Modulus Serial Communications modules provide up to three serial ports (bus port plus two general purpose ports) for interfacing with external radios, modems and intelligent control and monitoring devices such as variable frequency drives and power monitors. The bus port may also be used for general purpose RS-485 communications when not bussed with other Modulus I/O. Each port operates independently as a master or slave using industry-standard protocols such as Modbus, DF1, SDX (AES-128 encryption), and SDI-12. The modules also have an Ethernet port supporting Modbus, Ethernet IP, MQTT, and SDX protocols, as well as Ethernet-Serial bridging and Ethernet Routing.

The Serial Communications modules have built-in analog and digital I/O for tank level and process monitoring, and pump control applications such as wells, lift stations and booster pumping stations. The modules may be ordered with analog inputs supporting either mA, voltage or resistance/temperature measurement. In addition, they have five discrete inputs (one high-speed and four optically isolated), and a discrete output. These modules have 2 high-quality audio outputs that under program control, can play up to 1000 different MP3 audio segments through a public address or audio radio system. They can also vocalize the values of real-time data in any storage register in multiple common languages.

**STANDALONE OPERATION**
Modulus Serial Communications modules can serve as standalone devices with SCADA communications, local and web human machine interfaces (HMIs), historical trending and data logging, alarming, reporting, and programmable logic.

**COMMUNICATIONS**
Modulus Serial Communications modules have an Ethernet port and up to three serial ports to communicate with Modbus devices and Allen Bradley PLCs. They can serve as communications concentrators or master controllers, as well as providing web and data access to any other Modulus modules on the high-speed bus. They support Ethernet to Serial bridging, and routing through Ethernet ports in other Modulus modules on the bus.

**GRAPHICAL, MOBILE, AND LOCAL HMIs**
Configurable graphical and mobile device web interfaces, including the tools and libraries to build custom screens, are built in. The front panel display can also be customized to show live process values and states, and make setting changes.

**HISTORICAL TRENDING AND EVENT LOGGING**
Modulus Serial Communications modules have an internal flash disk, as well as a micro SD memory card slot to record over 100 years of data! Use built-in web tools to retrieve and display historical trend and event data and extract it as spreadsheet files.

**REPORTING**
Reports with custom graphics and logos can be created in minutes, showing live values, totals, trend/event data, alarm summaries, etc. They can be called up on demand, or sent out automatically.

**ALARMING**
A Modulus Serial Communications module can manage alarm conditions on any of it's local inputs and other Modulus I/O on the bus, as well as external devices via communications. Alarms condition can be displayed locally, and announced by text message, e-mail, and audible (public address) alerts. Alarms can be acknowledged by text message or e-mail, discrete input, or local HMI button. The module maintains a journal spreadsheet file of when alarms occurred, when they were acknowledged, by whom, and when the alarm conditions clear.

**PROGRAMMABLE LOGIC**
Modulus Serial Communications modules support programmable logic written in ladder logic, function block and text languages; all with 32-bit integer and floating point math. Programmable logic can supplement the built-in functions of the module.

**PID & PUMP CONTROL**
Modulus Serial Communications modules have a quad PID controller and a triplex pump controller (float or level control) with error detection and alarming. The Serial Communications Module is an ideal solution for SCADA operation of wells, lift stations, and booster pump stations.

**REDUNDANCY**
Modulus Serial Communications modules support redundancy for enhanced reliability. If a module goes off-line, a designated backup can take over automatically.
Modulus Serial Communications Module with Audio Out - Type 1120 - Specifications

FIELD I/O

Discrete Inputs: 1
- Input Range: Contact closure/open collector driver to ground, or 0 to 30Vdc (ON=<1.5V, OFF > 2.5V)
- Input Current: Approximately 0.5mA (internal current source)
- Filtering: Individually configurable: 5Hz, 10Hz, 20Hz, 50Hz, 100Hz, 1KHz, 2KHz, 5KHz, 10KHz+
- Input Range: 0 to 30V (OFF < 6V, ON>9V)
- Input Current: 1.2mA @ 12V, 3mA @ 24V

Discrete Outputs: 1
- Output Rating: 30Vdc, 2A maximum, current limited to approximately 2.25A.

Analog Inputs: 2
- Input Range:
  - [8X-5120]: 20mA (minimum input for full accuracy is 0.5mA)
  - [8X-5220]: 5V, +/-5V, 10V, +/-10V, 30V
  - [8X-5320]: 50K ohms, temperature using 2.2K, 10K (type II, III and w/11.K shunt) thermistors

COMMUNICATIONS

Ethernet: 1
- SCADA Protocols: Modbus TCP & UDP (master/slave), Ethernet IP (master/slave PLC5 & SLC5/05 emulation), SDX (AES-128 Encryption), MQTT, Ethernet to Serial bridging HTTP (server), FTP (server & client), E-mail (SMTP and POP3), ICMP (ping; server & client), NTP (client), DHCP (server & client), DNS, DDNS
- Serial: 1
  - RS-232, RS-485, RS-422, SDI-12 (COM1 - general purpose communications port.)
  - RS-232, RS-485, RS-422 (COM2 - general purpose communications port.)

Audio: 2
- 18-bit audio outputs, <0.2% Total Harmonic Distortion
- Formats:
  - Dedicated 32MB internal flash disk; up to 1000 audio file segments
  - MP3 compressed audio with automatic sample rate detection and playback; 320 kbit/s maximum

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: 64KB logic, 2MB source code, 32-bit integer and floating point math

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 lithium battery backup power
Stability: +/- 3ppm from –30°C to 70°C

GENERAL

Input Power: 10Vdc to 30Vdc
Power Consumption:
- Not using Ethernet: 18mA @ 12Vdc / 13mA @ 24Vdc (Ethernet power saver enabled)
- Using Ethernet: 78mA @ 12Vdc / 43mA @ 24Vdc

Field Wiring Termination:
- [81-5x20] screw terminal blocks
- [82-5x20] 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.
Modulus Serial Communications Module with Audio Out - Type 1120—Communications Port Wiring

DIMENSIONS and CONNECTIONS

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-485</td>
</tr>
<tr>
<td>2</td>
<td>+485</td>
</tr>
<tr>
<td>3</td>
<td>RESET</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
<tr>
<td>5</td>
<td>+V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminals</th>
<th>TB1</th>
<th>TB2</th>
<th>TB3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DI1</td>
<td>AUDIO L</td>
<td>D2</td>
</tr>
<tr>
<td>2</td>
<td>AI1</td>
<td>AUDIO R</td>
<td>D3</td>
</tr>
<tr>
<td>3</td>
<td>A0</td>
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<td>D4</td>
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<td>DO1</td>
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<td>D5</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>DIC</td>
<td></td>
</tr>
</tbody>
</table>

General Purpose Communications Port COM1
(modes are software configured)

General Purpose Communications Port COM2
(modes are software configured)

Typical COM1 and COM2 RS-232 Wiring to Modem/
Refer to the installation manual for additional installation details and precautions.

**Discrete Input DI1, Discrete Output DO1 & Analog Inputs —TB1**
The field wiring may be connected directly to the TB1 terminal block, or through a field Wiring Panel as shown in the diagrams below. All discrete inputs/outputs and analog inputs are referenced to the ground terminal (5). This terminal is connected internally to the power supply ground.

The Discrete Input accepts a contact closure or open-collector (“NPN” style) input signal. An external pull-up resistor is not required.

The Discrete Output sources current by switching the module input power to the output terminal.

The 8x-5160 model has analog Inputs that accept 20mA current signals. Loop powered (Figure A) and self-powered (Figure C) devices are supported. In power conserving applications, the analog sensors may be powered from the Discrete Output (Figure B), configured to switch power to the sensors only when needed to take an analog reading (with configurable “warmup” time).

The 8x-5260 model has analog Inputs that support voltage sensors (+/-5v, +/-10v and 30v) while the 8x-5360 model supports resistance sensors including thermistor type temperature sensors. The wiring for these sensors is shown in Figure D below.

Note that for loop powered devices, model 82-01xx Field Wiring Panels should be used. For self-powered devices, either model 82-00xx or 82-01xx Field Wiring Panels may be used.

**Audio and Push-to-Talk Outputs—TB2**
Audio Out Comm modules add two high-quality audio output channels and a transistor “open collector” Push-to-Talk discrete output to the base module. These can be used to announce audio messages over a public address or audio radio system. The field wiring to these outputs may be connected directly to the TB2 terminal block, or through an 82-02xx Field Wiring Panel as shown in the diagrams below.

The Audio Outputs have both left and right channels, along with a “Push-to-Talk” open collector output that will switch to ground when audio is playing. This can be used to activate the output of a public address amplifier, or key an audio radio transmission when audio is being played.

**8x-5160 (20mA Analog Inputs)**

**FIGURE A**
20mA Loop Powered Sensors External Loop Supply

**FIGURE B**
Sensor Power from Discrete Output

**FIGURE C**
Self-powered 20mA Sensors

**8x-5260 (Voltage) and 8x-5360 (Resistance/Temperature) Analog Inputs**

**FIGURE D**
Voltage and Resistance Sensor Wiring

Note: Resistance sensors do not have a polarity.

Sensor power may be AC or DC of either polarity. It can be the same source as the module input power.