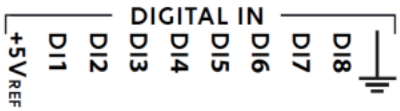
Using the IOX Connectors

To connect the IOX to a SmartServer IoT, use the USB C to USB A host cable included with the IOX to connect the USB C connector on the IOX to one of the four USB ports on a SmartServer IoT. If you have to connect more than four USB devices to a SmartServer IoT, connect a powered USB hub to one of the USB ports on the SmartServer IoT, and then connect the devices to the hub.

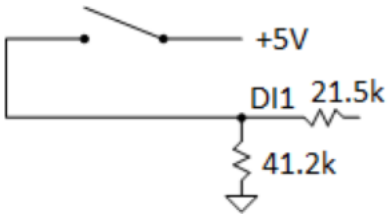
This page contains information regarding the following connections:

Connect to Digital Inputs

You can monitor up to eight digital inputs. The eight digital inputs, a 5V reference output, and a ground connection are available on the digital input connector, labeled as follows:



The digital inputs, 5V reference output, and ground are isolated to provide more flexibility in the digital signals that you can monitor. The digital inputs are not isolated from each other. The eight digital inputs support dry-contact as well as active digital signals of up to 31VDC with configurable thresholds. For a dry contact input, use the 5V reference and ground outputs plus a pull down resistor and series resistor as follows:

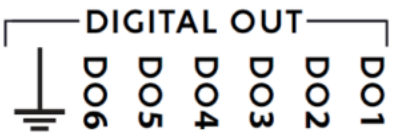


You can configure each of the eight inputs for any of the following:

- Digital level input with optional edge trigger on rising or falling edge; the input is debounced to prevent false triggers due to contact closure bouncing.
- DIN 43 864 compatible pulse count input supporting 30ms or longer low-high-low pulses; pulse counts are collected and reported over a configurable interval from once every second to once every 3600 seconds, with a default interval of 900 seconds.
- Frequency input with a range of 1Hz to 20kHz with a minimum resolution of <0.5% over the full measurement range and a configurable reporting interval from once every second to once every 3600 seconds, with a default interval of 10 seconds.

Connect to Digital Outputs

You can control up to six digital outputs. The six digital outputs and a ground connection are available on the digital output connector, labeled as follows:



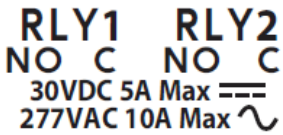
The digital outputs and ground are isolated to provide more flexibility in what you can control. The digital outputs are not isolated from each other. The outputs are open drain, can sink up to 100mA, and require an external pull up. You can configure each of the six outputs for any of the following:

- Digital level output.
- Frequency output with a range from 1Hz to 20kHz with a resolution of 0.005Hz.
- Pulse (oneshot) output, configurable with a normally high or normally low output, with a range from zero to 30 days with a resolution of 1ms. You can use this output to trigger a one-shot pulse, with a pulse width of up to 30 days, and a resolution of 1 ms.

- Pulse-width modulated output, configurable with a normally high or normally low output, with a range for the period for 2 ms to 30 seconds and a minimum resolution for the pulsewidth of 0.4% of the period.

Connect to Relay Outputs

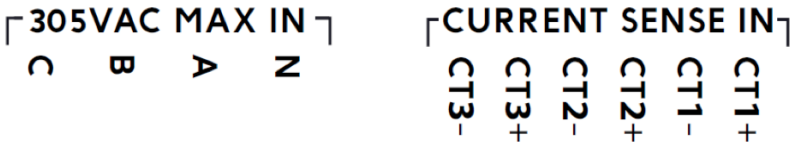
You can control up to two latching relay outputs. Each relay provides a normally open and a relay common output. When the relay output is active, the relay connects the normally open output to the relay common output. When the relay output is inactive, the normally open output is not connected to the relay common output. The outputs are available on two connectors, labeled as follows:



The relay contacts support up to 277VAC @ 10A or 30VDC @ 5A continuous, and up to 100A in-rush current for inductive loads.

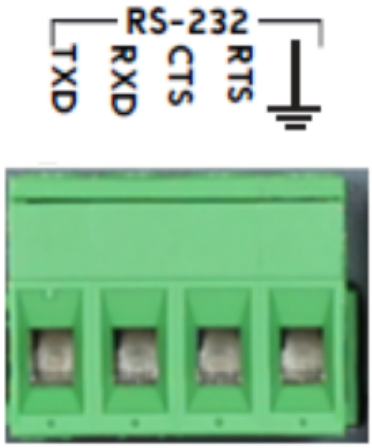
Connect the Energy Metering Input

If you are using the Model 41700-110 IOX with metering, you can monitor voltage, current, power, power factor, and energy usage of a one to three-phase AC line with an input voltage range of 100 – 277 VAC and power measurement accuracy of 0.5%. You must supply and connect an external current transformers (CT) for each phase to be monitored. The CT must output 0 – 0.333 VAC representing the load current passing through the CT. This requires an internal secondary burden resistor in the CT to convert the input current to a safe low voltage output. CTs with 0 – 0.333 VAC outputs are available to measure maximum loads of 5A to 6000A from multiple vendors including Continental Control Systems (see https://ctlsys.com/products/current-transformers/ and https://ctlsys.com/wp-content/uploads/2020/10/CTT-Solid-Core-Brochure.pdf) and Flex-Core (see the models with .333V secondary output at https://www.flex-core.com/products/low-voltage-current-transformers/). By default the IOX is configured for a CT with a 0 – 0.333VAC secondary output for a 0 – 5A primary load current. This is a 5A / 0.333VAC CT ratio. If you use a CT with a different CT ratio, configure the IOX for your CT as described in Metering Input. The voltage monitoring and current sense inputs are available on the energy monitoring input connectors, labeled as follows:



Connect an RS-232 Interface

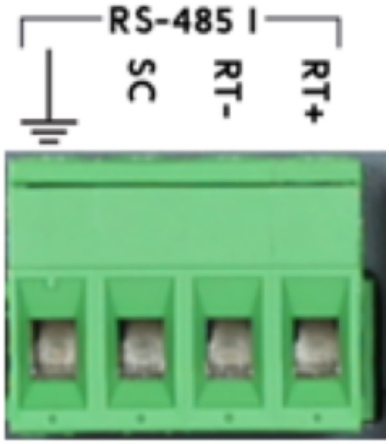
You can attach the IOX to a device with an RS-232 serial interface to enable a custom application that you develop and run on the attached SmartServer IoT to communicate with the device. To connect the RS-232 interface, connect the RS-232 transmit and receive signals labelled TXD and RXD on the RS-232 serial connector to your device, and also connect the ground connection to your device. Optionally, you can connect the Clear-to-Send (CTS) and Request-to-Send (RTS) signals on the RS-232 connector to your device. The interface is available on a removable green 4-pin connector as shown in the following figure.



The screw terminals on the RS-232 plugs accept 0.22mm – 3.3mm (22 – 12AWG) gauge solid wire. The optimum tightening torque for the screw terminals is 0.75 Newton-meters (6 lbs. in.) maximum. The ideal flathead screwdriver tip width for use with the screw terminal connectors is 3mm (0.12”). Strip wires to a length of 7mm (0.28”). You can use insulated cord pin end terminals to prevent fraying and inadvertent contact with adjacent terminals.

Connect the IOX to an RS-485 Interface

You can attach the IOX to an RS-485 network for communicating with Modbus RTU devices. The IOX includes an isolated RS-485 multi-drop bus interface. The interface is available on a removable green 4-pin connector as shown in the following figure.



The RS-485 receive/transmit connectors are labelled **RT+** and **RT-**. These connections are polarity-sensitive—**RT+** is positive and **RT-** is negative. Do not reverse the polarity of the RS-485 interface because it will cause improper bus operation.

The signal common (**SC**) pin provides a common signal reference ground. You can connect this pin to the shield of a shielded cable to improve noise immunity. You can connect the signal common to earth ground on no more than one device on an RS-485 channel. To connect **SC** to earth ground at the IOX, insert a jumper connecting **SC** to the earth ground pin to the left of the **SC** pin, and also connect the earth ground connector on the IOX power input to earth ground.

The screw terminals on the RS-485 plugs accept 0.22mm – 3.3mm (22 – 12AWG) gauge solid wire. The optimum tightening torque for the screw terminals is 0.75 Newton-meters (6 lbs. in.) maximum. The ideal flathead screwdriver tip width for use with the screw terminal connectors is 3mm (0.12”). Strip wires to a length of 7mm (0.28”). You can use insulated cord pin end terminals to prevent fraying and inadvertent contact with adjacent terminals.