- 8 Relay outputs (5A, 250VAC contacts)
- 8 Analog Inputs (10 bit) jumper-selectable for 0-5V or 0-20mA
- Pulse output countdown timers for relays
- RS485 or USB (virtual serial port)
- Can be used as a USB to RS485 converter
- Watchdog Timer resets the unit when communication from the network master is lost
- Connections via Pluggable Screw Terminals
- 1200-115200 Baud Modbus Slave Device

The KTA-226 is a Modbus Slave IO module for interfacing to any PLC or PC using the Modbus protocol. It behaves as a Modbus Slave and is controlled by writing to and reading from the Coils and Holding Registers. It can be used for many applications such as controlling lights and sprinkler systems, reading sensors and monitoring switches and other digital signals, or even for industrial control.

A pulse output feature allows the user to command one or more relays to switch on for a desired number of milliseconds.

The module can connect to a standard RS485 2-wire half duplex network or to a computer via USB. When connected via USB, the module acts as a USB to RS485 converter and multiple IO units (or other Modbus devices) can be connected to the RS485 bus. USB drivers are available for Windows, Mac and Linux.

The user can save a set of output statuses to be loaded when the unit is powered up or reset. A watchdog timer can be configured to reset the unit after a user-definable number of seconds since the last communication from a Modbus master.

12V (KTA-226) and 24V (KTB-226) versions are available.

Specifications:

Power Supply Vs and COM:
KTA-226: 9-16V DC (12V Nominal) ~200mA + External 5V drain
KTB-226: 18-32V DC (24V Nominal) ~200mA + External 5V drain
Analog Input ANx:
0-5V: ~500kΩ effective resistance with no jumper installed
0-20mA: ~250Ω effective resistance with jumper installed
Relay Outputs: SPDT relays rated to 5A (resistive). 250VAC / 30VDC
5V Auxiliary Supply 5V: 200mA

Connections:

Label	Description
ANx	Analog Input x
COM	Common Connection (Ground)
D+	RS-485 Data+ Connection
D-	RS-485 Data- Connection
5VO	Auxiliary 5V output
COM	Common Connection (Ground)
V+	12V / 24V Power Supply Positive Input
COM	Common Connection (Ground)
USB	USB connection to computer
NO	Relay Normally Open Contact
C	Relay Common Contact
NC	Relay Normally Closed Contact

Table 1 - Connections

Jumper Settings:

The analog inputs of the KTA-226 can be set for 0-5V or 0-20mA operation. Opening the case and inserting jumper shunts in the positions J1 to J8 will set the corresponding analog input to 0-20mA operation. Removing the shunts will set the analog inputs to 0-5V operation. The KTA-226 is equipped with protection on the analog inputs, but excessive voltage or current could damage the microcontroller and should be avoided.

Communicating with the KTA-226:

By default, the KTA-226 communicates at 9600 8N1 (8 data bits, no parity, 1 stop bit) with the Modbus slave address of 1. These settings can be changed by altering holding registers in the unit. If the unit has unknown serial settings, it can be temporarily reset to the default by connecting SCL and SDA (or Digital 12 and 13) internally and powering up the device. The baudrate, parity or Modbus address must be written to or the unit will return to its previous, unknown state the next time it is powered up.

A computer can connect to the unit via USB. The USB circuit is based on the FTDI FT232 series of convertors and virtual serial port drivers are available from FTDI for Windows, Mac and Linux. Ocean Controls has a range of Windows utilities for communicating to Modbus slave devices, including Modbus View and ISEE Modbus.

The USB circuitry works as a USB to RS485 converter. A single KTA-226 can be plugged into a computer via USB, and a chain of up to 32 KTA-226 or other RS485 devices can be connected to the serial bus.

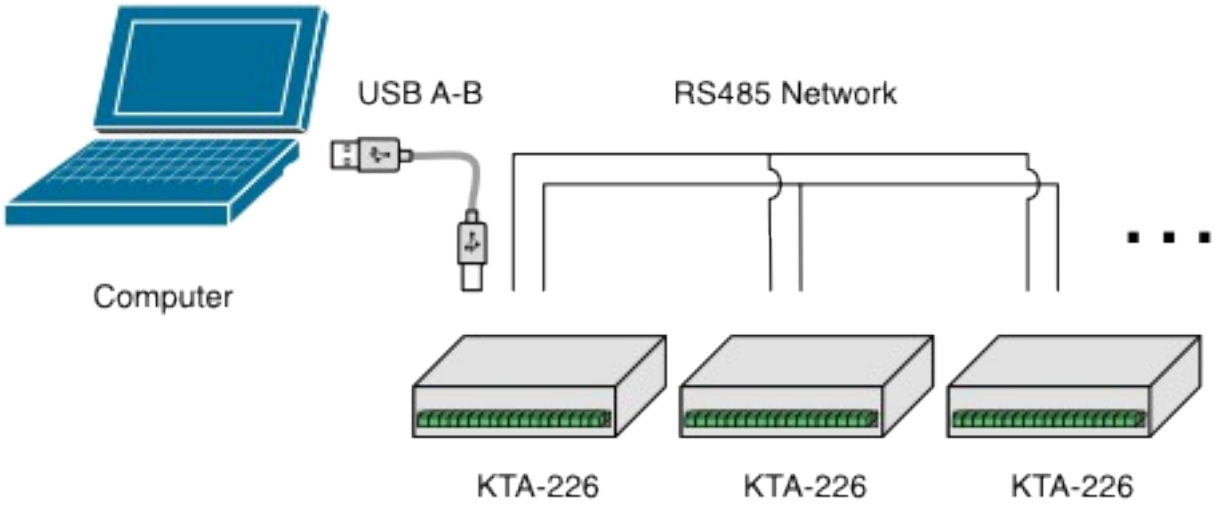


Figure 1

A PLC (or computer with the appropriate convertor) can connect to the unit via 2-wire RS485 serial at the D+ and D- terminals. In the case of a 3-wire network, the signal ground can be connected to any one of the COM terminals.

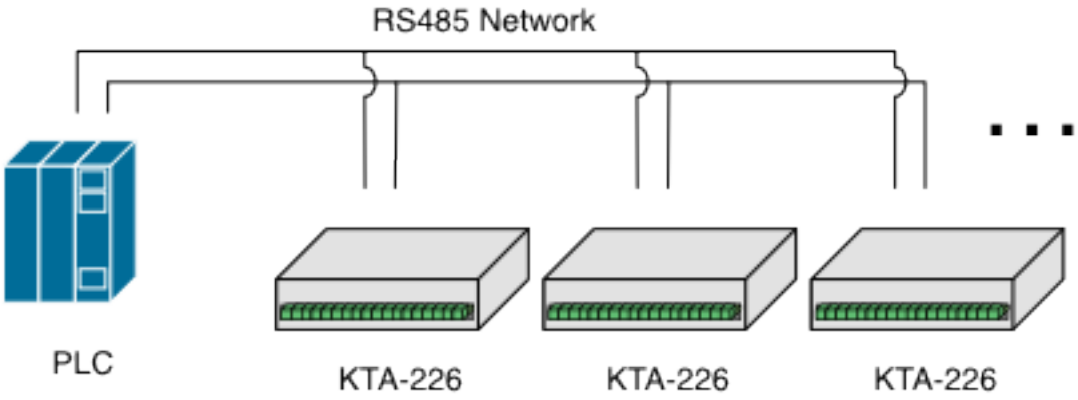


Figure 2

Modbus Registers:

Modbus is an industrial serial control protocol. A Modbus master (usually a PLC or PC) polls slave devices, asking for their status or commanding them to change an internal parameter. The specification defines coils, holding registers, input statuses, and input registers. Coils represent relays. Input registers are 16 bit input values, such as the KTA-226's analog inputs. Holding registers are internal registers of the slave. Input statuses are digital inputs.

While the KTA-226 doesn't have digital inputs, the analog inputs could be used as digital inputs. If the value of an analog input is greater than 50%, the corresponding input status is set high.

To simplify communications some Modbus systems only use coils and holding registers. The KTA-226 replicates the analog inputs 1-8 onto holding registers 40,001-40,008 to make interfacing to the unit simpler. It also replicates the digital version of the inputs used for input statuses 10,001-10,008 onto coils 9-16.

The table below shows the mapping of inputs and outputs (and special configuration registers) to holding registers, coils, input statuses and input registers.

Holding Register	Function
40001	AN1
40002	AN2
40003	AN3
40004	AN4
40005	AN5
40006	AN6
40007	AN7
40008	AN8
40009	Relay 1 pulse countdown
40010	Relay 2 pulse countdown
40011	Relay 3 pulse countdown
40012	Relay 4 pulse countdown
40013	Relay 5 pulse countdown
40014	Relay 6 pulse countdown
40015	Relay 7 pulse countdown
40016	Relay 8 pulse countdown
40017	Watchdog time in seconds
40018	Modbus Slave Address
40019	Serial Baudrate
40020	Serial Parity

Coil	Function
00001	Relay 1
00002	Relay 2
00003	Relay 3
00004	Relay 4
00005	Relay 5
00006	Relay 6
00007	Relay 7
00008	Relay 8
00009	AN1 > 50% Flag
00010	AN2 > 50% Flag
00011	AN3 > 50% Flag
00012	AN4 > 50% Flag
00013	AN5 > 50% Flag
00014	AN6 > 50% Flag
00015	AN7 > 50% Flag
00016	AN8 > 50% Flag

Input Register	Function
30001	AN1
30002	AN2
30003	AN3
30004	AN4
30005	AN5
30006	AN6
30007	AN7
30008	AN8

Input Status	Function
10001	AN1 > 50% Flag
10002	AN2 > 50% Flag
10003	AN3 > 50% Flag
10004	AN4 > 50% Flag
10005	AN5 > 50% Flag
10006	AN6 > 50% Flag
10007	AN7 > 50% Flag
10008	AN8 > 50% Flag

Table 2 - Modbus Function Map

The analog inputs are continuously sampled and presented as input registers and at the holding registers 40005-40007. The analog converter is 10 bit. 5V (or 20ma) is represented by the value 1023. (0x3FF)

The pulse countdown timers activate their corresponding relays and an internal timer reduces the counters by 1 every millisecond. If the values of these registers is non-zero, the relay will be active. Writing 1000 to holding register 40009, for example, will cause relay 1 to switch on for one second and then switch off. This feature takes precedence over a write to the coil during the timing period. If the coil is already on at the start of the pulse it will stay on for the number of milliseconds specified then switch off.

The Watchdog Timer defines a length of time in seconds to wait after the last communication from a Modbus master before resetting. A value of 0 disables the timer. The reset state is the value of the holding registers and coils present when the serial settings registers (40018 – 40020) are written to.

For example: the user wishes the unit to reset and power up with coils 1-4 on, and for coil 8 to pulse on for one second to signal a reset. To do this, she waits until any countdowns have finished, then sets the coils 1-4 on and coils 5-8 off. She then writes a value of 1000 to coil 8's countdown register (40016), 5 seconds to the watchdog timer register (register 40017) and the Modbus slave address to register 40018. This stores the coil pattern and the countdown timer value to non-volatile memory as the reset state. If the unit doesn't receive a poll from the PLC for 5 seconds, it will switch coils 1-4 on, and pulse coil 8 on for one second. It will do this every 5 seconds until the PLC begins to communicate with it again.

The Modbus slave address can be any value from 1 to 247, as per the Modbus specification.

The value in register 40019 sets the serial baudrate and must be one of the values shown in Table 3

Register 40019	Baudrate
12	1200 baud
24	2400 baud
48	4800 baud
96	9600 baud
144	14400 baud
192	19200 baud
384	38400 baud
576	57600 baud
1152	115200 baud

Table 3 - Baudrate

The value in register 40020 must be one of the values in Table 4

Register 40020	Parity
0	No Parity
1	Odd Parity
2	Even Parity

Table 4 - Parity

Test Utility

A test utility is available at http://www.oceancontrols.com.au

The test utility speaks to the controller. The upper panel allows selection of the Modbus slave address, baud and parity. The button open and closes the serial port connection. By default the KTA-226 has an address of 1, baud of 9600 and no parity. Shorting D12 and D13 together inside the unit and turning the power on will reset these settings to their defaults.

The second panel allows the user to change the KTA-226's slave address, baudrate and parity.

When not connected to a sensor, it is normal for the analog inputs to show random readings. This is due to the highly-sensitive inputs picking up charge from the environment.

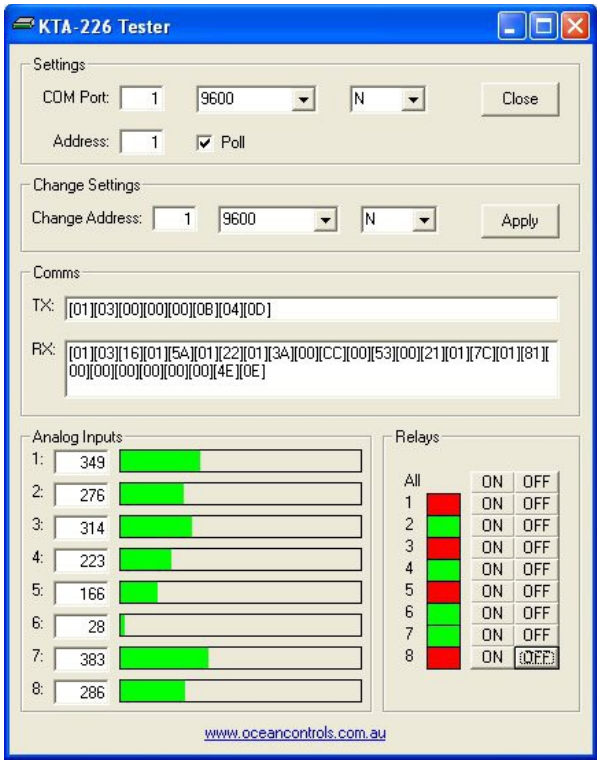


Figure 3 - KTA-226 Tester

Wiring:
Analog inputs can be wired for 0-5V or 0-20mA signals, depending on the position of the input jumper inside the unit. A regulated 5V output is provided for the convenience of wiring analog sensors like potentiometers.

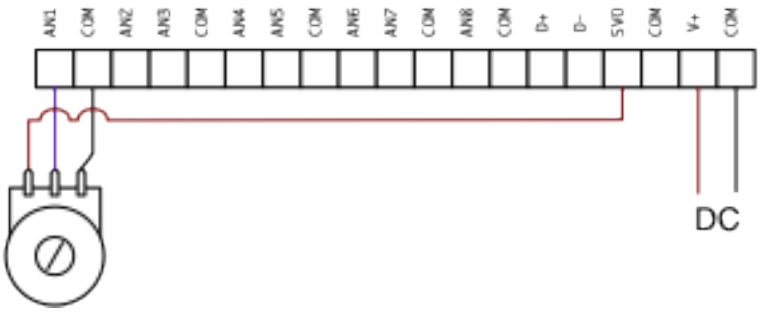


Figure 4 – Wiring a potentiometer

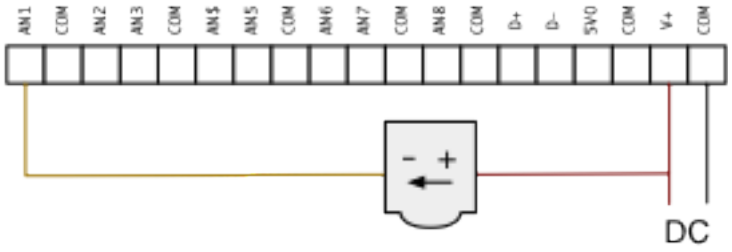


Figure 5 – Wiring a 4-20mA loop-powered sensor

The analog inputs can be connected to digital sensors. The figures below show the wiring for a dry-contact switch and an NPN-type sensor.

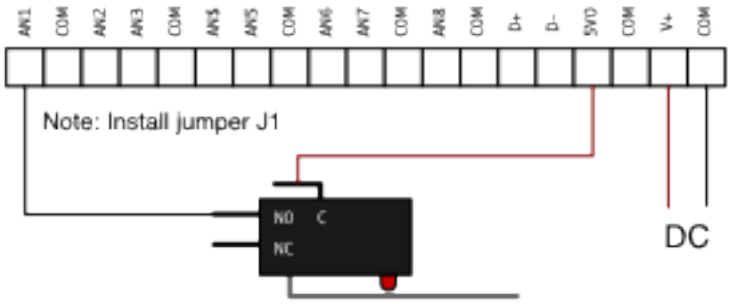


Figure 6 – Wiring a dry contact switch

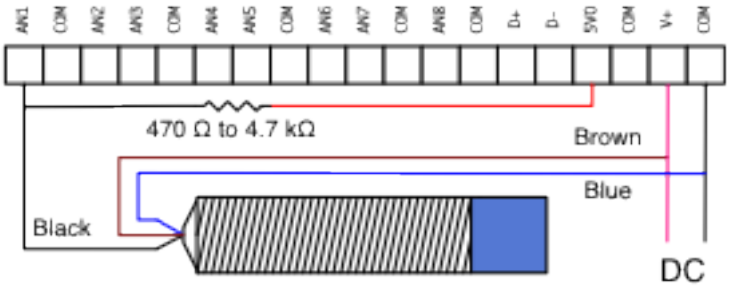


Figure 7 – Wiring an NPN type sensor

The relay outputs on the KTA-226 can be wired to DC or AC loads.

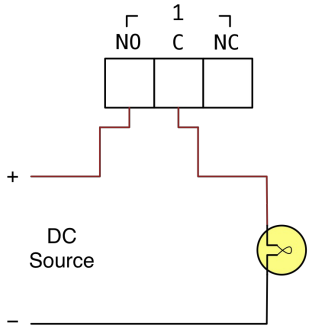


Figure 8 - Wiring a simple DC load

Inductive loads at high currents cause large voltage spikes when turned on or off, and this can disrupt sensitive electronics. For large inductive loads, a snubber is recommended. A DC load can be bypassed with a circulation diode. An AC load requires an RC snubber across the relay contacts. Ensure that diodes, resistors and capacitors used for snubbers are correctly rated for the load and voltage being switched.

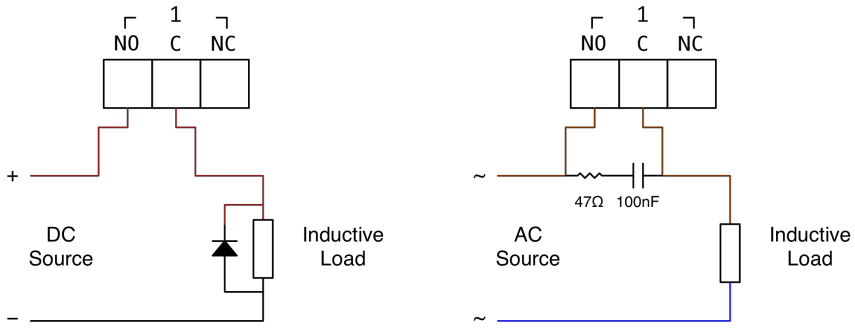
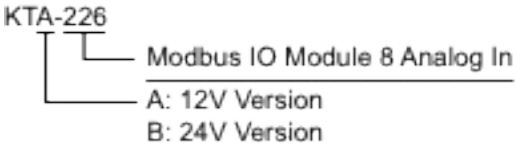


Figure 10 – AC and DC Snubbers

Selection Guide:



Licensing:

The KTA-226 hardware is derived from the KTA-225 and the schematics and CAD files are available under Creative Commons Attribution Share-Alike licenses. All rights to the firmware are retained by Ocean Controls and will not be released. Contact info@oceancontrols.com.au for more information.

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CERTIFICATE OF CONFORMITY

Certificate No.: SEM13091702

The following product has been tested by SEM.Test Compliance Service Co., Ltd. with the listing standards and found in conformity with the **EC Council Directive of 2004/108/EC & 2006/95/EC.** It is possible to use CE marking to demonstrate the conformity with this **EMC Directive.**

Report No.	:	STR13098324E
Applicant	:	Ocean Controls
Address	:	Factory 3 / 24 Wise Ave Seaford Victoria Australia
Manufacturer	:	Ocean Controls
Address	:	Factory 3 / 24 Wise Ave Seaford Victoria Australia
Description of Product	:	8 Relay 8 Analog USB IO Controller
Model No.	:	KTA-225,v3
Trade Name	:	Ocean Controls
Test Standards	:	**EN 61000-6-1:2007**
		EN 61000-6-3:2007+A1:2011

The referred test report(s) show that the product complies with the essential requirements in the above listed standards. The applicant is authorized to use this certificate in connection with the EC declaration of conformity according to Annex 1 of the Directive.

CE

Test Laboratory

Shenzhen SEM.Test Technology Co.,Ltd.

Jandy So
Supervisor
Date of Issue: Nov 15, 2013

This certificate of conformity is based on a single evaluation of the submitted sample(s) of the above mentioned product. It does not imply an assessment of the whole production and other relevant Directives have to be observed.

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