TEKTROL
Technology Solutions

TEK-LCD 7804B

Explosion-Proof Modbus Scanner Indicator

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Introduction

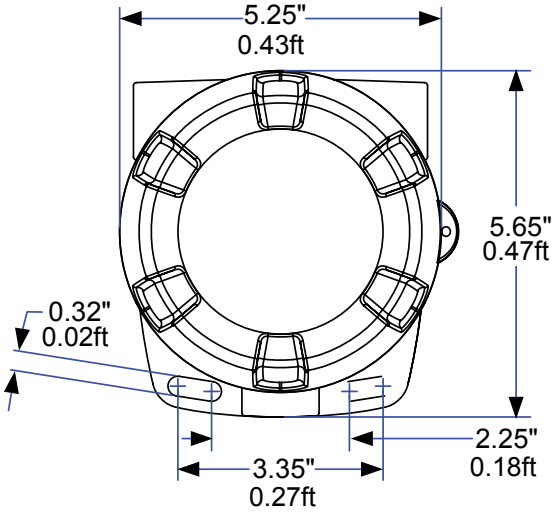
The Tek-LCD 7804B Explosion-Proof Modbus Scanner Indicator

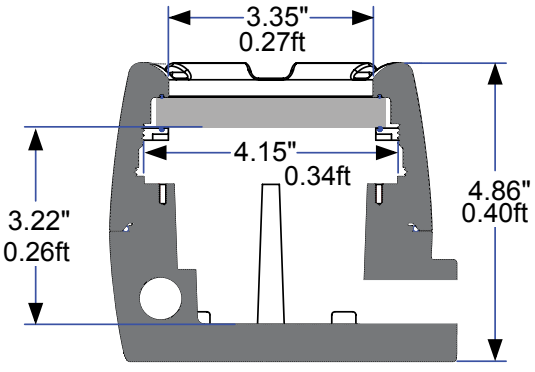
The Tek-LCD 7804B is an explosion-proof, RS485 serial input Modbus® RTU scanner capable of scanning up to 16 Modbus variables and displaying them on an easy-to-read, dual-line, LCD display. This Modbus scanner can be programmed as a Modbus RTU master, slave, or snooper. The Tek-LCD 7804B is available in two upper display line configurations: 5-digit decimal display and feet & inches display with bar graph. The lower line is the same for both versions and consists of seven alphanumeric characters. The Tek-LCD 7804B carries FM, CSA, ATEX, and IECEx approvals for use in hazardous areas. Two features that really make the Tek-LCD 7804B stand out are its wide viewing angle display and SafeTouch® through-glass buttons. These buttons allow the Tek-LCD 7804B to be programmed and operated through the glass, thus eliminating the need to remove the cover in a hazardous area.

Features

- Modbus® Master, Slave, or Snooper Mode
- Scan up to 16 Modbus Process Variables
- 5-Digit Decimal or Feet & Inches Level Display
- On-Board Three-Wire RS-485 with Modbus
- Independent Scaling, Tag, and Unit for Each PV
- 7 Alphanumeric Character 0.4" (0.03ft) Lower Display for Process Variables, Custom Units, and Tags
- Explosion-Proof, IP68, NEMA 4X Enclosure
- SafeTouch® Through-Glass Button Programming
- Isolated 4-20 mA Output Option
- Pulse Input for Rate, Total, and Grand Total
- 13-Digit Totalizer with Total Overflow Feature
- Password Protection
- Backlight Standard on All Models
- Automatic Rate, Total, and Grand Total Unit Conversions
- Operates from -40°F to 158°F (-40 to 75°C)
- Data Logging Functions and Modbus Accessible Data
- Two Isolated Pulse Outputs Standard, Up to 5 kHz

Dimensional Drawings





Specifications

General

Decimal Display	Top:Top Display: Five Digits (0 to 99999), 0.7" (0.05ft) high, 7-segment, automatic lead zero blanking. Bottom Display: Seven Characters, 0.4" (0.03ft) high, 14-segment, automatic lead zero blanking. Symbols: Total, grand total, high alarm, low alarm, SafeTouch button sleep mode/disable, password lock.
Feet & Inches Display	Top Display: 0.60" (0.04ft) high, 0 to 399FT, 1115/16 IN, 7-segment, programmable 1/16 or 1/8 fraction display. Bottom Display: Seven Characters, 0.4" (0.03ft) high, 14-segment, 7-digits. Tank Level Indicator : 20-segments, F (Full) and E (Empty). Alarm Indication: High and low alarm Backlight: White
Display Assignment	Top and Bottom Display*: Process Variables (PV); Alternating PV and Units, Tag and PV, or Tag, PV, and Units; Pulse Input Rate, Total, or Grand Total with Alternating Tag. Bottom Display: All Top Display Options or Off Units and tag independent for each PV, pulse input rate, total, and grand total. *Note: On feet and inches display models, top display used only for level Modbus process variables or math channels.
Backlight	White LED, 10 sec auto-off when battery powered. Backlight deactivated below temperature ≈ -4°F
Alarm Indication	Flashing display plus HI/LO (alarm) or SET indicators.
Scan and Update Rate	Ambient > -4°F: Modbus PV scan rate programmable from 2 to 99 seconds per PV. Tag and units programmable for 1 to 5 second alternation. Pulse input variables update 1/second. Rate update is dependent on gate settings. Ambient <-4°F: All Modbus scan, alternating units and tags, and pulse input variables update/10 seconds minimum.
Underrange	Upper Display: Decimal display flashes -9999 Level display flashes to 399FT 1115/16 IN Lower Display: Flashes -999999
Overrange	Upper Display: Decimal display flashes 99999 Level display flashes to 399FT 1115/16 IN Lower Display: Flashes 9999999
Programming Method	Four SafeTouch through-glass buttons when cover is installed. Four internal push buttons when cover is removed.
Recalibration	Calibrated at the factory to read frequency in Hz. No recalibration required.
Password Menu Options	Three programmable password selections can be used for the following: restrict modification of settings, prevent resetting the total or grand total without the password, or permanently lock out the ability to change or reset the grand total or any grand total related settings(making a non-resettable grand total). Pass: Restricts modifications of programmed settings to require re-entering the password to make changes. Pass T: Restricts the reset of total to require re-entering the password. Disables the manual mode reset contact. Pass GT: Restricts the reset of grand total to require re-entering the password. May enable a non-resettable grand total and permanent lockout of grand total-related settings with a specific password.
Input Power	9-30 VDC, 38 mA max. 2.2 W
Data Logging	Up to 512 records, recorded 4/day at specific times or at defined time intervals. Record contains first eight enabled Modbus PVs; C1-4 if enabled; date; time; pulse rate, total, and grand total with units; and log number.
Isolation: All Models	500 V opto-isolated pulse input-to-power/OC output with isolated input enabled, 500 V input/power-to-RS-485 serial communications. AXA Models: 500 V input/power-to-analog output.
Environmental	Operating temperature range: -40°F to 167°F (-40 to 75°C); Storage temperature range: -40°F to 167°F (-40 to 75°C); Backlight deactivated below temperatures ≈ -4°F; Relative humidity: 0 to 90% non-condensing
Non-Volatile Memory	All programmed settings and total reading are stored in non-volatile memory for a minimum of ten years if power is lost.
Connections	Screw terminals accept 12 to 22 AWG wire
Enclosure	Explosion-proof die-cast aluminum with glass window, corrosion resistant epoxy coating, color: blue. NEMA 4X, 7, & 9, IP68. Copper-free (0.3%). Default conduit connections: Three ¾" NPT threaded conduit openings. One ¾" NPT metal plug with 0.03ft hex key fitting installed. Additional conduit opening configurations and plugs may be available; verify quantity and sizes on specific device labeling during installation.
Mounting	May be mounted directly to conduit. Two slotted flanges for wall mounting or NPS 1½" to 2½" or DN 0.13ft to 0.21ft pipe mounting.
Display Orientation	Display may be mounted at 90° increments up to 270° from default orientation.
Overall Dimensions	5.67" x 5.24" x 4.88" (0.47ft x 0.43ft x 0.40ft) (W x H x D)
Weight	5.00 lbs (80 oz, 2.27 kg)

Pulse Rate/Totalizer

Display Assignment	The top display may be assigned to rate, total, or grand total, in addition to Modbus process variables.
Rate Display Units	Gallons, liters, imperial gallons, cubic meters, barrels, bushels, cubic yards, cubic feet, cubic inches, liquid barrels, beer barrels, hectoliters, or custom.
Rate Display Time Base	Rate display may be calculated in terms of units per second, minute, hour, or day.
Total/Grand Total Display Units	Gallons, liters, imperial gallons, cubic meters, barrels, bushels, cubic yards, cubic feet, cubic inches, liquid barrels, beer barrels, hectoliters, or custom. Setting is independent for each.
Total/Grand Total Display Unit Multiplier	x1, x100 (h), x1000 (k), or x1,000,000 (M) multiplier (and prefix) applied to total or grand total display units. Setting is independent for each.
Total/Grand Total Decimal Points	Up to six decimal places or none: 6.666666, 55.55555, 444.4444, 3333.333, 22222.22, 111111.1 or 0000000 Total and grand total decimal points are independently programmed, and are independent of rate decimal point.
Totalizers	Calculates total and grand total based on rate and field programmable multiplier to display total in engineering units. Time base must be selected according to the time units in which the rate is displayed. The total and grand total utilize the same time base, with different conversion factors and resets.
Totalizer Reset	Via SafeTouch® RESET button, mechanical button (cover off), external contact closure (total only), automatically via user selectable preset value and time delay (1 – 99,999 sec). Manual reset may be disabled or protected by password for the total and grand total. Total and grand total reset independently.
Total Overflow & Rollover	The total can display up to 9,999,999,999,999. Up to 9,999,999 can be displayed on the lower display normally. An overflow display will toggle between the first six digits and last seven digits (999999 <> 9999999) for a 13-digit total. The total will rollover beyond thirteen digits. The T indicator on the display will flash to indicate total overflow, and the six most significant digits (first six numbers of the total) are indicated with the flashing overflow symbol.
Grand Total Overflow & Rollover	The grand total can display up to 9,999,999,999,999. Up to 9,999,999 can be displayed on the lower display normally. An overflow display will toggle between the first six digits and last seven digits (999999 <> 9999999) for a 13-digit total. The grand total will rollover beyond thirteen digits. The GT indicator on the display will flash to indicate grand total overflow, and the six most significant digits (first six numbers of the grand total) are indicated with the flashing overflow symbol.
External Total Reset	External total reset connections are made between RST and COM. Logic High: 1.4 V, 3.3V max; Logic Low: < 0.8 V. 90 ms minimum pulse width.

Pulse Input

Pulse/Transistor/Contact Closer Input	Field selectable; Sourcing or sinking pulse or square wave; 0-5 V, 0-12 V, or 0-24 V; TTL; NPN or PNP transistor; Open collector 100 kΩ pull-up to 3 V; Switch contact 100 kΩ pull-up to 3 V; PNP transistor 100 kΩ pull-down to ground (COM); Active input 100 kΩ to battery level, 10 kΩ to power Maximum Frequency: 64 kHz; Minimum Pulse Width: 5 µs; **Threshold Setting** — **Low (V)** — **High (V)** Normal — 1.2 — 2.0 Low — 0.2 — 1.2
Opto-Isolated Input	Sourcing pulse or square wave 0-5 V, 0-12 V, or 0-24 V; Logic High: 2-24 V, Logic Low: < 1 V; Maximum Frequency: 20 kHz; Minimum Pulse Width: 20 µs; Input Current: 1 mA @ 5 V, 2.5 mA @ 12 V, 5 mA @ 24 V
Low Voltage Mag Pickup Input	Sensitivity: 20 mVp-p to 24 Vp-p; Maximum Frequency: 6 kHz
Minimum Input Frequency	0.0001 Hz. Minimum frequency is dependent on high gate setting (rate display).
Input Impedance	Pulse input: Greater than 75 kΩ @ 1 kHz. Open collector/switch input: 100 kΩ pull-up to 3 V.
Accuracy	±0.03% of calibrated span ±1 count
Pulse Input Recalibration	All ranges are calibrated at the factory to read frequency in Hz. No recalibration required.
Temperature Drift	Rate display is not affected by changes in temperature.
Low-Flow Cutoff	0-99,999 (0 disables cutoff function)
Decimal Point	Up to four decimal places or none: 4.4444, 33.333, 222.22, 1111.1, or 00000
Calibration	May be calibrated using K-Factor, scale without signal source, or by applying an external calibration signal.
K-Factor	Field programmable K-Factor converts input pulses to rate in engineering units. May be programmed from 0.000001 to 9,999,999 pulses/unit.
Calibration Range	Input 1 signal must be ≥ 1 Hz; input 2 signal may be set anywhere above input 1 setting. Minimum input span is 1 Hz. An Error message will appear if the input 1 and input 2 signals are too close together.
Input Contact Debounce Filter	Programmable contact debounce filter. Input signal frequency speed selections of Hi (no filter), Med (250 Hz max input, 2 ms pulse width), and Low (100 Hz max input, 5 ms minimum pulse width).
Time Base	Second, minute, hour, or day
Time Base	Low gate: 1-99 seconds; High gate: 2-9,999 seconds

Modbus Scanner Process Variables

PV Inputs	Up to 16 independently programmed Modbus process variables (PVs) may be scanned (Master mode) or detected (Snooper mode). Each of the 16 Modbus PVs may be enabled or disabled.
Slave ID	Specifies which device on the bus to monitor. Valid for Master and Snooper modes only. Assign the slave ID or address (1-247) of each of the devices containing the process variables to be displayed (Slave ID for PV1-16).
Register Number	Specifies which register(s) to read in the devices on the bus. 5 Digit Function 03: 40001–49999; 04: 30001–39999; or 65: 1–9999. 6 Digit Function 03: 400001–465535 or 04: 300001–365535; or 65: 1–65535. Range is dependent on Function Code selection (03, 04, or 65) Will read 2 registers for Long integer and Floating point data types; the register entered and the next consecutive register number. Valid for Master and Snooper modes only.
Function Code	03, 04, and 65 (used to read 32 bit registers). Master & Snooper modes only.
Data Type	Select the data format of the PVs. Select between short integer (2 byte), long integer (4 byte), or floating point (4 byte). Slave mode uses floating point only.
Byte Order	Integer data programmable as binary or BCD, and signed or unsigned. Byte order selectable as big-endian (1234), little-endian (4321), byte swap big-endian (2143), or byte swap little-endian (3412). Byte swap unavailable for short.
Mounting	May be mounted directly to conduit. Two slotted flanges for wall mounting or NPS 1½" to 2½" or DN 0.13 to 0.21ft pipe mounting.
Display Orientation	Display may be mounted at 90° increments up to 270° from default orientation.
Overall Dimensions	5.67" x 5.24" x 4.88" (144 mm x 133 mm x 124 mm) (W x H x D)
Weight	5.00 lbs (80 oz, 2.27 kg)

Modbus Operating Modes

Master	Processes and displays data read from Modbus RTU slave devices. Up to 16 process variables (PVs) from up to 16 slave devices. Each PV programmed individually.
Slave	Processes data sent to it from a Modbus RTU master device.Note: Refer to Modbus Register Tables at www.predig.com for details.
Snooper	Listens to the Modbus traffic and picks up a specific register or registers being polled by a Master device from a specific slave device and processes the data being read. Up to 16 process variables (PVs) from up to 16 devices. If multiple registers are polled by the master with one command, only the first returned value will be read.
Master Poll Time	0.1 to 99.9 sec. Time between read-commands.
Master Timeout	0.1 to 99.9 seconds. Time elapsed after a poll request is made before the scanner considers that request to have failed.
Number of Retries	1-99. The number of retries the scanner will make when requesting data before reporting an error condition on the PV.
Snooper Response Time	0.1 to 99.9 seconds. Time since the last PV update the before being considered an error.
Slave Timeout	0.0 to 99.9 seconds. Time elapsed after the last data received from a master before the scanner considers the data to be out of date. Programming 0 disables the timeout, and PV data will be displayed indefinitely despite not being updated regularly.
Externally Powered Back-light:	**Voltage Range** / **Maximum Power** **9-30 VDC** — 9 VDC: 0.2 W; 12 VDC: 0.25 W; 24 VDC: 0.5 W; 30 VDC: 0.75W

4-20 mA Transmitter Output

Output Source	Modbus PV 1-16, math channel 1-4, rate/process, total, grand total, or disabled
Scaling Range	4.000 to 20.000 mA for any display range.
Disable	If disabled, the output will output 3.2 mA
Calibration	Factory Calibrated: 0.0 to 1000.0 = 4-20 mA output
Underrange	Output Underrange: 3.8 m
Overrange	Display Overrange: 20.5 mA. Output Overrange: 20.5 mA
Accuracy	± 0.05% span ± 0.004 mA
Temperature Drift	32.1 µA/°F max from -40°F to 158°F (-40 to 75°C) ambient
External Loop Power Supply	30 VDC maximum
Output Loop Resistance	**Power Supply** / **Minimum** / **Maximum** 24 VDC: 10 Ω / 750 Ω 30 VDC: 100 Ω / 1100 Ω

Open Collector Outputs

Output Assignment	Two open collector pulse outputs Out 1 and Out 2.
Rating	Isolated open collector, off: 24 VDC max, on: <1 V @ 150 mA max
Alarm Output	Assign to Modbus PV 1-16, math channel 1-4, or rate for high or low alarm trip point. Assign to total or grand total for total or grand total alarms.
Alarm Deadband	0-100% FS, user selectable
Alarm Acknowledge	Front panel SCAN/ENTER button resets output and screen indication.
Pulse Output Count	The pulse output count (COUNT) is programmable from 0.000001 to 9999999. PV and math channels generate a frequency equal to the PV or math value divided by the Count value. Rate pulses are generated at a rate of one output pulse per Count value. Total and grand total pulses are generated for every total or grand total increment selected (e.g. Count value of 100 will generate one pulse every time the total is incremented by 100 units). Pulse rate retransmission outputs one to one for input pulses, up to maximum output speed. Count is not used for retransmitting outputs.
Pulse Output Pulse Width	Unless otherwise stated, pulses are 50% duty cycle for required frequency. A pulse rate retransmit output will generate 100 to 130 µs pulses at the falling edge of every input pulse.
Pulse Output Maximum Frequency	5 kHz, pulse width at 50% duty cycle. If the outputs exceed 5 kHz, the scanner will display pUlse OVERRNG
Quadrature Output	Output set to quadrature will lag the other pulse output by 90° (1/4 duty cycle) at output frequency. Minimum 1 Hz
Timer Output	Programmable on and off time, repeating cycle. Minimum period 0.1 second, maximum 100,000 seconds. Minimum pulse time 0.01 second, maximum 10,000 seconds.

Product Ratings and Approvals

FM	ATEX	IECEx	CSA
Class I, Division 1, Groups B, C, D **Class II, Division 1, Groups E, F, G** **Class III, Division 1; T6** **Class I, Zone 1, AEx d IIC T6 Gb** **Zone 21, AEx tb IIIC T 185°F** **Ta = -40°F to 167°F (-40°F to 167°F)** **Enclosure: Type 4X & IP66** **Certificate number: 3040391**	**II 2 GD** **Ex d IIC T6 Gb** **Ex tb IIIC T185°F Db IP68** **Tamb -40°F to 167°F (-40°F to 167°F)** **ATEX Certificate: Sira 10ATEX1116X**	**Ex d IIC T6 Gb** **Ex tb IIIC T185°FC Db IP68** **Ta = -40°F to 167°F (-40°F to 167°F)** **IECEx Certificate: IECEx SIR 10.0056X**	**Class I, Division 1, Groups B, C, D** **Class II, Division 1, Groups E, F, G** **Class III, Division 1;** **Ex d IIC T6** **Enclosure Type 4X, IP66/68:** **Ta = -40°F to 167°F (-40°F to 167°F)** **Certificate number: 2325749**

Serial Communications

Protocol	Processes and displays data read from Modbus RTU slave devices. Up to 16 process variables (PVs) from up to 16 slave devices. Each PV programmed individually.
Scanner ID	1 – 247. Specifies the address of the PD6830X.
Baud Rate	1,200; 4,800; 9,600; 19,200; 38,400; 57,600; or 115,200 bps
Transmit Time Delay	Programmable between 0 and 199 ms
Parity/Stop Bit	Even, odd, none with 1 stop bit, or none with 2 stop bits
Byte-to-Byte Timeout	Max of 1.5 character times or 750 µs

Popular Models

Model Number	Description
7804B-AX0	Explosion-Proof Modbus Scanner Indicator

Accessories

Model Number	Description
7800A-6846	Steel Pipe Mounting Kit
7800A-6846SS	Stainless Steel Pipe Mounting Kit
7800B-002	¾" M-NPT to ½" F-NPT Approved Reducer

Customer Service and Support

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Tek-Trol is a fully owned subsidiary of TEKMATION LLC. We offer our customers a comprehensive range of products and solutions for process, power, and oil and gas industries. Tek-Trol provides process measurement and control products for Flow, Level, Temperature and Pressure Measurement, Control Valves and Analyzer systems. We are present in15 locations globally and are known for our knowledge, innovative solutions, reliable products, and global presence.

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