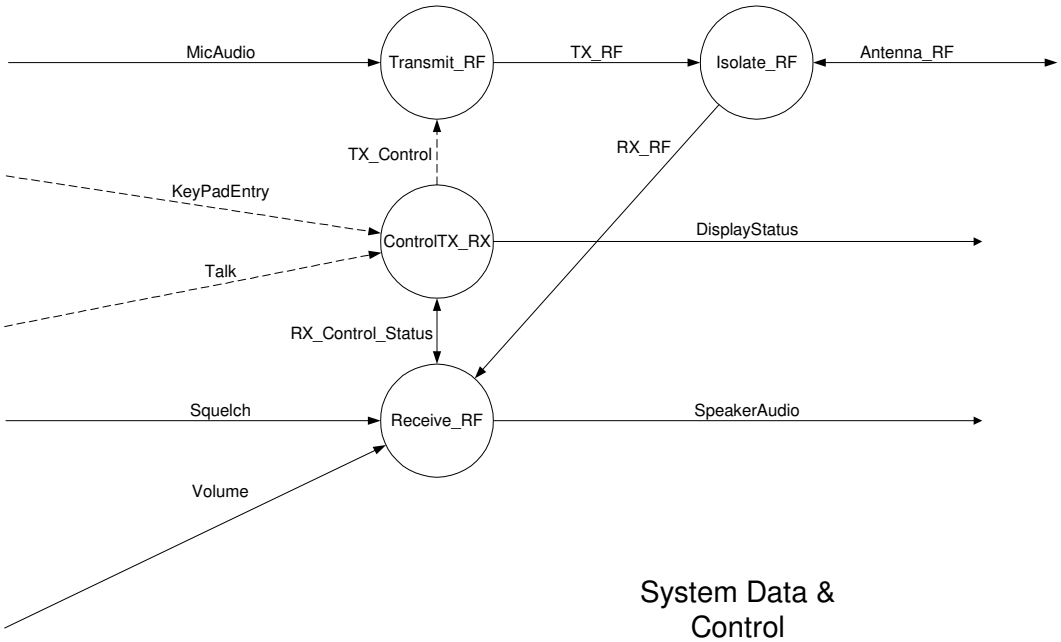
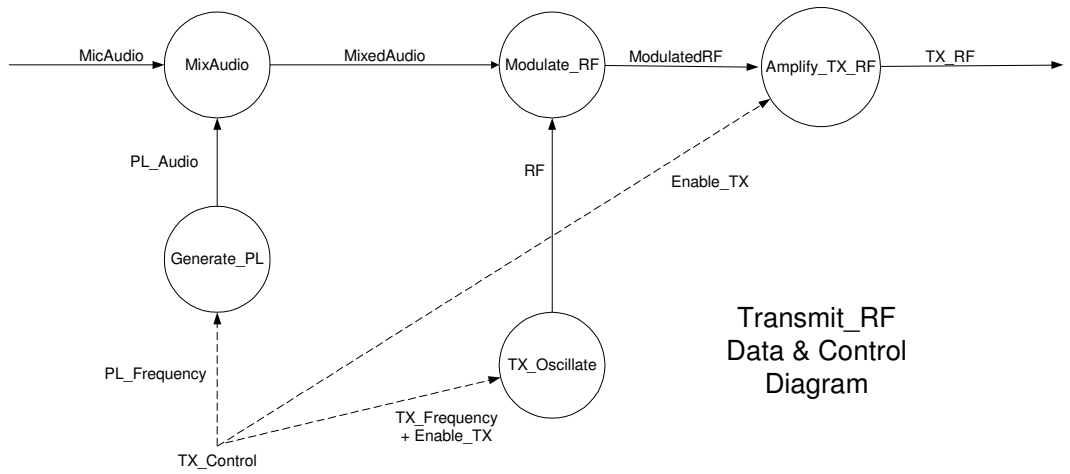
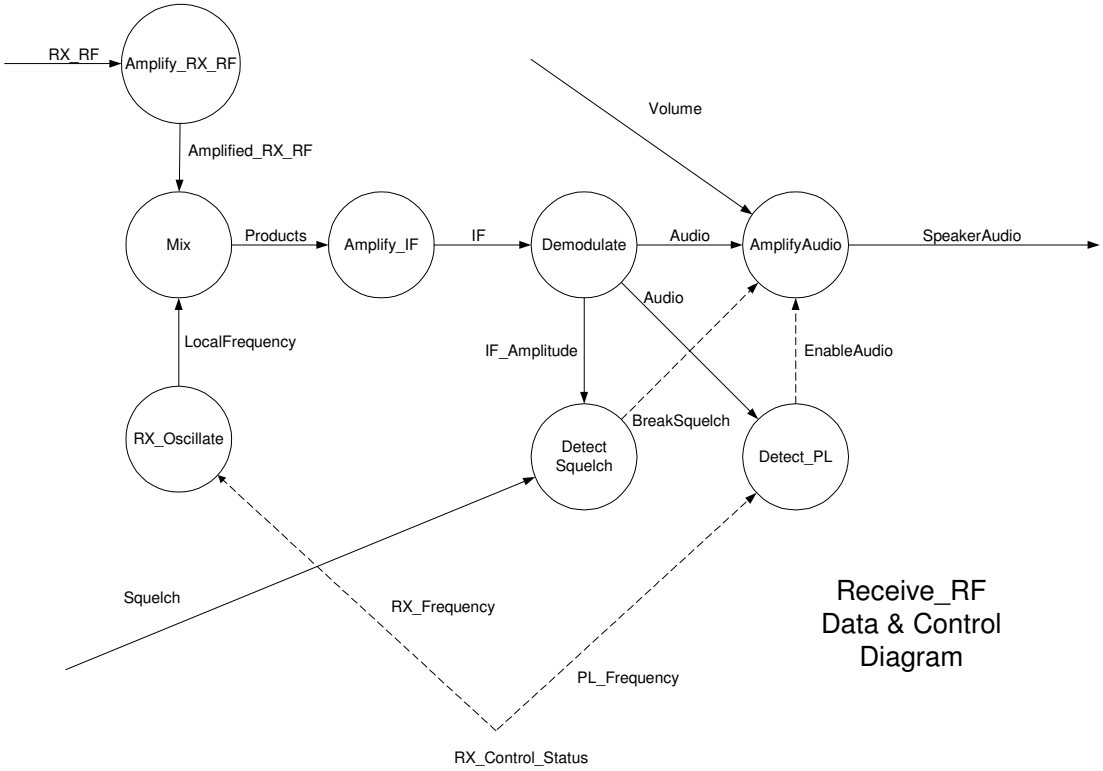


Data & Control Context Diagram



System Data & Control Diagram


MicAudio
MixAudio
MixedAudio
Modulate_RF
ModulatedRF
Amplify_TX_RF
TX_RF
PL_Audio
RF
Enable_TX
Generate_PL
PL_Frequency
TX_Oscillate
TX_Frequency
+ Enable_TX
TX_Control
Transmit_RF
Data & Control
Diagram


RX_RF
Amplify_RX_RF
Volume
Amplified_RX_RF
Mix
Products
Amplify_IF
IF
Demodulate
Audio
AmplifyAudio
SpeakerAudio
Audio
LocalFrequency
IF_Amplitude
EnableAudio
RX_Oscillate
Detect
Squelch
BreakSquelch
Detect_PL
Squelch
RX_Frequency
PL_Frequency
RX_Control_Status
Receive_RF
Data & Control
Diagram

PSPECS & CPECS (Process & Control Specifications)

System

This process is a amateur radio HT (Handi Talkie) transceiver. The Keypad allows for entry of operating mode, PL Frequency, & Frequency. Pressing the PushToTalk switch switches the System from receive to transmit. The VolumeControl controls Speaker volume. SquelchControl controls the level of received RF that will break squelch.

ControlTX_RX (Software)

This process takes the Talk and KeyPadEntry inputs and controls the Transmit_RF and Receive_RF processes as well as Showing DisplayStatus..

MixAudio (Analog or Software)

This process adds the MicAudio and PL_Audio inputs and output them as MixedAudio.

Generate_PL (Analog or Software)

This process generates PL_Audio based on the PL_Frequency input.

Modulate_RF (High signal RF)

This process frequency modulates the RF carrier input with the MixedAudio to yield Modulated_RF.

TX_Oscillate (High signal RF)

This process generates the RF carrier output based on the frequency selected by TX_Frequency and is enabled by Enable_TX.

Amplify_TX_RF (High signal RF)

This process takes the Modulated_RF input and amplifies it to TX_Rf if the Enable_TX control input is TRUE.

Amplify_RX_RF (Low signal RF)

This process amplifies the RX_RF input to create the Amplified_RX_RF output.

Mix (Low signal RF)

This process mixes (multiplies) the Amplified_RX_RF and LocalFrequency inputs to create the Products output.

RX_Oscillate (Low signal RF)

This process creates the LocalFrequency output based on the RX_Frequency control input.

Amplify_IF (Low signal RF)

This process filters and amplifies the intermediate frequency (IF) portion of the Products input and discards the other frequency products.

Demodulate (Low signal RF)

This process frequency demodulates the IF inputs to create the Audio output. It also outputs the strength of the IF input signal to the IF_Amplitude output.

Detect_Squelch (Analog or Software)

This process compares the IF_Amplitude input with the Squelch input. If the IF_Amplitude is greater than the Squelch then the BreackSquelch is set to TRUE else it is set to FALSE.

AmplifyAudio (Analog)

This process amplifies the Audio input to create the SpeakerAudio output if both the BreakSquelch EnableAudio control inputs are TRUE.

Detect_PL (Analog or Software)

This process sets the EnableAudio control output to TRUE if the frequency selected by the PL_Frequency control input is detected within the Audio signal input.

TSPEC (Timing Specification)

All outputs of the System must respond to any change in any input change within 100ms.

Requirements Dictionary

MicAudio

Audio from Microphone.

KeyPadEntry

Frequency and mode commands.

Talk

Push to talk switch.

Volume

Volume control.

Squelch

Squelch control.

DisplayStatus

Display data for Display of operating frequencies and mode.

SpeakerAudio

Audio to Speaker.

Antenna_RF
Transmit and receive radio frequency signal.

TX_RF
Transmit radio frequency signal.

RX_RF
Receive radio frequency signal.

TX_Control

PL_Frequency
Private Line sub audio frequency selection.

TX_Frequency
Transmit frequency selection.

Enable_TX
Enable transmit control.

RX_Control_Status

PL_Frequency
Private Line sub audio frequency selection.

RX_Frequency
Receive frequency selection.

PL_Audio
Private Line sub audible audio tone.

RF
Transmit radio frequency carrier.

MixedAudio
PL and microphone audio.

ModulatedRF
Modulated RF.

Amplified_RX_RF
Amplified receive RF.

LocalFrequency
Local frequency.

Products
Products of mixing input RF with that of local oscillator.

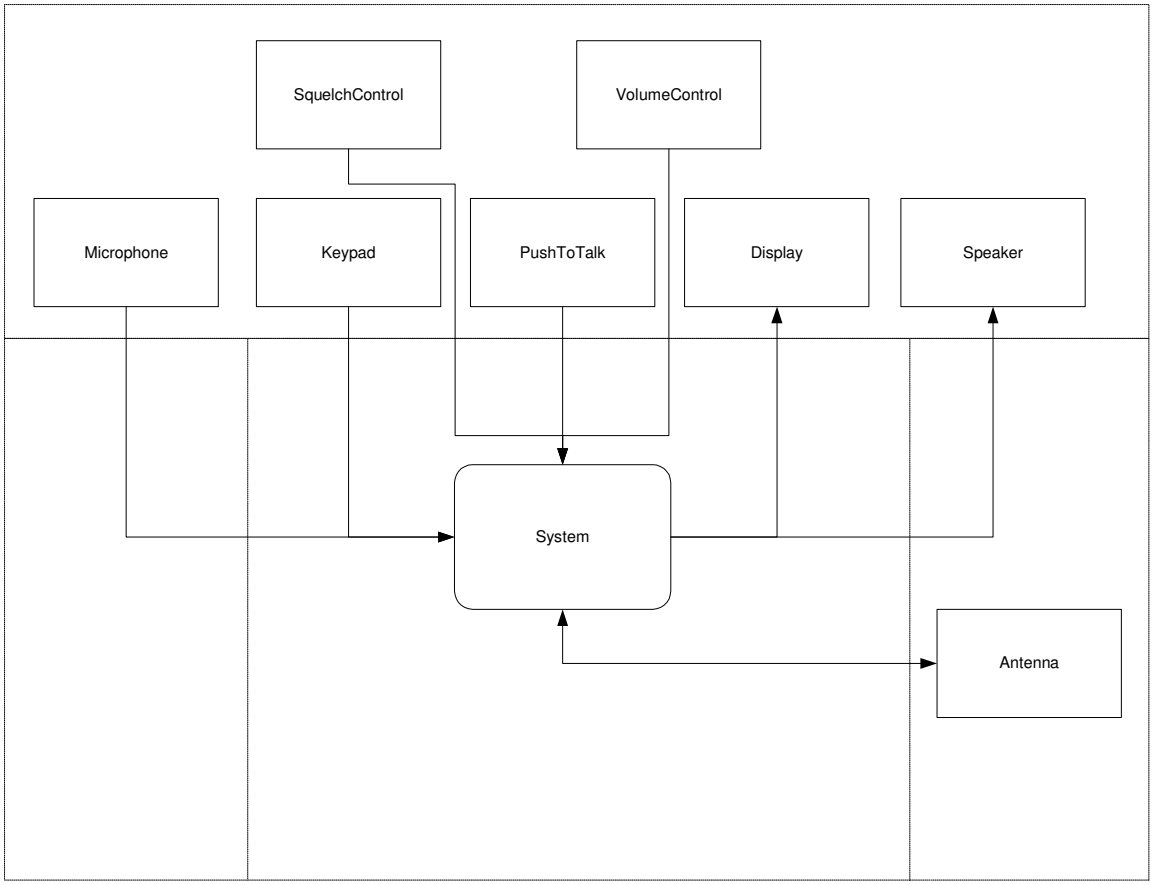
IF
Intermediate frequency.

IF_Amplitude
Strength of received signal.

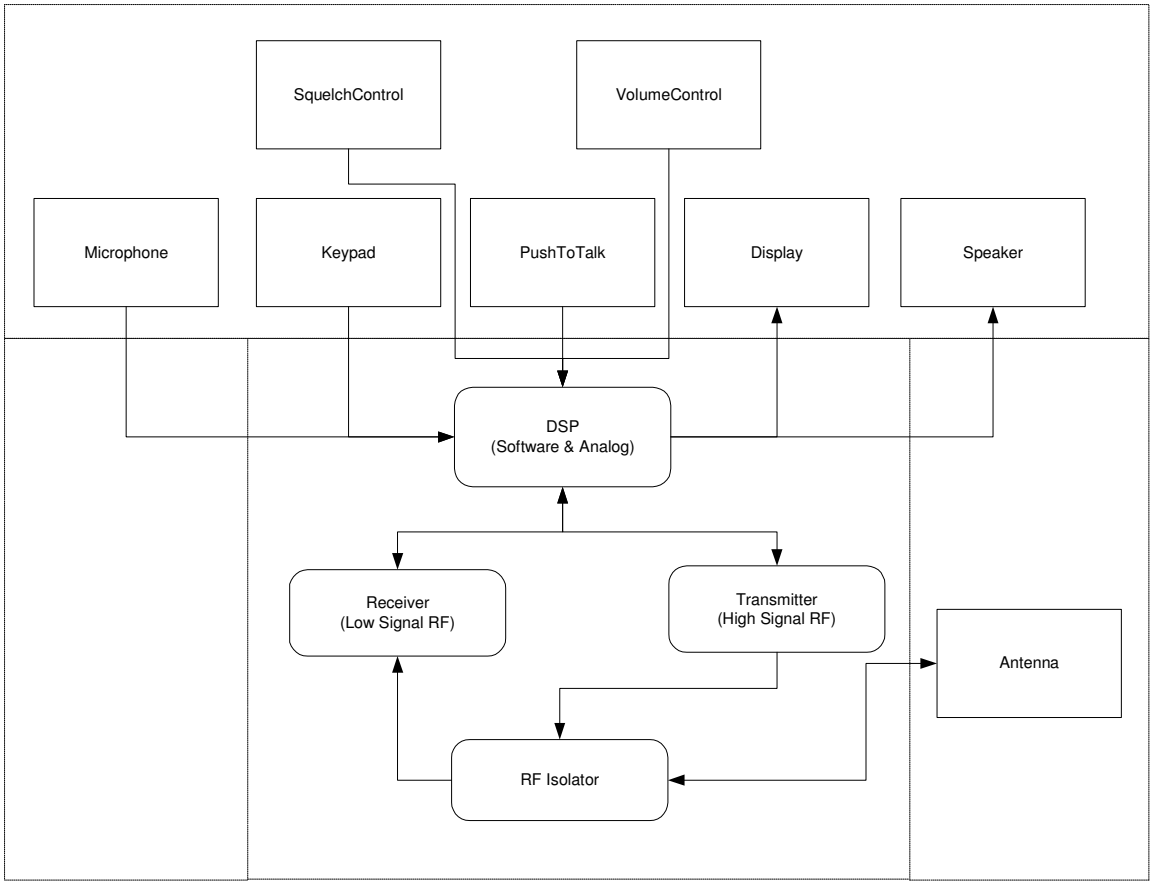
Audio
Received audio.

BreakSquelch
Control for breaking squelch.

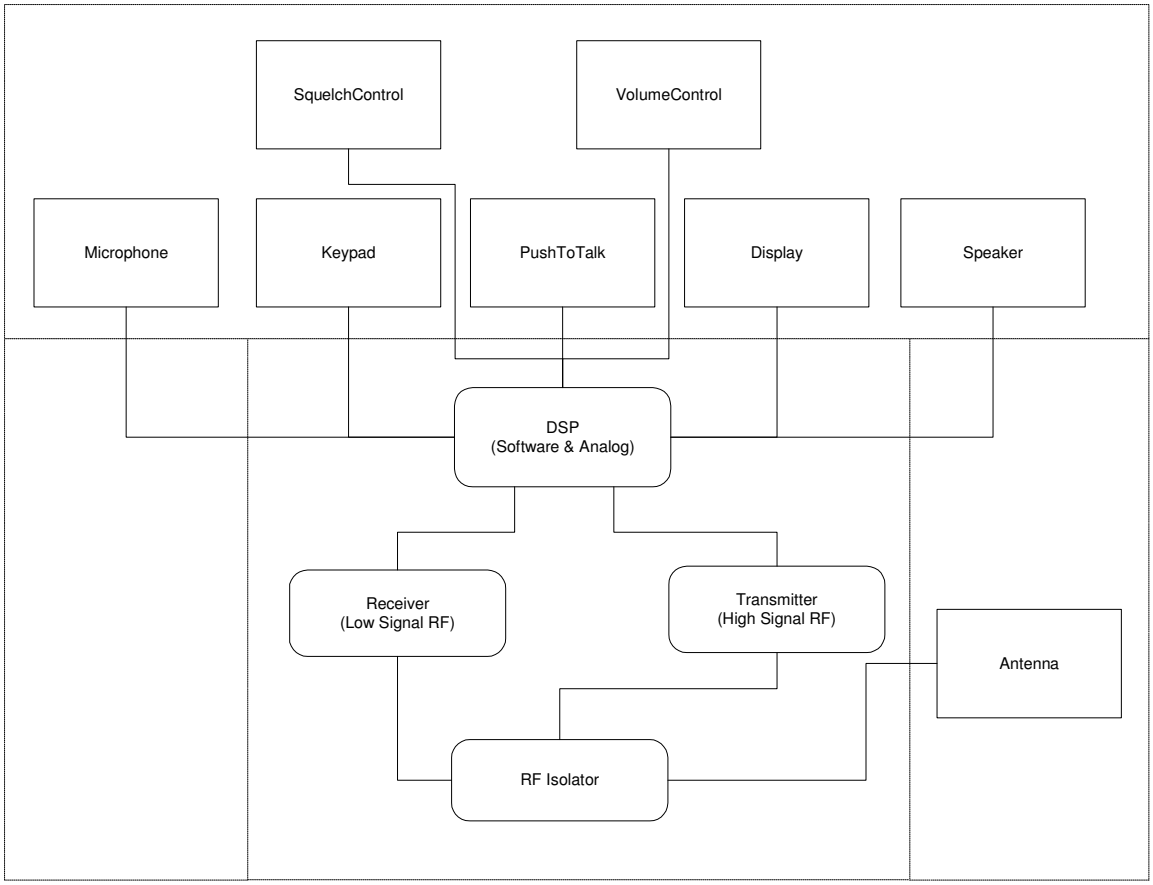
EnableAudio
Enable audio for detected PL.



Architecture
Context Diagram



Architecture Flow Diagram



Architecture Interconnect Diagram

Architecture Module Specifications (AMS)

DSP

This module performs all software and analog functions.

Receiver

This module performs all low signal RF functions.

Transmitter

This module performs all high signal RF functions.

Architecture Interconnect Specification

Antenna and RF connections are made with 50 ohm coaxial cable e.g. RS-274.
Remaining connections are made consistent with signal level and isolation requirements.

Timing Requirements

The DSP shall respond to all inputs within 100 ms. Remaining modules have no timing requirements at all.