General Information

Models 6508 and 6509 are general purpose multichannel digital receiver VME boards which accept digitized data at sampling rates up to 70 MHz. They may be configured with up to eight channels of narrowband receivers to perform frequency down conversion, lowpass filtering, and decimation of the sampled output.

The receiver output signals are delivered through front panel C40 comm ports for implementing DSP functions on Pentek's C40 DSP processor boards. Another set of front panel C40 comm ports can be used for receiver tuning control from the DSP processor. Receiver tuning, filter and FIFO control is available from the VMEbus.

Operating Principle

These units utilize highly integrated digital receiver chips containing a tunable local oscillator, a mixer and a tunable low pass output filter. The local oscillator frequency and the output filter cutoff frequency in each section are independently programmable over the VMEbus interface providing extremely flexible and agile operation.
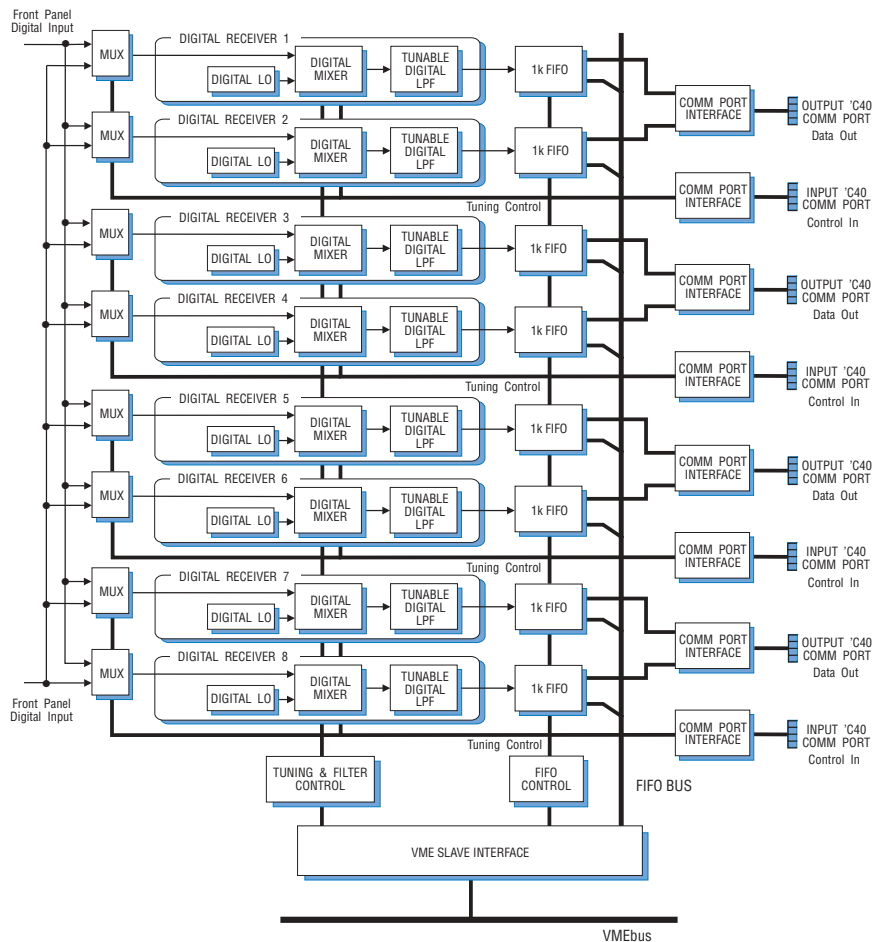
Model 6508 uses the Intersil HSP50016 receiver chip while Model 6509 uses the Graychip GC1011A.

Applications

These VME boards provide an effective way to create multichannel digital signal processing and analysis systems for selected frequency bands. Since they down convert selected bands, they make it economically feasible to perform DSP functions such as FFT spectrum analysis on RF signals. Typical applications include frequency-division multiplexed communications systems, modem modulation schemes, and analysis of many forms of radar signals.

Features

- Sampling rates to 70 MHz
- Two TTL, ECL (6509 only) or FPDP inputs
- Four C40 comm port data outputs
- Tuning control via VME interface or four input C40 comm ports
- Dynamic range greater than 100 dB (Model 6508) or 80 dB (Model 6509)
- 0.008 Hz tuning resolution (Model 6508) or 0.26 Hz resolution (Model 6509)
- FIFO buffering
- Compatible with the Pentek Series 64xx A/D Converters

Block Diagram, Models 6508, 6509

Flexible Input Connections

Parallel digital input data samples from two sources are accepted on a front panel multipin connector with TTL or, optionally, differential ECL or FPDP level compliance. Each receiver channel employs a multiplexer that independently selects either of these input data sources. In addition to the input comm port control access, the VMEbus interface can be used to program operating modes, tuning frequencies and decimation bandwidths.

Specifications - Model 6508

Narrowband Receivers (8)
Receiver type: Intersil HSP50016
Digital input format: two independent inputs; each input with 16-bit words, 2's complement; one sample clock line
Input level: TTL single-ended; optionally FPDP (option -008)
Sampling rate: DC to 70 MHz max.
Data input connector: 80-pin flat ribbon cable 0.025″ pitch (3M)
Input multiplexers: each receiver channel can independently select one of two front panel inputs under program control
Local oscillator: direct digital synthesizer; single frequency CW and sweep (chirp) up/down modes; CW frequency is equal to $F*f_s/2^{33}$, where F is a 32-bit binary integer and f_s is the input sample rate
Tuning range: DC to $f_s/2$ (35 MHz for f_s = 70 MHz)
Tuning resolution: $f_s/2^{33}$ (~0.008 Hz for f_s = 70 MHz)
Low pass filter: decimating 121-tap FIR, programmed by 15-bit integer R, from 16 to 32,768; nominal output Nyquist bandwidth $f_N = f_s/4R$; output sampling rate is $f_s/4R$ for complex outputs and $f_s/2R$ for real outputs
Filter response: ±0.04 dB passband ripple; –3 dB bandwidth = $0.56f_N$; –100 dB stop bandwidth = $0.8f_N$
Real mode: consecutive 16-bit real output samples at sampling rate $f_s/2R$
Complex mode: 16-bit complex (interleaved I and Q) output samples at sampling rate $f_s/4R$ per complex pair

Specifications - Model 6509

Narrowband Receivers (8)
Receiver type: Graychip GC1011A
Digital input format: two independent inputs; each input with 12-bit words, 2's complement; one sample clock line

Input level: optionally FPDP (option -008) or ECL differential (option -012)
Sampling rate: DC to 70 MHz max
Data input connector: 68-pin flat ribbon cable 0.025″ pitch (3M)
Input multiplexers: each receiver channel can independently select one of two front panel inputs under program control
Local oscillator: direct digital synthesizer; frequency = $F*f_s/2^{28}$, where F is a 28-bit binary integer and f_s is the input sample rate
Tuning range: DC to $f_s/2$ (35 MHz for f_s = 70 MHz)
Tuning resolution: $f_s/2^{28}$ (~0.26 Hz for f_s = 70 MHz)
Low pass filter: decimating FIR programmed by 14-bit integer D, from 16 to 16,384; nominal output Nyquist bandwidth $f_N = f_s/4D$; output sampling rate is $f_s/4D$ for complex outputs and $f_s/2D$ for real outputs
Filter response: programmable 70 dB or 50 dB stopband attenuation at $1.2f_N$ where f_N is Nyquist frequency

	70 dB	50 dB
–3 dB bandwidth	$0.8f_N$	$0.9f_N$
±0.2 dB ripple BW	$0.7f_N$	–
±0.4 dB ripple BW	–	$0.8f_N$

Real mode: 16-bit real output samples at sampling rate $f_s/2D$
Complex mode: 16-bit complex (interleaved I and Q) output samples at sampling rate $f_s/4D$ per complex pair

Specifications - Both Models

Data FIFO: 1k x 16 expandable to 16k x 16 bits per channel, VME interrupts for full, half-full and empty.
Comm port outputs: four, one for each receiver channel pair; byte-serial with 4 bytes per 32-bit longword; data packed (two 16-bit words per longword) or unpacked (one 16-bit word per longword)
VME interface: slave A32, D32, I(1-7)
Control registers: memory-mapped over the VMEbus and via input comm ports; receiver chip control registers (includes local oscillator, filter decimation, real/complex mode, etc.), input multiplexer control, and channel synchronization control
Power: 3.6 A at +5 V; 0.1 A at +12 V; 0.3 A at –12 V
Size: standard 6U VMEbus board, single slot; board 160 mm (6.3 in.) x 233.5 mm (9.2 in.), panel 0.8 in. wide

Ordering Information

Model	Description
6508	8-Channel 2-Input Digital Receiver VME Board
Options:	
-008	FPDP inputs
-021	16 ksample FIFOs
6509	8-Channel 2-Input Digital Receiver VME Board
Options:	
-008	FPDP inputs
-012	ECL diff. inputs
-021	16 ksample FIFOs

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