



CATS Puma Basic

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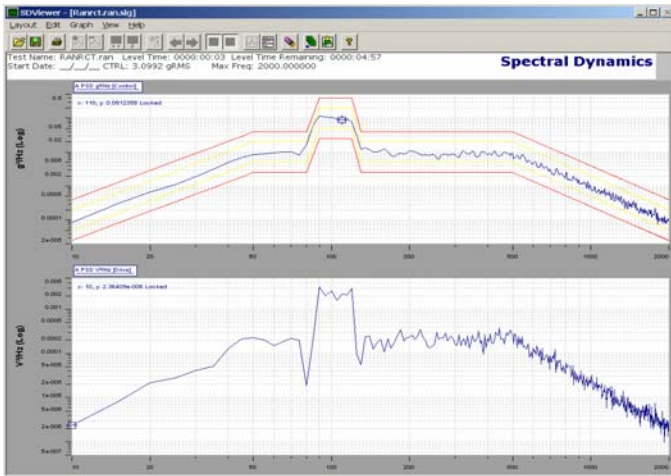


Figure 1

The Puma Basic was designed to meet a wide range of environmental test requirements. It combines the simplicity of operation required for production screening with the power and versatility required for R&D prototype testing. The system includes Random, Sine and Classical Shock capabilities. It also incorporates our Powerful Multiple DSP Architecture, accurate control, and the unmatched safety features that Spectral Dynamics is known for.

- 2 to 4 Input Channels with ICP
- The same Powerful Multiple DSP Architecture as Spectral Dynamics CATS Puma
- Comprehensive vibration test capabilities
 - Random
 - Sine
 - Classical Shock with SRS displays
 - Stepped Sine
- Integration with chambers, and other test instrumentation
- Exceptionally rapid correction for resonant frequencies – provides excellent protection against over test
- The Best and Most Comprehensive Safety Features in the Industry

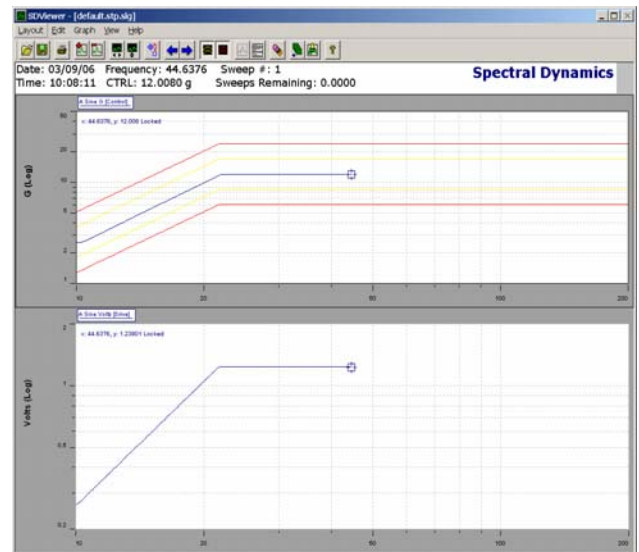


Figure 2

Puma Basic Random

Control Methods

Control method Patented adaptive control algorithm with separate controls loops dedicated to controlling the shape of the drive spectrum and overall RMS level optimizes both control speed and stability

Input/Output

Input channels 2 to 4; all simultaneously sampled
Input dynamic range >94dB with auto-ranging
Output dynamics range 90dB

Control Performance

Dynamic range Up to 90 dB
Output Pure Gaussian noise
Equalization accuracy Control to within ± 1 dB for a flat reference spectrum with 120 DOF 90% statistical confidence

Loop time With 4 control channels, 4 new data frames per loop, 2000 Hz, 200 lines 120 DOF, less than 0.5 seconds
Re-equalization rate For an instantaneous change of 6 dB in all control spectrum lines, the spectrum RMS is re-equalized to within ± 1 dB within 8 control loops, for a flat reference with 4 control channels, 120 DOF

Reference Spectrum

Definition Easily defined by a combination of up to 500 amplitude/frequency breakpoints, (PSD value/frequency value) and slopes (dB/octave values)
Spectral alarm/abort limits Independent positive and negative alarm and abort tolerances for each breakpoint
Frequency range (DC to) 50, 80, 100, 200, 400, 500, 800, 1000, 2000, 4000, and 5000 Hz
Frequency resolution 100, 200, and 400 lines
Units g-in/s-in; g-m/s-mm; m/s²-m/s-mm EU for Measurement Channels
Import reference Copy & paste from spreadsheet program.

Control Parameters

Number of control channels 1 to all available channels
Multi-channel control strategy Average, maximum, minimum; user-defined weighting for each control channel
Mode of operation Manual, automatic, automatic only
Test duration User-defined, maximum 9999:59:59 (hhh:mm:ss)
Degrees of freedom User-defined, minimum 8, maximum 30000
Output level control Automatic, manual

Startup Parameters

Initial test level User-selectable; -80 to 0 dB
Time at initial level User-defined number of loops
Level increment 1 to 20 dB
Pre-stored drive startup User-selectable (No/Yes/Yes with verify before start)

Test Automation Features

Level scheduling Up to 500 test levels; each level with programmable time at level, time between levels, abort/ignore action

Safety Features

Shaker limits Pretest verification that spectrum dynamic limits are within shaker operational limits (acceleration, velocity displacement and voltage)
Loop check max. drive signal User-selectable, 0 to 5000 mV RMS
Alarm/Abort RMS RMS acceleration limit in dB or Absolute units
Alarm/Abort spectral lines Number of lines, or percent of lines within user-specified range
Channel RMS abort Aborts test if any channel RMS threshold exceeded
Control signal loss Automatic detection with smooth drive shutdown
Manual abort Graphical and keyboard abort buttons
External kill-switch Rack or desktop mountable external abort circuit with programmed shutdown (option)
Drive signal clipping 2 to 20 sigma
Startup/shutdown rates Independently selectable 1 to 50 dB/sec

Channel Setup

Channel type Control, measurement, inactive
Sensitivity 0.001 to 9,999 mV/g or mV/(m/s²)
ICP power On/off
Coupling AC or DC
Channel loop check Enabled, disabled
Channel label Up to 20 characters for each channel
Transducer serial number Up to 10 characters for each channel
Transducer Database Table Driven Archival Database
Control channel weighting Individuality defined, 20 to 6 dB
RMS abort Individually defined, 0 to 999 grms or (m/s²) rms
Base Engineering Units Label (EU), Conversion (EU/Transducer Unit)
Engineering Units Integrated(Label and Scale), Double Integrated(Label and Scale), Differentiated(Label and Scale), Double Differentiated (Label and Scale)

On-Line Status Monitors

Test status Elapsed and remaining test time
Level status Schedule level number, elapsed and remaining level time
Control status Test dB level, drive RMS level, Control Level GRMS
Channel status RMS levels for all active channels
Message log Records all test operations, including operator commands, and reports on alarm or error conditions

On-Line Controls

Start/Abort test Smoothly initiates or terminates test
Resume test Restart test and complete remaining time
Test Mode Manual or automatic
Drive update Update of drive spectrum on or off
Level Step up or step down
Pause Lower drive level to -90 dB, hold until resume

On-line Analysis

Real-time displays Spectra or time histories for all available channels may be simultaneously displayed during the test
Spectra analyzed PSD, auto-spectrum, linear-spectrum, transmissibility, frequency response function (magnitude/phase or real/imaginary), coherence,
Averaging control User-selectable; DOF exponential or linear averaging
Real-time/stored data Simultaneous display and overlay of spectra or time histories for real-time data and any stored data

Data Storage

Setup options Automatic storage every 1 to 10,000 seconds, save on level change, save on alarm, save on external command, manual save
Playback Automatic play of entire test data file, with adjustable display update delay; manual selection
Run message log Text file records all system status messages displayed during test run



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TSPUMARN0301

Puma Basic Sine

Control loop	True analog-quality sine sweep with a double precision integrated phase algorithm for low distortion
Control Performance	
Dynamic range	Greater than 80 dB with 0.05 dB level step control over the full range
Output signal	Analog-quality digital sine generation, using a double precision integrated phase algorithm for low distortion
Loop time	Less than 5 msec for single channel control
Compression rate	Up to 3,500 dB/sec with unconditionally stable feedback control loop
Harmonic distortion	< -75 dB at full output
Reference Profile	
Definition	Up to 500 frequency segments
Segment types	Constant displacement, velocity, acceleration, and straight line acceleration (linear or logarithmic)
Crossover frequencies	Automatically calculated to avoid segment boundary discontinuities
Alarm and abort limits	Independent positive and negative alarm and abort margins
Sweep range	User-defined sweep range from 1 to 5000 Hz
Sweep resolution	User-defined resolution of 450 to 800 points per sweep
Spectrum dynamic limits	Acceleration range, maximum or minimum acceleration, maximum velocity and maximum displacement
Control Parameters	
Mode of operation	Manual, automatic
Test duration	Maximum 99,999 sweeps or 9999:59:59 (hhh:mm:ss); unlimited test
Measurement processing	RMS processing for all channels in parallel
Transducer types	Control based on acceleration, velocity, displacement (transducer with programmable transition frequency band)
Number of control channels	1 to all available channels, max 4
Multi-channel control strategy	RMS, arithmetic average, min, max
Abort channels	Abort test when user-defined level exceeded
Compression	5% to 100%
Units	m/s ² - m/s - mm; g - in/sec - in; g - m/s - mm
Box Tolerance Enable	Alarm & Abort width set 0 to 100%
Startup/Shutdown Rate	1 to 99 dB/sec
Sweep Parameters	
Sweep mode	Linear, logarithmic
Sweep duration	User-defined, maximum 999:59:59 (hhh:mm:ss)
Number of sweeps	0.01 to 100,000
Sweep rate-linear	0.00003 to 300 Hz/sec (0.0018 to 18,000Hz/min)
Sweep rate-logarithmic	0.1 to 800 Oct/min
Initial sweep direction	Up, down
Safety Features	
Shaker limits	Pretest verification that spectrum dynamic limits are within shaker operational limits (acceleration, velocity, displacement and voltage)
Loop check max. drive	User-selectable, 0 to 5,000 mV RMS
Control signal loss	Continuous automatic detection
Manual abort	Graphical and keyboard abort buttons
Maximum drive signal	0.0001 to 12 V peak
Startup/shutdown rates	Independently selectable, 1 to 99 dB/sec
Channel Setup	
Channel type	Control, measurement, reference, inactive
Sensitivity	0.001 to 999,999 mV/g or mV/(m/s ²) mm; EU for Measurement Channels
Channel loop check	Enabled, disabled
Channel label	Up to 20 characters for each channel
Transducer serial number	Up to 10 characters for each channel
On-Line Test Analysis	
Display functions	Control, drive, measurement channel 1 to 4, frequency response function magnitude
Cursors	X and Y value readout, peak search,
Scaling of display	Log/linear, auto-scaled/fixe

Real-time/stored data	Simultaneous display and overlay of real-time data and any stored data
Data Storage	
Setup options	Sweep Increment, first sweep, last sweep
Playback	Scan through the entire test data file, with adjustable delay and Tagging
Documentation	
Test summary	Fully documented post-test summary, easily printed or incorporated into any document using standard word processing software
Run message log	Text file records all system status messages displayed during test run
Safety Features	
Shaker limits	Pretest verification that spectrum dynamic limits are within shaker operational limits (acceleration, velocity, displacement and voltage)
Loop check max. drive	User-selectable, 0 to 5,000 mV RMS
Control signal loss	Continuous automatic detection
Manual abort	Graphical and keyboard abort buttons
Maximum drive signal	0.0001 to 12 V peak
Startup/shutdown rates	Independently selectable, 1 to 99 dB/sec

Puma Basic Stepped Sine

Reference Profile	
Definition	Up to 500 dwells frequency's specified in acceleration
Alarm and abort limits	Independent positive and negative alarm and abort margins for each dwell
Dwell range	User-defined dwells from 1 to 10000 Hz
Control Parameters	
Mode of operation	Manual, automatic
Test duration	Maximum 99,999 sweeps or 9999:59:59 (hhh:mm:ss); unlimited test
Measurement processing	RMS processing for all channels in parallel
Transducer types	Control based on acceleration
Number of control channels	1 to all available channels, max 4
Multi-channel control strategy	RMS, arithmetic average, min, max
Compression	5% to 100%
Units	m/s ² - m/s - mm; g - in/sec - in; g - m/s - mm
Startup/Shutdown Rate	1 to 99 dB/sec
Dwell duration	User-defined, maximum 999:59:59 (hhh:mm:ss)
Safety Features	
Shaker limits	Pretest verification that spectrum dynamic limits are within shaker operational limits
Loop check max. drive	User-selectable, 0 to 5,000 mV RMS
Control signal loss	Continuous automatic detection
Manual abort	Graphical and keyboard abort buttons
Maximum drive signal	0.0001 to 12 V peak
Startup/shutdown rates	Independently selectable, 1 to 99 dB/sec
On-Line Test Analysis	
Cursors	X and Y value readout, peak search,
Scaling of display	Log/linear, auto-scaled/fixe
Data Storage	
Setup options	Save All, Save Last, or save at specified time intervals
Playback	Scan through the entire test data file, with adjustable delay and Tagging
Documentation	
Test summary	Fully documented post-test summary, easily printed or incorporated into any document using standard word processing software
Run message log	Text file records all system status messages displayed during test run
Safety Features	
Shaker limits	Pretest verification that spectrum dynamic limits are within shaker operational limits (acceleration, velocity, displacement and voltage)
Loop check max. drive	User-selectable, 0 to 5,000 mV RMS
Control signal loss	Continuous automatic detection
Manual abort	Graphical and keyboard abort buttons
Maximum drive signal	0.0001 to 12 V peak
Startup/shutdown rates	Independently selectable, 1 to 99 dB/sec



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TSPUMARN0301

Puma Basic Classical Shock

Control Methods

Control loop Patented adaptive control algorithm with transfer function updating and coherence smoothing to accurately and quickly compensate for non-linearity or time varying changes in the dynamic load

Control Performance

Dynamic range > 90 dB

Pulse Definition

Types Half-sine, initial peak sawtooth, terminal peak sawtooth, trapezoidal, rectangular

UFF Scale Factor - 40 to + 40 dB

Pulse duration 0.1 to 32000 ms

Buffer duration 10 ms to 64 sec

Pulse amplitude 0.01 to 500 g

Rise time (trapezoidal) 0.1 to 10,000 ms

Peak time (trapezoidal) 0.1 to 10,000 ms

Fall time (trapezoidal) 0.1 to 10,000 ms

Units g-in/s-in; g-m/s-mm, m/s²-m/s-mm

Frequency range from 50 Hz to 10 kHz; dependent on the pulse duration and type of compensation,

Frame size Automatic selection of 512 - 8192 samples, in powers of 2 steps

Pulse dynamic limits Maximum input voltage, max/min acceleration, max/min velocity, max/min displacement, calculated and displayed

Pulse Compensation

Type Pre- and post-pulse, pre-pulse only, post-pulse only

Displacement optimization (Pre- and post-pulse) Single sided, double sided

Compensation method (Double sided) Displacement, symmetrical acceleration, non-symmetrical acceleration

Pre-pulse amplitude 5 to 100%

Post-pulse amplitude 5 to 100%

Symmetrical Compensation 5 to 100%

Display Tolerances

Type None, MIL-STD-810, user-specified

Specified segments + pre-pulse, - pre-pulse, + main pulse, -main pulse, + post-pulse, - post-pulse

Specified tolerance 1 to 99%; independent for each segment

Control Parameters

Mode of operation Manual

Number of control channels Any one channel selectable as control

Repetitive pulses 1 to 1,000,000

Delay between pulses 15 to 8,000 ms

Control Strategy

Drive update Off, on (equalization function updated after every pulse)

Output polarity +/-

Weighting for averaging User-selectable: 0.05 to 1

Feedback gain User-selectable: 0.05 to 1

Equalization method Transfer function

Equalization level 0 to -80 dB

Input for equalization Pulse, random

Start-up Parameters

Initial test level Equalization level to 0 dB

Level increment 1 to 20 dB

Equalization delay 0.0 to 8,000 ms

Safety Features

Shaker limits Pretest verification that spectrum dynamic limits are within shaker operational limits (acceleration, velocity, displacement and voltage)

Loop check max. drive User-selectable, 1 to 5,000 mVrms

Loop check max. noise User-selectable, 1 to 1,000 mVrms

Max average error alarm 0.01 to 100 %

Max average error abort 0.01 to 100 %

Max peak error alarm 0.01 to 100 %

Max peak error abort 0.01 to 100 %

Control signal loss Continuous automatic detection

Maximum drive signal 0.01 to 12V peak

Test Automation

Automatic level increase User-selectable initial level, level increment, delay between pulses; re-equalization between each pulse

Multiple pulse User-selectable full level pulses and delay

Channel Setup

Channel type Control, auxiliary, inactive

Sensitivity 0.001 to 999,999 mV/g

Channel loop check Enabled, disabled

Channel label Up to 20 characters for each channel

Transducer serial number Up to 10 characters for each channel

Transducer Power Constant current source On or Off

On-Line Analysis

Real-time analysis Pulses and spectra for 1 to all available channels simultaneously displayed

Display units Acceleration, Velocity, and Displacement

SRS displays Maxi-max; Primary & Residual + or -

SRS Resolution 1/1, 1/3, 1/6 Octave

SRS damping 0.1 to 99 %, user selectable

SRS definition Absolute Acceleration, Relative Displacement

Cursors X and Y value readout, peak search

Scaling of display Log/linear, auto-scaled/fixed, full control

Data Storage

Data storage setup Every pulse, last pulse, off

Playback Scan through the entire test data file, with adjustable delay

Test summary Fully documented post-test summary, easily printed or incorporated into any document using standard word processing software

Run message log Text file records all system status messages displayed during test run



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