Rapid II™ Datasheet

Off-the-shelf test cell control and DAQ

Rapid II™ provides both a powerful **4-axis controller** AND several channels of full-featured, high-speed **data acquisition**. With the software tools provided, configuration and start up is accomplished in a matter of hours requiring **no code whatsoever**. Wineman Technology's menu driven configurator Inertia™ works with National Instruments abstraction engine VeriStand™ for defining and redefining your test environment — from real-time test procedures, user defined alarm profiles, and PID loop control to graphing, custom screens, database interfaces, and logging any channel or variable in the system.

Durability Testing

Servo-Hydraulic Controllers

Load Frame Controllers

Gearbox Testers

Fatigue Testing

Performance Testing

Engine Dynamometers

Powertrain Dynamometers

Production Testers

Quality Audit

Applications range from simple component test systems to complex servo-hydraulic, driveline, or dynamometer test cells. Rapid II™ scales from a single axis control system to multiple axes and runs synchronous or asynchronous test profiles.

INERTIA™ VeriStandUI

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Rapid II™ Datasheet

PIDF Control [i]	
Control/Output Channels	Unlimited
Loop Rate	1 kHz
Output Drive	±10 V, ±100 mA, 4-20 mA, Custom
Gain Parameters	Proportional, Integral, Derivative, Feedforward, Limit Loops, Cascade Control
Compensation	Amplitude Control, Peak Detection, Dither, Mode Transfer

Operator PC Interface	
Network Connection	(1) Ethernet RJ45 port, also: (1) USB 2.0 port, (1) EtherCAT port, (1) RS-485 port
Operating System	Microsoft Windows
Drivers	NATIONAL INSTRUMENTS VeriStand, WTI Inertia
Utilities	PID Tuning, Data Reporting, Test Editor, User Administration, Screen Editor, Error Monitor, Alarm Monitor
Operator Screens	Unlimited number of user customizable screens with dialog driven configuration

I/O (expandable with EtherCAT) [ii]	
Analog	**Inputs**: (8) 16-bit, ±10 V or 4-20 mA (1 kS/s & simultaneous for AIs and AOs) **Outputs**: (4) 16-bit, ±10 V, optional mA; **Connectors**: standard DE-9
Digital	**Inputs**: (12) 5-24 VDC differential, high speed, quadrature; (16) 24 VDC sinking **Outputs**: (16) 24 VDC sourcing; **Connectors**: standard DE-9 and DC-37
Thermocouple	(8) Type-K with voltage suppressor on individual channels
Emergency Stop	(SIL3) Self monitoring safety relay with pushbutton monitoring

Data Logging	
Number of Log Files	Unlimited
File Formats	CSV, TSV, TDMS
Data Rates	Up To Maximum Acquisition Rate
Triggering Modes	Periodic Time, Periodic Cycles, Crash, In-Limit, Out-of-Limit, Pre-trigger, Post-trigger, Single Shot
Trigger Channel	Any System Variable

[i] Actual loop rates determined by system's channel count and processor options

[ii] Data acquisition channel types and number of total channels based on specific configuration

Rapid II™ Datasheet

Detailed Description

Overview

- Preconfigured for quick deployment in test cell
  - Includes desktop computer and monitor
  - Includes VeriStand Full Development System and INERTIA Full Development System
- 120 VAC powered
- Components housed in 5U rack mount enclosure (approx. 19”w x 8.7”h x 17”d)
- Data Acquisition and Control System
  - Data logging
  - Alarming
  - PID control
  - Calculated channels
  - Real-time stimulus profile execution
- Standard hardware configurations
  - Based on the National Instruments CompactRIO real-time controller
  - Integration of wiring, power supply and routing, conditioning, connectors, E-Stop, etc.
- Expandable via EtherCAT

I/O Summary

- Analog Inputs (8): ±10 V or 4-20 mA individually selectable, 1 kS/s simultaneous
- Analog Outputs (4): ±10 V, 1 kS/s simultaneous
  - Servo Valve Outputs (4): ±100 mA
- High Speed Digital Inputs (12): 5-24 VDC, can be used individually or grouped for quadrature
- Digital Inputs (16): 24 VDC
- Digital Outputs (16): 24 VDC, de-energized in emergency stop state
- Thermocouple Inputs (8): Type-K
- Emergency stop safety circuit

Communication Interfaces

- One (1) USB 2.0 Port
- One (1) Ethernet Network Port (for connection to client computer)
- One (1) EtherCAT Expansion Port
- One (1) RS-485 Port

Variations

176500-01	RAPID II
176500-02	RAPID II with CAN bus

Rapid II™ Datasheet

Detailed Description

Front Panel

- Power On/Off Button
- Emergency Stop Button
- Emergency Stop Reset Button

Analog Inputs (8)

- ±10 V or 4-20 mA individually selectable 16-bit analog inputs are connected internally to an NI 9220 AI module (1 kS/s)
- DE-9 male back panel connector (1 per channel) for end user connection
- Individual channels can be configured for 4-20 mA by installing jumper on mating connector between pins 4 & 5
- For differential measurements (Diff), a bias resistor can be selected to tie Signal (-) to ground through a 1 MOhm resistor
- For single-ended measurements (RSE), a direct connection can be selected to tie Signal (-) directly to ground
- 24 VDC excitation power and common provided on pins 8 and 9 respectively to simplify connection of conditioned sensors

Pin	Assignment
1	24 VDC Common (GND)
2	AI (+)
3	AI (-)
4	mA Sel (+): for mA measurements, jumper this to pin 5
5	mA Sel (-)
6	Diff Bias Sel: for differential measurements, jumper this to pin 1 (GND)
7	RSE Bias Sel: for single-ended measurements, jumper this to pin 1 (GND)
8	+24 VDC
9	24 VDC Common (GND)

Analog Outputs (4)

- ±10 V 16-bit analog outputs are connected internally to an NI 9263 analog output module (1 kS/s)
- DE-9 female back panel connector is provided (1 per channel) for end user connection
- 20 mA and 100 mA options provided
- 24 VDC excitation power and common provided on pins 8 and 9 respectively to simplify connection of devices requiring external power

Pin	Assignment
1	4-20 mA enable: only use when using 4-20 mA; remove jumper to get full scale when using -10-10 V output
2	-10-10 V (+)
3	-10-10 V (-)
4	4-20 mA (+): jumper pin 1 to pin 2 to enable this output
5	4-20 mA (-): jumper pin 1 to pin 2 to enable this output
6	-100-100 mA (+)
7	-100-100 mA (-)
8	+24 VDC
9	24 VDC Common (GND)

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Detailed Description

High Speed Digital Inputs (12)

- 5-24 V differential inputs are connected internally to two NI 9411 digital input modules
- Four (4) DE-9 male back panel connectors are provided with three high speed digital inputs each
- Channels can be used individually for measuring frequencies or can be used in groups for quadrature position monitoring
- 24 VDC excitation power and common provided on pins 8 and 9 respectively to simplify connection of devices requiring external power

Pin	Assignment
1	A+
2	A-
3	B+
4	B-
5	Z+
6	Z-
7	+5 VDC
8	+24 VDC
9	DC Common (GND)

Digital Inputs (16)

- 24 VDC sinking digital inputs are connected internally to an NI 9425 digital input module
- One (1) DC-37 back panel female connector is provided for end user connection
- Voltage suppressors provided on individual channels

Pin	Assignment	+24 VDC
1	DI0	20
2	DI1	21
3	DI2	22
4	DI3	23
5	DI4	24
6	DI5	25
7	DI6	26
8	DI7	27
9	DI8	28
10	DI9	29
11	DI10	30
12	DI11	31
13	DI12	32
14	DI13	33
15	DI14	34
16	DI15	35

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Detailed Description

Digital Outputs (16)

- 24 VDC sourcing digital outputs are connected internally to an NI 9476 digital output module
- One (1) DC-37 back panel female connector is provided for end user connection
- Electronic overcurrent, inrush, flyback, and short-circuit protection provided for each channel

Pin	Assignment	Common (GND)
1	DO0	20
2	DO1	21
3	DO2	22
4	DO3	23
5	DO4	24
6	DO5	25
7	DO6	26
8	DO7	27
9	DO8	28
10	DO9	29
11	DO10	30
12	DO11	31
13	DO12	32
14	DO13	33
15	DO14	34
16	DO15	35

Thermocouple Inputs (8)

- Type-K thermocouple inputs are connected internally to an NI 9212 thermocouple input module
- Type-K miniature panel jacks are provided on the back panel (1 per channel)
- Voltage suppressors provided on individual channels

Emergency Stop

- A self-monitoring safety relay is provided for monitoring the state of the E-stop pushbutton
- Safety circuit provides a Safety Integrity Level (SIL) of 3
- Connector provided on back panel for interfacing to system safety circuit as required or for expansion

Terminal	Assignment
1	Remote Reset (+)
2	Remote Reset (-)
3	E-Stop Ch 1 (+)
4	E-Stop Ch 1 (-)
5	E-Stop Ch 2 (+)
6	E-Stop Ch 2 (-)
7	Safe Contact (+)
8	Safe Contact (-)