

NUFLO™

# Scanner® 1131

*Electronic Flow Measurement  
Remote Telemetry Unit (RTU)*



A functionally and computationally superior EFM/RTU that provides custody transfer measurement data and control functions to production, transmission and distribution markets.

Powerful, fast and flexible

Reduces operational costs  
and maximizes profits



*Powerful, fast, and flexible, the NuFlo Scanner 1131 reduces operation costs and maximizes profits by providing accurate information for monitoring, measurement, and control of your natural gas or hydrocarbon liquid process.*

## Field Mount & Rack Mount Configurations

To accommodate cost effective operations in both hazardous and general purpose areas, the Scanner 1131 is offered in field mount and rack mount configurations.

**Field Mount** – designed specifically for Class I Division 1 and Division 2 hazardous areas adjacent to pipeline or production equipment. Housed in a weather proof fiberglass reinforced plastic enclosure, the unit can be either wall or pipe mounted. Solar panel charges a sealed, air transportable, gelled, lead-acid battery ensuring an intrinsically safe, low powered operating system.

**Rack Mount** – designed for general purpose applications, requires conventional 24 VDC power and can be mounted in any non-hazardous area.

## Accurate

Although optimized for both measurement and control, the strength of the Scanner 1131 lies in its ability to provide custody transfer measurement.

- Auto-calibration of analog inputs for component and temperature effects
- Up to 12 user defined calibration points
- Hysteresis correction and static pressure shift correction to DP zero and span for external transmitter inputs
- Automatically estimates flow during calibrations, plate changes, and power outages

## Application Flexibility

- Supports all common primary devices:
  - Differential Producers- orifice fitting, pilot sensor (annubar), cone, wedge, nozzle
  - Linear Pulse Output Meters - turbine, positive displacement, ultrasonic
- Natural gas algorithms follow North American (AGA) and International (ISO) Standards
  - AGA3-92, 5, 7, 8-94 (Detailed and Gross Methods), Redlich-Kwong, Standard-Katz and a 5x5 pressure vs. temperature "Z" matrix method
  - ISO 5167-1, 12213-1, -2, -3, and SGERG
- Liquid algorithms follow API Manual of Petroleum Measurement Standards (MPMS)
  - API 2540 Table 34, 53A, 53B, 54A and 54B
  - MPMS Chapter 11.2.1(M), 11.2.2(M), 11.2.3(M)
- Communications protocols
  - ScanCom (ADEPT)
  - Modbus (Gould and Enron implementations)
  - BSAP (Bristol Babcock)
- Control
  - Proportional and Integral with Second Variable Override
  - Nomination
  - Run Switching
  - Emergency Shutdown

## Simple & Powerful

### Secure & Reliable

- Five configurable levels of log-in security
- Single main circuit board designed to minimize connections and potential points of failure
- System diagnostics perform ongoing watchdog, memory, program integrity and battery checks
- On-board battery backup to maintain history data storage and real-time clock for up to 10 years
- All units environmentally tested as a completed assembly prior to shipment

### Energy Efficient

- Sophisticated power management system optimizes low power (usually solar) operation of the RTU, communications devices (radios, modems, etc.), and end devices (transmitters, field switches)
- Battery system designed to provide a minimum of 14 days autonomy

### Easy to Configure & Use

- Common user interface throughout entire Scanner family of products
- Easy to use, software prompted routines for day-to-day operations (i.e. plate changes, calibrations, downloading data)
- Configuration SAVE/RESTORE function minimizes duplicate or similar configuration time for 'standard load' type applications

### DPE + Multi-Variable Transducer

- Provides simultaneous pressure and differential pressure measurement and can easily be direct mounted to the existing flow run, eliminating electrical wiring and instrument tubing installation costs
- Designed for the high accuracy, low power requirements of today's EFM/RTU applications and industry requirements

## Faster & Stronger

### Additional I/O

#### More flow runs, broader controls

- (12) single ended 4-20mA/1-5V analog inputs or 6 differential 4-20mA / 1-5V channels
- (2) RTD inputs, (2) high speed frequency inputs
- (2) isolated 4-20 mA/1-5V analog outputs
- (6) multi-function digital I/O, configurable as status input /status output or pulse output ports

### Enhanced Communications

#### More ways to transmit data

- (2) RS232C multi-function serial ports on main board
- (2) User selectable RS232C/RS485/RS422 serial ports on main board
- (1) User selectable RS232C/RS485/ RS422 serial port on expansion board
- All ports configurable for network communications, gas chromatograph interface, multi-variable transmitter interface, alarm call-out, remote console or serial report printer functions
- Unit supports multiple concurrent protocols, including Modbus, ScanCom and BSAP. Call Cameron for a complete list of supported commands, record formats and protocols.
- Expansion board with serial-to-Ethernet and Bluetooth (wireless) capabilities.

### Expanded System Board

#### More memory for increased speeds

- Intel 386™ EX processor operates at 16 Mhz
- Intel 387™ SX coprocessor speeds floating point computations by another order of magnitude
- 1024 Kbytes of code space, up to 96 Kbytes of volatile ram, and up to 448 Kbytes of non-volatile ram

### Optimized Power

#### More data for less cost

- Processing of low level I/O by dedicated micro-controller allows for unit to scan keypad, generate pulse outputs, sample status inputs, and manage A/D conversion of all inputs
- Micro-controller functions as a low-powered real-time clock with 32 kHz crystal
- DMA logic allows up to 32 bytes to be 'spooled' into memory without interrupting 386™ EX

### Cross Functional Applications

#### More help to more people

- Operators: optimize production, daily balances
- Gas Control: meet daily and intraday nominations
- Gas Marketing: optimize spot sales, contracts
- Engineering: monitor reserves, evaluate economics
- Financial Accruals: production and revenue accounting

## Scanner 1131 Specifications

### Main Circuit Board

Computer section	Microprocessor	Intel™ 386EX 16/32 bit embedded processor
	Coprocessor	Optional Intel™ 387SX (DC powered version only)
	Clock speed	16 MHz.
	Program memory	Up to 1024 Kbyte FLASH memory
	Scratchpad memory	Up to 96 Kbyte of static ram
	Non-volatile memory	Up to 448 Kbytes of battery backed static ram
	Real time clock	Battery backed real time clock/calendar
	Backup battery	Single cell lithium battery, replaceable in safe area
	Data retention	1 year minimum (unpowered) including clock
A/D system	Resolution	16 bits
	Linearity error	± 0.015% typical
	Throughput	All inputs converted in less than 1.0 second (DC powered model only)
Display/keypad	Display	4 line x 20 character alphanumeric LCD. Optional LED Backlighting
	Keypad	Standard 8 button read-only keypad. Optional extended numeric keypad
Serial communications ports	Quantity	4
	Port #1 & Port #2	RS-232C
	Port #3 (optional)	RS-232C or optional switch selectable RS-232C/RS-422/RS-485
	Port #4 (optional)	Switch selectable- RS-232C / RS-422 / RS-485
	Baud rates	110, 150, 300, 600, 1200, 2400, 4800, 9600, or 19,200 baud, software selectable
	Parity	Even, odd, or none, software selectable
	Stop bits	1 or 2, software selectable
Modem power output	+8.0V ±10% @ 10 mA	
Pulse inputs	Quantity	2
	Pulse signal types	Preamplified square wave, open collector, contact closures, Pepperl & Fuchs inductive proximity sensor, or turbine magnetic pickup coil, configured via on board DIP switch.
	Over voltage protection	± 40 VDC
Status in/status out/ pulse outputs	Quantity	6
	Maximum voltage	± 40 VDC
	Status/pulse out	
	Max. onstate current	100 mA
	Maximum pulse output rate	5 counts/second @ 50% duty cycle
Analog inputs (see Note 1)	Quantity	6 differential / single ended (switch selectable) (optional 12 single ended input version available with external termination resistors)
	Type	1-5 V or 4-20 mA
	Under/over range	-25%, +5% of span nominal
	Accuracy	1-5V: ± 0.03% of span max. error @ 25°C (75°F) 4-20 mA: ± 0.045% of span max. error @ 25°C (75°F)
	Average temperature effect	1-5V: ± 0.0025% of span/°C max. 4-20 mA: ± 0.0030% of span
	Impedance	> 10KΩ (1-5V input), ~ 250Ω (4-20 mA input)
	Common mode range	0 - 6 VDC minimum (differential inputs)
	Common mode rejection ratio	> 60 db (DC) (differential inputs)
	Over voltage protection	± 40 VDC steady state overvoltage, plus 300W surge for 1 msec
	RTD inputs (see Note 2)	Quantity
Type		100Ω 2 or 3-wire with lead compensation
Range		-45°C to +120°C (-50°F to +250°F)
Accuracy		± 0.20°C @25°C ambient including RTD linearization
Average temperature effect		± 0.0065°C measurement error / °C ambient change
Overvoltage protection		± 40 VDC steady state overvoltage, plus 300W surge for 1 msec
Analog outputs	Quantity	2
	Type	Optically isolated, externally powered
	Accuracy	± 0.1% of FS maximum error @ 25°C (after factory calibration)
	Temperature effect	± 1% of FS maximum error over temperature
	Liftoff voltage	< +10.0 VD

1. Average temperature effect is defined as the (maximum - minimum) divided by the operating temperature range, expressed in terms of % of span.

2. The common mode range defines the common mode voltage of the external signal over which the common mode rejection ratio applies. The 6V specification allows for a 20 mA current loop signal into 300Ω of impedance external to the 1131 (in addition to the voltage dropped by the 1131 input).

## DPE + Multi-Variable Transducer

Quantity	2 (Optional)
DP ranges	30, 200, 300, 400, 840 in. H <sub>2</sub> O (7.5, 49.8, 74.7, 99.6, 209.2 kPa)
Static pressure ranges	100, 300, 500, 1500, 3000, 5300 psia (690, 2068, 3447, 10342, 20684, 36542 kPa)
Maximum overrange pressure	150 psia on 0-100 psia SP 450 psia on 0-300 psia SP 750 psia on 0-500 psia SP 2250 psia on 0-1500 psia SP 4500 psia on 0-3000 psia SP 7420 psia on 0-5300 psia SP
Process temperature	-40°F to +175°F (-40°C to +80°C)
Accuracy	Accuracy (500 psia) ±0.05% for spans ≥5% of the sensor URL ±(0.0025)(URL±SPAN) for spans <5% of the sensor URL Accuracy (300, 1500, 3000 and 5300 psia) ±0.05% for spans ≥10% of the sensor URL ±(0.0025)(URL±SPAN) for spans <10% of the sensor URL
Stability	Long-term drift is less than ±0.05% of upper range limit (URL) per year over a 5-year period
Temperature effect	± 0.25% of full scale over full operating temperature range
Static pressure effect	Span shift: ±0.1% of DP reading/100 psi change in static pressure
Cell material	Stainless steel (Hastelloy C optional)
Process cover material	Stainless steel (Hastelloy C optional)
Bolting	B7 (B7M or Inconel optional)

## Power Supplies

DC power supply	Input voltage	19.2 to 28.8 VDC
	Input isolation	Optionally available (500 VAC for 1 minute)
	Transmitter supply	24 VDC ± 10%, 240 mA (maximum) (Vin-0.3V on non-isolated version)
	Area classification	Class 1, Division 2, non-incendive
Rechargeable battery power supply	Input voltage	13 to 28 VDC
	Input isolation	None
	Battery charger	14 VDC nominal with temperature compensation 750 mA current limit with 75 mA float charging circuit
	Modem/radio supply	Battery voltage output with short circuit protection 2.0A (maximum) with software controlled low voltage cutoff
	Transmitter supply	10 VDC, 15mA (maximum) Division 2 configuration
	2 configurations	1. Class 1, Division 1, Intrinsically safe with approved solar panel or I.S. barrier device 2. Class 1, Division 2, Non-incendive

## Environmental

Operating temperature	-40°C to +60°C (-40°F to +140°F) - operating computer
	-30°C to +65°C (-22°F to +149°F) - non-back-lit alphanumeric displays -10°C to +50°C (+14°F to +122°F) - back-lit alphanumeric displays
Storage temperature	-40°C to +85°C (-40°F to +185°F) - non-back-lit alphanumeric displays
	-30°C to +65°C (-22°F to +149°F) - back-lit alphanumeric displays
Relative humidity	Maximum 90% non-condensing (standard display)
Electrical classification	CSA certification (depending on power supply)
	Intrinsically safe, Class I, Division 1, Groups C & D
	Class I, Division 1, Groups A, B, C & D
Enclosure	CSA certified - Enclosure 4 (Weatherproof), 4X (optional), or General Purpose

## Expansion Boards

### 1) Analog and Status Output (ASO1)

Analog outputs	Quantity	3 (maximum)
	Type	Optically isolated, externally powered
	Signal type	4-20 mA current loop, externally powered
	Allocation	User-selectable
Status/pulse outputs	Quantity	3 (maximum)
	Type	Optically isolated
	Count rate (pulse mode)	0 to 8 Hz, 50 % duty cycle maximum
	Max. on-state current	100 mA (fused at 250mA)
	Max. off-state voltage	40 VDC
	Function	User-assignable

### 2) Communications and Analog Output (CAO1)

Serial communications	Quantity	1 (maximum)
	Interface	Switch selectable as RS-232C / RS-422 / RS-485
	Baud rates	110, 150, 300, 600, 1200, 2400, 4800, or 9600 baud, software selectable
	Parity	Even, odd, or none, software selectable
	Stop bits	1 or 2, software selectable
	Function	Printer, remote console, or gas chromatograph port
	Protection	Surges to 300 W @ 1 msec. plus DC overload to $\pm 40$ V
	Analog outputs	Quantity
Type		Optically isolated, externally powered
Function		User assignable (Flow rate, temperature, etc.)

### 3) Communications and Status (Digital) Input / Output (CD01)

Serial communications	Quantity	1 (maximum)
	Interface	Switch selectable as RS-232C / RS-422 / RS-485
	Baud rates	110, 150, 300, 600, 1200, 2400, 4800, or 9600 baud, software selectable
	Parity	Even, odd, or none, software selectable
	Stop bits	1 or 2, software selectable
	Function	Printer, remote console, or gas chromatograph port
	Protection	Surges to 300 W @ 1 msec. plus DC overload to $\pm 40$ V
	Status inputs and status/pulse outputs	Quantity
Input voltage		+40 VDC maximum
On-state current		100 mA maximum (status or pulse output)
Maximum pulse rate		8 counts/second at 50% duty cycle (pulse output)
Function		User-assignable
Protection		Optically isolated, polarity protected, surge protected to 500W for 1 msec.

#### 4) Status Input / Output Pulse Input/ Output Digital Channels (DIO1)

Status/pulse input	Quantity	5 (maximum)
	Input voltage	+40 VDC maximum
	Input current	Current limited @ 2.5 mA nominal
	Pulse input frequency	0 to 10 kHz
	Protection	Optically isolated, polarity protected & surge protected to 300 W for 1 msec.
Phase discriminator	Quantity	2 (maximum)
	Function	Compares phase relationship of inputs 1 vs.2 and 3 vs.4
	Phase accuracy	$\pm 15^\circ$
	Operating frequency	1 Hz to 10 kHz
Pulse comparators	Quantity	2 (maximum)
	Function	Continuous comparison of two pulse trains for sequence phase, as well as detection of simultaneous pulses, with a latched alarm generated if an error detected. Programmable low frequency cutoff prevents false alarms during flow startup or shutdown.
	Operating frequency	1 Hz to 10kHz
Status/pulse output	Quantity	5 (maximum)
Specifications	Input voltage	+40 VDC maximum
	On-state current	100 mA maximum @ 25°C (75°F)
	Maximum pulse rate	8 pulses/second @ 50 % duty cycle
	Off-state leakage	< 100 $\mu$ A @ +40 V and 25°C (75°F)
	Protection	Optically isolated and surge protected to 300 W for 1 msec.

#### 5) Ethernet-Bluetooth (EB02)

The EB02 adapter board provides the Scanner 1131 EFM/RTU with Ethernet and Bluetooth communication interfaces.

Ethernet	The Ethernet module supports ScanCom over Ethernet, Modbus over Ethernet and Modbus TCP. Modbus maps can be configured in the Scanner or the Ethernet module. Multiple hosts can communicate simultaneously over the Ethernet port using up to four virtual serial ports on the Scanner. Since the Ethernet module connects to the Scanner via a serial port, the communication speed is limited to the speed of the Scanner serial port. With this option, a user can collect and store Scanner history records as SCM files and then upload them with any FTP program at the speed of the Ethernet connection from anywhere on the local area network.
Bluetooth	Bluetooth technology provides a secure, standards-based wireless connection between a host and Scanner 1100 EFM/RTU. Providing wireless data transfer up to 100 meters, eliminating the need for serial cable connections. The EB02 board connects to the serial console port connector on the Scanner enclosure with a 4-pin connector. This enables the Scanners A01 console port to be used for either Bluetooth wireless port or serial communication with a cable. (The serial communication takes priority over Bluetooth communication when both are installed and in use).

**MEASUREMENT SYSTEMS****HOUSTON  
HEAD OFFICE | 281.582.9500****NORTH  
AMERICA | 1.800.654.3760**  
ms-us@c-a-m.com**ASIA  
PACIFIC | +603.5569.0501**  
ms-kl@c-a-m.com**EUROPE,  
MIDDLE EAST  
& AFRICA | +44.1243.826741**  
ms-uk@c-a-m.com**USA • CANADA • UK • CHINA • UAE • ALGERIA • MALAYSIA • INDIA • KENYA****[www.c-a-m.com/flo](http://www.c-a-m.com/flo)**