

Thermo Scientific AutoEXEC

32-Run Flow Computer for Natural Gas and Petroleum Liquids

The Thermo Scientific™ AutoEXEC is the industry's first flow computer that measures natural gas and petroleum liquids simultaneously.

- Calculates flow at up to 10 times per second on 32 runs simultaneously
- Capable of batching and archiving for 100+ products
- Facilitates communications through two USB ports: host and slave-device
- Customizable software screens to view specific parameters
- API 21.2 Custody Transfer Compliance for liquids



Versatile Unit for Gas & Liquid

With an update rate of 10 times per second, the Thermo Scientific AutoEXEC flow computer comes first amongst other flow computers for natural gas and/or petroleum liquids. Built on the Freescale™ Coldfire® 32-bit processor, the AutoEXEC system has the fastest computational speed on the market, greater than 300 million instructions per second (MIPS). This performance, in conjunction with its 32-bit hardware floating point capabilities, enables the remote terminal unit (RTU) to solve complicated mathematical equations accurately and rapidly.

Expandable for Maximum I/O

The standard AutoEXEC unit includes a CPU board, power supply and an enclosure with six available board slots. To build a system, customers choose the needed input/output (I/O) from the optional boards. Up to seven additional chassis can be daisy-chained together, providing enormous I/O and meter run capabilities. Each board option has its own 32-bit ARM 7 industrial grade processor, resulting in the fastest possible communication to the motherboard.

Robust Data Batching & Archiving

With 2 MB of battery-backed RAM and 4 MB of non-volatile serial flash memory, over 100 different products can be loaded into the system to facilitate batching and archiving. Users can connect computers and other devices through two USB ports to facilitate data downloading. The host port enables downloads to a memory stick, while laptops and PCs can connect to the unit for configuration and data retrieval via the slave-device port. Secure access controls, authentication and built-in encryption ensure protection of data.

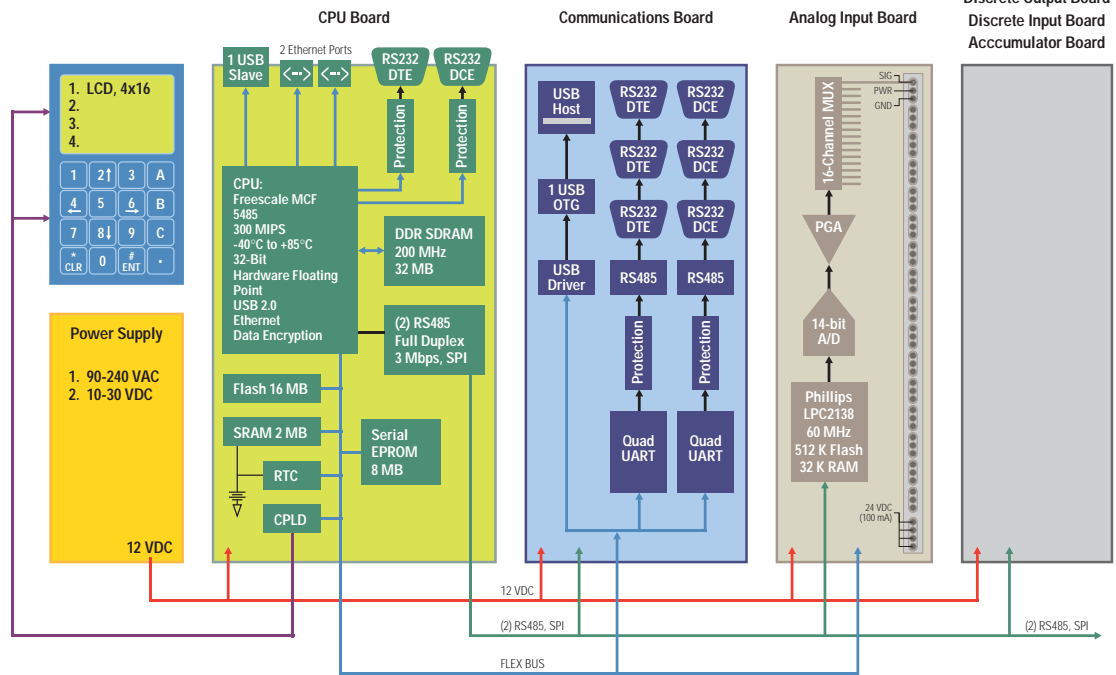
Easy to Setup & Use

The AutoEXEC system is preloaded with a default configuration, and remote configuration can be easily achieved over TCP/IP. Optional custom configuration are also available. User-configurable screens in the Thermo Scientific™ AutoCONFIG Software simplify initial set-up, minimizing employee involvement.



Thermo Scientific AutoEXEC

AutoEXEC Design and Layout



CPU

The Freescale™ Coldfire® processor runs at 200 MHz and includes built-in math and encryption co-processors for ultra-high performance. Two standard fast ethernet controllers (FEC) provide actual full-speed 10/100 mbps ethernet connectivity. Each port is independently configurable for MAC/IP addresses.

Input/Output (I/O)

The CPU communicates with I/O boards through a high-speed RS485 backplane that communicates at three mbps, allowing update rates in excess of 10 times per second.

USB Host

The USB host port can be used to connect USB flash drives for historical data downloads and for connection to peripheral devices (i.e., printers).

Memory

The unique AutoEXEC memory configuration enables high-speed data access. 32 MB of high speed SDRAM running at 200 MHz is utilized for program execution. The AutoEXEC firmware is user upgradeable and is stored in 16 MB of flash memory. Historical data is stored in a combination of 2 MB of battery-backed RAM and 4 MB of non-volatile serial flash.

Communications

An optional communications board provides an additional eight communication ports, USB host and OTG connectivity. The serial ports are divided into six RS232 and two RS485 ports, allowing for connection to chromatography, tank levels, ultrasonic diagnostics, etc.



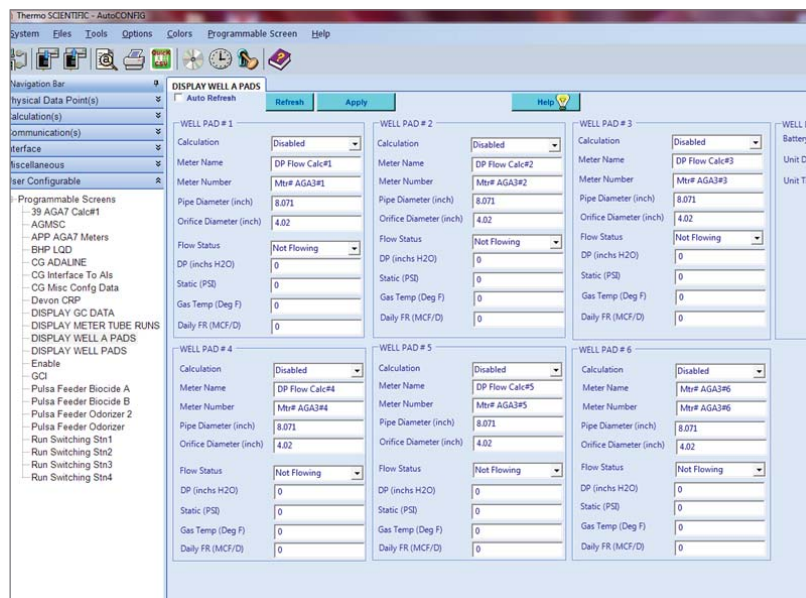
AutoEXEC Board Options

	Point Count	Input	Electrical	Voltage Out	Isolation	Onboard CPU
Com Board	6 RS232 DB9 DTE Outputs		ESD (Electrical Static Discharge) protected			32-bit ARM 7
DI	16	5-12 VDC		12 VDC isolated		32-bit ARM 7
DO	16		250 VAC 30 VDC @ 5 amps		1500 VDC from backplane	32-bit ARM 7
AI	16	1-5 VDC	0-5 VDC with ±10% over/under range up to -0.5-5.5 V	12 V/160 mA & 24 V/100 mA	1500 VDC from backplane	32-bit ARM 7
AO	4		4-20 mA		1500 VDC from backplane	32-bit ARM 7
PI	4 (Future 6)	Switch selectable input up to 20 KHz				32-bit ARM 7
DE	8 Honeywell DE					32-bit ARM 7
Liquid Flow	6 Pulse/Freq Inputs	Switch selectable input up to 20 KHz				32-bit ARM 7
Prover	2 Switch Inputs		Contact closure for Start/Stop			
Combo	4 Pulse/Freq Inputs	Switch selectable input up to 20 KHz				32-bit ARM 7
	4 AI	1-5 VDC	0-5 VDC with ±10% over/under range up to -0.5-5.5 V	12 V/160 mA & 24 V/100 mA	1500 VDC from backplane	32-bit ARM 7
	1 AO		4-20 mA		1500 VDC from backplane	32-bit ARM 7
	4 DI	5-12 VDC		12 VDC isolated		32-bit ARM 7
	4 DO		60 VDC @ 2 Amps			32-bit ARM 7

Thermo Scientific AutoCONFIG Software

Thermo Scientific AutoCONFIG software for Microsoft® Windows® provides ease-of-use for the integrator or operator. Built-in wizards enable inexperienced technicians to setup Thermo Scientific flow computers in minutes. A graphical user interface provides a userfriendly environment. Additional benefits include:

- Complete integrated support for all Thermo Scientific flow computers
- Multiple, simultaneous views
- User-configurable Microsoft Outlook®-like tree view
- Remote communications via serial, TCP, radio, satellite, etc.
- High-contrast monochrome mode for use in direct sunlight.
- Customizable screens to view specific parameters



Thermo Scientific™ AutoCONFIG built-in software.

Upgrade Kit for Thermo Scientific BenchMark Users

Thermo Scientific BenchMark users can easily upgrade to a fully functional AutoEXEC system by adding the BenchMark upgrade kit. The kit includes a basic AutoEXEC unit with an upgrade board that plugs into the CPU slot of the BenchMark. The BenchMark unit communicates with the AutoEXEC CPU board via a full-duplex, high-speed RS485 port. This interface to existing BenchMark expansion boards allows a gradual migration to the AutoEXEC system. Each BenchMark upgrade board has a 32-bit, ARM 7 Industrial Grade CPU, providing high speed connectivity to the AutoEXEC CPU.

Unsurpassed Lightning Protection & Stress Testing

We consistently manufacture the industry's most reliable flow computers because of our steadfast commitment to lightning protection. No other manufacturer tests their board designs to withstand more than 120 consecutive, indirect lightning strikes that measure up to 6,000 volts/3,000 amps each. For added protection, we provide multiple surge protection schemes on each board. Our engineers also conduct a complete environmental stress test on each and every board shipped from our plant. Temperature cycling from -40°C (-40°F) to a scorching +85°C (+185°F) is conducted and any board that fails does not ship.

Durable NEMA 4X Enclosure

The AutoEXEC enclosure is available in aluminum or stainless steel NEMA 4X or as a panel-rack mounted unit. All enclosures include a configurable display and keypad. An optional radio kit is also available for the NEMA version.

Customer Training & Support

Every Thermo Scientific AutoEXEC instrument is backed by outstanding customer support. Our comprehensive training programs include hands-on sessions with highly skilled engineers to ensure users are well versed on system configuration, theory of operation, maintenance and troubleshooting. Visit www.thermo.com/processtraining for more information.



Durable NEMA 4X AutoEXEC enclosure available in aluminum or stainless steel.

General Specifications	
Processor	32 bit Freescale™ Coldfire®, operates at 200 MHz, processes at 300 million instructions per second (MIPS)
Memory	32 MB operation, 16 MB flash memory, 2 MB battery backed RAM plus 4 MB non-volatile serial flash
Communication Ports	CPU Board: 2 RS232, 2 ethernet, 1 slave USB Com Board: 6 RS232, 2 RS485, USB host, USB On-the-Go (OTG)
Power	Input: 90 VAC to 250 VAC, 9 VDC to 30 VDC Output: 12 VDC on AI board
Historical Data Storage	65 days of daily, 35 days of hourly
Audit Trails	200 alarm events, 100 different types of alarms
Audit Log Storage	200 alarm events, 23 different types of alarms

Environmental Specifications	
Operating Temperature	-40°C to +85°C (-40°F to +185°F)
Operating Humidity	0-95% RH, non-condensing
FCC Compliance	Complies with the limits for a Class A computing device with Part 15 of the FCC rules
Approvals	Class I Div 2 (Groups C&D), ATEX zone 2 for hazardous area locations, CE, GOST (pending)
Enclosure Rating	NEMA 4X industrial control enclosure in aluminum or stainless steel

Physical Specifications	
Rack / Panel Mount Dimensions	Cover: 438.15 mm (17.25 in) W x 266.7 mm (10.5 in) H Card Cage: 431.8 mm (17.0 in) W x 266.7 mm (10.5 in) H x 269.7 mm (10.62 in) D Overall: 438.15 mm (17.25 in) W x 266.7 mm (10.5 in) H x 319.28 (12.68 in) D
NEMA 4X Dimensions	431.8 mm (17.0 in) W x 711.2 mm (28.0 in) H x 411.5 mm (16.2 in) D
Display	4 x 16 character LCD

Natural Gas Calculations	
Supercompressibility (Fpv)	AGA 8 Gross-1992; AGA 8 Detail-1992; AGA 8 Short-1985; NX-19; NX-19 Analysis; GERG
Differential Meters (DP, Orifice)	AGA 3/ASTM 2530-1992; AGA 3-1985; GOST; V-Cone; Annubar; Slotted-DP
Linear Meters (Turbine)	AGA 7; AGA 9; AGA11
Energy	AGA 5
Diagnostic	AGA 10-SOS
Additional Factors/Equations	Fwv (manual); Fwv (partial); Fwv (full); Fws
Turbine Meter Linearization	10-Point Frq/K-Factor Table

Liquid Calculations	
API Tables	Table A (generalized crude oils); Table B (generalized products); Table C (thermal expansion properties); Old Table (NGL, LPG SG range .425 to .650); Table 23/24 E (NGL, LPG); VCF (CH 11.1 2004); Propylene (CH 11.3.3.2); Ethylene (API 2565/CH 11.3.2.1); Ethylene (NBS 1045)
Volume Correction Factor (VCF)	Consistent with API 2540/ASTM D1250-80/IP 200; 5/6 A/B; 23/24 A/B; 53/54 A/B; 6/24/54 C; CH 11.1 2004; Note: natural gas liquids (NGL) and liquefied petroleum gases (LPG): OLD 23/24, OLD 53/54; Table E is new standard to replace OLD 23/24.
Correction for Effect of Pressure on Liquid	Ch 11.2.1/Ch 11.2.2; Ch 11.2.1M/Ch 11.2.2M (compressibility factors for hydrocarbons), equilibrium pressure
Propylene Density	API Ch 11.3.3.2
Ethylene Density	API 2565 (Ch 11.3.2.1); Ethylene NBS 1045
Live Density Input	Thermo Scientific™ Sarasota liquid density meter, Solartron, UGC, 4-20 mA

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