RP2.1 Real-Time Processor

RP2.1 Overview

The RP2 and RP2.1 real-time processors consist of an Analog Devices Sharc floating point DSP with surrounding analog and digital interface circuits to yield a powerful programmable signal-processing device capable of handling a variety of tasks.

Power and Communication

The RP2.1 mounts in a System 3 zBus Powered Device Chassis (ZB1PS) and communicates with the PC using any of the zBus PC interfaces. The ZB1PS is UL compliant, see the *ZB1PS Operations Manual* for power and safety information.

Software Control

Software control is implemented with circuit files developed using TDT's RP Visual Design Studio (RPvdsEx). Circuits are loaded to the processor through TDT run-time applications or custom applications. This manual includes device specific information needed during circuit design. For circuit design techniques and a complete reference of the RPvdsEx circuit components, see the *RPvdsEx Manual*.

Features

Memory

The RP2 comes with 16MB of memory for data storage and retrieval. The RP2.1 has 32MB of memory for data storage and retrieval.

Digital Input/Output Bits

The digital I/O circuits include eight bits of digital input and eight bits of digital output that are accessed on the 25 pin connector on the front of the RP2. The

eight bits of I/O can be used within the processing chain in a variety of ways including implementing triggers, timing trigger responses, and lighting LEDs. The first four bits of the digital inputs and digital outputs as well as the Trigger/Enable input are mapped to LED indicators on the front panel of the RP2. There is an additional TRIG input BNC on the front panel.

D/A and A/D

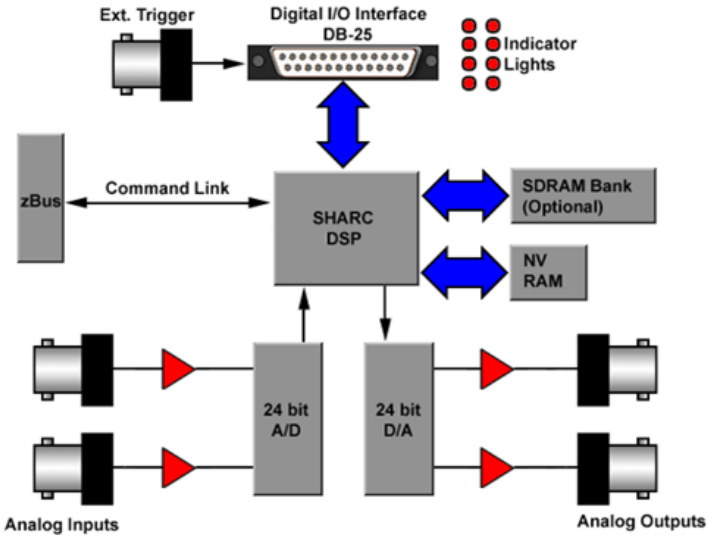
The RP2.1 is equipped with two channels of 24-bit, 200 kHz sigma-delta D/A and two channels of 24-bit, 200 kHz sigma-delta A/D. Sigma-Delta converters provide superior conversion quality and extended useful bandwidths, at the cost of an inherent fixed group delay. See "RP2.1 Technical Specifications" on page 4-5, for the group delay of each device. The original RP2 A/D's run at 100 kHz. An Optional RP2-5 (identifiable by its version number only) is equipped with 24-bit 50 kHz A/D and 50 kHz D/A. The RP2-5 device does not have SDRAM.

Hardware

Up to 32MB of SDRAM can be installed for storage of long waveforms and acquired data. An RP2 comes standard with 16MB of SDRAM while an RP2-5 has no SDRAM. All of the RPvdsEx buffer components, used to build circuits for the RP2, utilize the SDRAM memory and therefore will not work when used on an RP2-5 device.

The RP2 communicates with and is programmed through the zBus link.

The RP2 hardware also contains a powerful digital I/O sub-system, offering eight bits of digital input and eight bits of digital output as well as a dedicated trigger input connected to a BNC on the front panel. The first four bits of both input and output port and the trigger input have LED monitors for a quick indicator of bit state. The bits of these ports can be programmed individually or as a 'digital word' and used in a variety of ways within the RP2 processing circuit.



The RP2 is interfaced to the analog world via a two channel 24-bit analog to digital converter and a two channel 24-bit digital to analog converter. The RP2 system's I/O buffer handles +/- 10 Volt signals with excellent signal to noise performance. The RP2 contains a 100 kHz (50 kHz BW) A/D and a 200 kHz (100 kHz BW) D/

A, while the RP2-5 has a 50 kHz (25 kHz BW) A/D and D/A. Both devices allow for user programmable sampling rates from the specified maximum down to 6.25 kHz. A special calibration program is used to calibrate the RP2's analog I/O offering very small gain and DC offset errors.

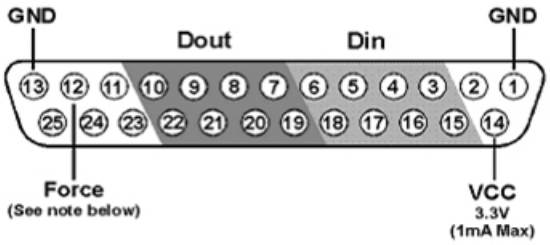
RP2.1 Technical Specifications

This table also includes specification for the RP2 and RP2-5.

DSP	50 MHz Sharc 21065, 150 MFLOPS
Memory	RP2: 16 MB SDRAM RP2.1: 32 MB SDRAM RP2-5 has no SDRAM
A/D	2 channels, 24-bit sigma-delta
Frequency Response	DC - 0.84 * Nyquist (1/2 sample rate) RP2.1: DC - 82 kHz maximum RP2: DC - 41 kHz maximum RP2-5: DC - 21 kHz maximum
S/N (typical)	105 dB (20 Hz to 20 KHz), 95 dB (20 Hz to 50 KHz)
Distortion (typical)	-95 dB for 1 KHz input at 5 Vrms
A/D Sample Rate	RP2.1: 195.312 kHz maximum RP2: 97.656 kHz maximum RP2-5: 48.828 kHz maximum
Sample Delay	RP2.1: 65 samples RP2: 41 samples
D/A	2 channels, 24-bit sigma-delta
Frequency Response	DC - 0.84 * Nyquist (1/2 sample rate) RP2.1: DC - 82 kHz maximum RP2: DC - 41 kHz maximum RP2-5: DC - 21 kHz maximum
S/N (typical)	105 dB (20 Hz to 20 KHz), 95 dB (20 Hz to 50 KHz)
Distortion (typical)	-95 dB for 1 KHz output at 5 Vrms
D/A Sample Rate	RP2.1: 195.312 kHz maximum RP2: 97.656 kHz maximum RP2-5: 48.828 kHz maximum
Sample Delay	RP2.1: 30 samples RP2: 30 samples
Output Current	RP2.1: 175 mA maximum
Digital Inputs	8 bits + 1 TRIG input

Digital Outputs	8 bits
System Reset	Force input (see the section below on how to reset)
Input Impedance	10 kOhm
Output Impedance	10 Ohm

DB25 Connector Pin Out



Pin	Name	Description		Pin	Name	Description
1	GND	Ground		13	GND	Ground
2	NA	Not Used		14	VCC	3.3V (1A Max)
3	DI1	Digital Input Bits		15	DI0	Digital Input Bits
4	DI3			16	DI2	
5	DI5			17	DI4	
6	DI7			18	DI6	
7	DO1	Digital Output Bits		19	DO0	Digital Output Bits
8	DO3			20	DO2	
9	DO5			21	DO4	
10	DO7			22	DO6	
11	NA	Not Used		23	NA	Not Used
12	Force	Used to reset the RP2.1		24		
				25		

Note: TDT recommends the PP16 Patch Panel for accessing digital I/O.

Important!: **Force** is used to reset the RP2.1, including deleting the device's microcode. It has no function in data acquisition or manipulation.

To reset the device:

1. Connect a wire (or paper clip) from pin 12 to pin 13 on the Digital I/O port.
2. With pins 12 and 13 shorted, use the desktop shortcut to run **zBUSmon**.
3. In the zBUSmon utility window, hold down the shift key and right-click the device in the system diagram.
4. Click **Program RP2.1** on the shortcut menu.
5. In the System3 Device Programmer window, select the device type (RP2).
6. Next click the Browse button next to the *uCode File* field and select **RP21.dxe**.

7. Remove the short from pins 12 and 13, and click the **Program Device!** button.

   Do not use your computer until the device reprogramming is complete (approximately five minutes).