MODULUS

COMBO Input/Output Modules

with 8 Universal Analog Inputs

Modulus COMBO Input/Output modules extend the I/O capacity of Modulus SCADA controllers, as well as the many 3rd party devices that support industry standard communications protocols such as Modbus, DF1, SDI-12 and Ethernet IP.

COMBO modules are available with 12/24V or 120/240V Discrete Inputs. Both AC and DC signals are supported.

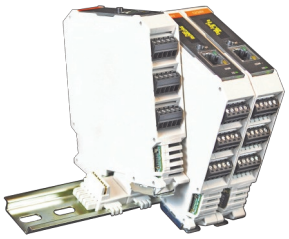
Modulus COMBO I/O modules have built-in web pages for configuration, programming, monitoring and manuals. No application software is needed; just a web browser. Custom user documentation can also be loaded into the module, so that drawings, datasheets, etc. are always available for site support and maintenance.

12/24V discrete input models

8x-3004 8DI, 4DO, 8UI
8x-3005 8DI, 4DO, 8UI, 4AI
8x-3014 8DI, 4DO, 8UI, 4AO

120/240V discrete input models

8x-3104 8DI, 4DO, 8UI
8x-3105 8DI, 4DO, 8UI, 4AI
8x-3114 8DI, 4DO, 8UI, 4AO



Modulus COMBO I/O Module

- **8 DISCRETE INPUTS (OPTICALLY ISOLATED)**
- **4 DISCRETE OUTPUTS (RELAY)**
- **8 UNIVERSAL ANALOG INPUTS (w/SENSOR CONDITIONING)**
- **4 OPTIONAL ADDITIONAL ANALOG INPUTS OR OUTPUTS**
- **1 ETHERNET PORT**
- **2 SERIAL PORTS (BUS PORT PLUS 1 GENERAL PURPOSE PORT)**

STANDALONE OPERATION

Modulus COMBO I/O modules can serve as standalone devices with SCADA communications, local and web human machine interfaces (HMIs), trending and data logging, alarming, reporting, and programmable logic control.

COMMUNICATIONS

COMBO modules have an Ethernet port and two serial ports to communicate directly with Modbus devices, as well as Allen Bradley PLCs. Ethernet to Serial bridging is also supported. The module can also serve as a communications concentrator or master controller.

GRAPHICAL, MOBILE, AND LOCAL HMIs

Configurable graphical web and mobile device interfaces are built into COMBO modules. The front panel display can also be customized to show live process values and states, and make setting changes.

HISTORICAL TRENDING AND EVENT LOGGING

COMBO modules have an internal solid state flash disk, as well as a micro SD memory card slot to record over 100 years of data! You can retrieve and display historical data with built-in web tools and extract trend and event data as spreadsheet files.

REPORTING

Reports can be created in minutes showing live values, production totals, trend and event data, alarm summaries, etc. Customize reports with your own logos and graphics. Call up reports on demand, or have them automatically transferred to your computer.

ALARMING

A COMBO module can manage alarm conditions on any of it's local inputs, as well as over 500 conditions monitored by communications with other devices. Alarms conditions can be displayed locally and annunciated by a contact closure on one of its outputs, or in tandem with other devices such as a Modulus Cellular Communications module (for text message and e-mail alerts). The module maintains a journal spreadsheet file of when alarms occurred, when they were acknowledged, by whom, and when the alarm conditions cleared.

PROGRAMMABLE LOGIC

Each COMBO module supports programmable logic written in any mix of ladder logic, function block and text languages. Programmable logic can be used for anything that can't be done with the built-in functions of the module.

PID AND PUMP CONTROL

COMBO modules support four Proportional, Integral and Derivative (PID) loops and have a built-in triplex Pump Controller (float or level control with alternation).

REDUNDANCY

COMBO I/O modules support redundancy for enhanced reliability. If a module goes off-line, a designated backup can take over automatically.

ICL

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Modulus COMBO (8 Universal Analog Inputs) I/O Module Specifications

FIELD I/O

Digital Inputs:	**8**	Optically Isolated, bipolar (AC/DC, not polarity sensitive)
I/O Range:		**[8x-3004, 8x-3005, 8x-3014]** 0 to 30V (OFF < 6V, ON>9V), **60V absolute maximum** **[81-3104, 81-3105, 81-3114]** 0 to 240V (OFF < 60V, ON>90V), **300V absolute maximum** **[82-3104, 82-3105, 82-3114]** 0 to 120V (OFF < 60V, ON>90V), **160V absolute maximum**
I/O Current:		**[8x-3004, 8x-3005, 8x-3014]** 1.2mA @ 12V, 3mA @ 24V **[8x-3104, 8x-3105, 8x-3114]** 1.2mA @ 120V, 3mA @ 240V
Filtering		Individually configurable: 5Hz, 10Hz, 20Hz, 50Hz, 100Hz, 500Hz, 1KHz, 2KHz+
Digital Outputs:	**4**	Relay contacts, Form A (normally open)
Contact Output Rating:		240/277 Vac, 30Vdc, 3A maximum per output (resistive load). **Do not exceed 8A on any group of 4 outputs on a terminal block.** A snubber diode (DC) or RC snubber (AC) must be used across the relay contacts or load connections for **any** inductive load.
Universal Analog Inputs:	**8**	16-bit, Delta Sigma, individually selectable input ranges
Input Ranges:		• 20mA (minimum input for full accuracy is 0.5mA) • 5V and +/- 5V, 10V and +/- 10V, 30V • +/- 250mV • 50K ohms • J, K, T, E, R,S, B, N thermocouple (ungrounded type) • Thermistor - 2.2K, 10K (type II, II and 11.K shunt) • 10Ω Cu RTD, 100Ω Pt RTD (2/3 wire), 1KΩ RTD (2 wire), 3-wire RTDs requires use of two analog inputs
Maximum signal level		35Vdc on any range

OPTIONAL FIELD I/O

		Either one of the below options can be added to the base configuration
Analog Inputs (option)	**4**	16-bit, Delta Sigma, individually selectable input ranges
Input Ranges:		• 20mA (minimum input for full accuracy is 0.5mA) • 5V and +/- 5V, 10V and +/- 10V, 30V • +/- 250mV • 65K ohms • J, K, T, E, R,S thermocouple (ungrounded type) • 2.2K, 10K (type II, II and 11.K shunt) • 1KΩ RTD (2 wire)
Analog Outputs (option)	**4**	12-bit
Output Ranges:		• 20mA

COMMUNICATIONS

Ethernet:	**1**	10/100mb/s (10/100 Base-T)
SCADA Protocols		Modbus TCP & UDP (master/slave), Ethernet IP (master/slave), Ethernet to Serial bridging
Internet Protocols		HTTP (server), FTP (server & client), ICMP (ping; server and client), NTP (client), DHCP (server & client), DNS, DDNS
Serial:	**1**	RS-485 (This port is available if not used for bus communications with other modules.)
	1	RS-232, RS-485, RS-422, SDI-12 (This port is always available for general purpose communications.)
Baud Rates		115K, 38.4K, 19.2K, 9600, 4800, 2400, 1200 baud
Protocols		Modbus RTU (master/slave), DF1 (slave), SDI-12 (general purpose port only)

HMIs

Local:	128x32 graphical, wide temperature range yellow OLED and single pushbutton
Graphical:	Web based, graphic library included. Compatible with most browsers, including Internet Explorer, Firefox, Chrome, Safari, Android
Mobile:	Web based, text only, up to 50 registers. Compatible with most browsers, including Internet Explorer, Firefox, Chrome, Safari, Android

PROGRAMMING

Languages:	Ladder Logic, Function Block, Text—built-in web based graphical and text editor and debugger
Capacity:	32KB logic, 2MB source code

STORAGE

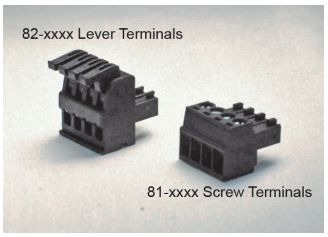
Registers:	504 Numeric registers, 504 Boolean registers
Internal Flash disk:	32MB
Removable disk:	Micro SD Card (up to 256GB, supplied by customer)

CLOCK

Real Time Clock:	Temperature compensated with 3-day super-capacitor auto-recharge backup power
Stability	+/- 3ppm from –30°C to 70°C

GENERAL

I/O Power:	10Vdc to 30Vdc
Power Consumption (average)	
Not using Ethernet, relays OFF	18mA @ 12Vdc / 13mA @ 24Vdc (Ethernet power saver enabled)
Using Ethernet, relays OFF	78mA @ 12Vdc / 43mA @ 24Vdc
Additional current per relay ON	10mA @ 12Vdc / 5mA @ 24Vdc
Additional with AI option	10mA @ 12Vdc / 5mA @ 24Vdc
Additional with AO option	Loop current from I/O power (20mA @ 12Vdc / 20mA @ 24Vdc per output used)
Field Wiring Termination:	**[81-3xxx]** screw terminal blocks **[82-3xxx]** lever terminal blocks, 3.5mm, 22 to 14GA wires
Temperature:	-40°C to 70°C (operating), -40°C to 85°C (storage)
Humidity:	<95% RH (non-condensing)
Enclosure:	Polyamide, light gray (RAL 7035)
Mounting:	35mm DIN rail with bus connector block



Specifications subject to change without notice. Consult factory to ensure that you are working with current information.

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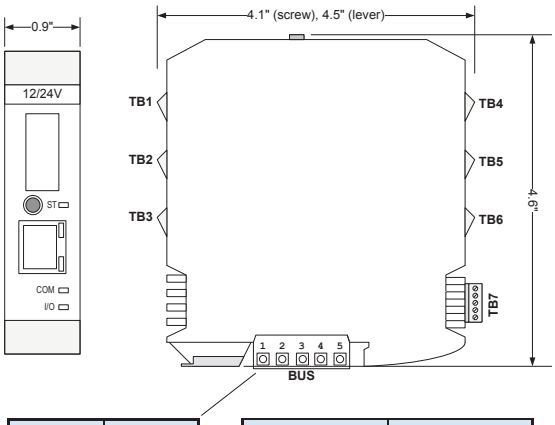
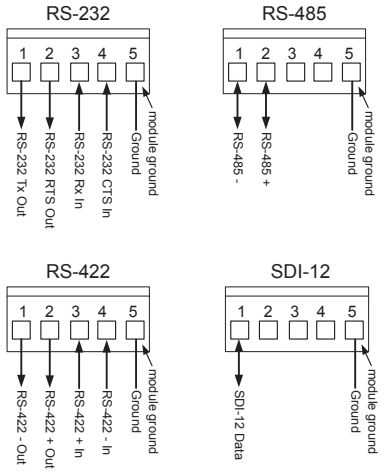
Modulus COMBO (8 Universal I/Os) I/O Module DIMENSIONS and WIRING



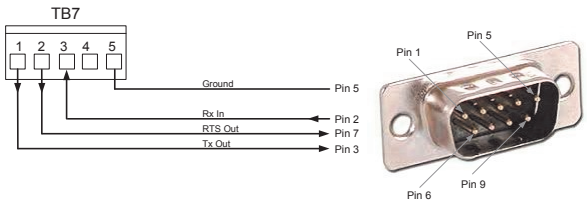
Terminal	Function
1	-485
2	+485
3	RESET#
4	GND
5	+V

Terminal Block	Inputs/Outputs
TB1	DI1 - DI4
TB2	DI5 - DI8
TB3	DO1 - DO4
TB4	UI1 - UI4
TB5	UI5 - UI8
TB6	optional AI/AO

General Purpose Communications Port TB-7
(modes are software configured)

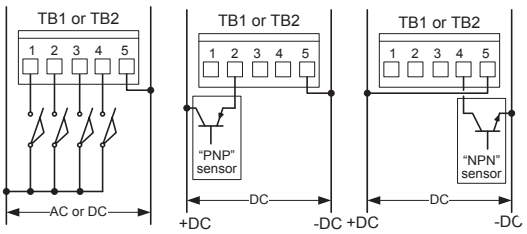


Typical RS-232 Wiring to Modem/Radio



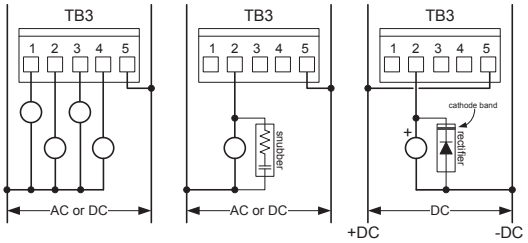
Refer to the installation manual for additional installation details and precautions.

OPTICALLY ISOLATED DISCRETE INPUTS



The discrete inputs on a terminal block share a common with only the inputs on that same block and are isolated from all other I/O points.

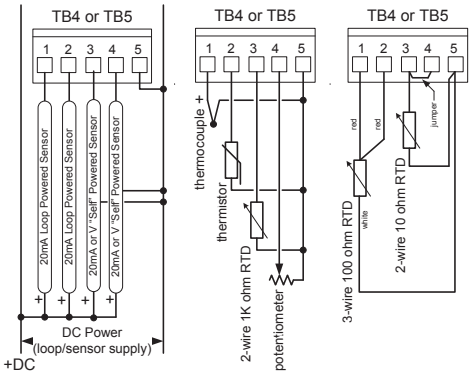
RELAY OUTPUTS



The relay outputs on terminal block 3 share a common with only the other outputs on that same block and are isolated from all other I/O points.

A snubber diode (DC) or RC snubber (AC) must be used across the relay contacts or load connections for **any** inductive load.

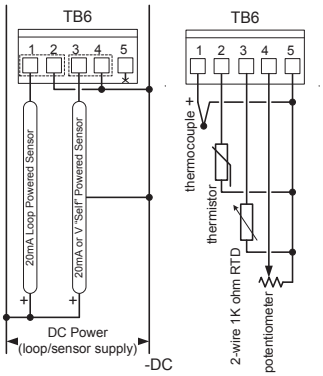
UNIVERSAL ANALOG INPUTS



The analog inputs on terminal blocks 4 and 5 share a common that is isolated from all other I/O points.

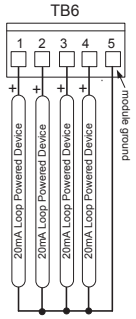
Note that 3-wire RTD sensors utilize two analog inputs per sensor.

OPTIONAL ADDITIONAL ANALOG INPUTS (TB6)



The optional analog inputs on terminal block 6 share a common that is isolated from all other I/O points. These inputs support 20mA and voltage signals, as well as 2-wire sensors (3-wire RTDs are not supported).

OPTIONAL ANALOG OUTPUTS (TB6)



The optional analog outputs on terminal block 6 share a common with the module main input power. The power is also utilized as the source for analog output loop power. Typically this is 24Vdc.

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