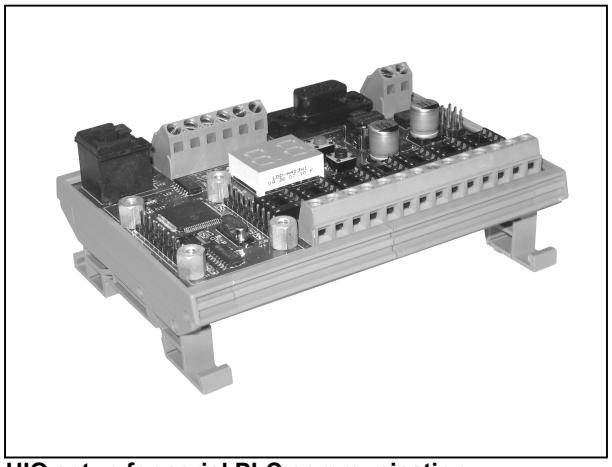
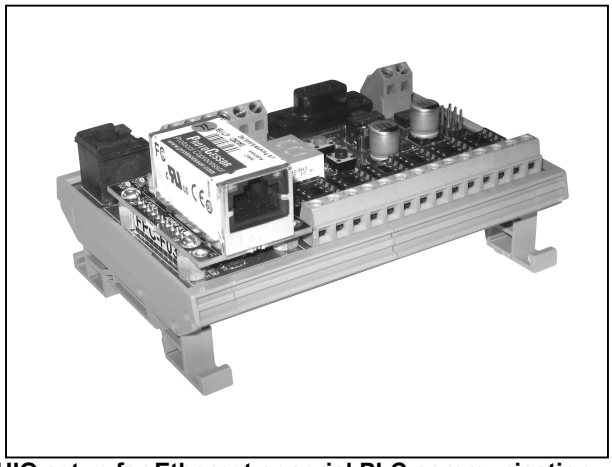
UIO Interface Module

Used In Scanner Mode for PLC Control Of EDI Distributors and VGC Gates



UIO setup for serial PLC communication



UIO setup for Ethernet or serial PLC communication

This document is intended to familiarize the reader with the concept of the UIO, and its interaction with the PLC and attached devices. It is not intended to be used as an installation guide.

- **For EDI distributors & VGC gates**
- **Control one or an entire network of devices**
- **On board 2 digit status display**
- **Long distance EDINet communication (4000')**
- **Field configurable operating modes**
- **Many serial and Ethernet PLC protocols supported**
- **DIN rail mounting**
- **EMI interference resistant**
- **Requires 9 to 30 Volt AC/DC supply**
- **Field upgradeable firmware**

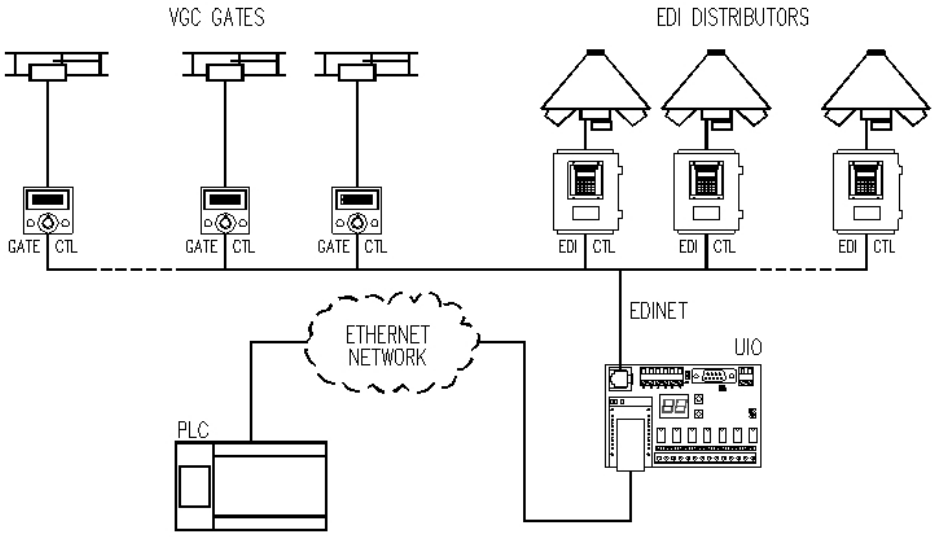
UIO_SMC 4/12/13

UIO Scanner Overview

The UIO has two basic modes of operation: Scanner mode and Digital mode. This document will concentrate only on the Scanner mode. Digital mode is covered in other documents.

Increasing importance is being placed on gathering information and controlling various mechanical devices critical to the operation of grain and feed handling facilities. It is relatively easy to monitor or control 2-state devices; those that are on-off, high-low, open-close etc. Other devices are more complex, having many positions and states, and driven by their own microprocessor based controls.

Two of these more complex devices, are the EDI distributor and the VGC gate. They often qualify as critical components to be automated. A facility may have several distributor drives and many gates that must be controlled by a PLC. Commonly, this requires a large up-front investment for interface wiring, special PLC I/O modules and the programming effort required to conduct a conversation with each piece of equipment. The UIO is designed to eliminate this cost.



A typical UIO scanner installation.

The UIO sits between the PLC and multiple EDI and/or VGC drives. It gathers the status data of the drives and sends it to the PLC in one small data packet via a serial or Ethernet connection. It then reads a small portion of PLC memory that holds the desired position for each device and instructs the drives to reposition if necessary.

The program running in the PLC has no part in this activity. It only provides the memory registers for the UIO to read and write. **There is no PLC programming required to communicate with these devices.**

The general concept of UIO interfacing is described below. Specific setup details are covered in the UIO Scanner Installation manual and EDI and VGC network interfacing manuals.

The PLC Side of the UIO

As stated earlier, the UIO is available with Ethernet or serial PLC connection. For this discussion we will assume that Ethernet has been selected. The UIO is field programmed with the PLC's IP address, selected protocol and the beginning memory location in the PLC that will hold the device data.

The common ground for all protocols is that the handling of data in the PLC memory is the same. There are 40, 16-bit integer registers set aside for the UIO. These are 40 contiguously numbered registers in many protocols or 2 Tagged arrays of 20 registers in others. We will use the numbered registers for this explanation.

For convenience we will refer to the first register as R1 and the last as R40. Registers R1-R20 are 'position' registers and R21-R40 are 'request' registers. Each scanned drive has an assigned a single character address, e.g. 'A', 'B' etc. R1 is paired with R21 for the 'A' drive, R2 is paired with R22 for the 'B' drive, etc.

R1-R20 are written on each UIO scan cycle with the status value of each drive. Non-existent addresses have a zero for this data value. Immediately following the write, R21-R40 are read. These values set by the PLC and represent the requested positions for each device.

As an example, assume 'A' is an EDI distributor and R1=5 indicating the rotating spout is confirmed to be at position 5. If the PLC makes R21=10, the UIO will command the distributor to change to position 10. R1's value will change on each scan as spout 'A' moves to the requested position. When R1=R21 the PLC is assured that spout 'A' is in its requested position. If spout 'A' is blocked from reaching its intended destination, R1 will never equal R21.

Another example assumes 'B' is a VGC gate with R2=25 indicating it is 25% open. If the PLC sets R22=50, the UIO will command the gate to change to 50% open. R2's value will change on each scan as gate 'B' moves to the requested opening percent. When R2=R22 the PLC is assured that gate 'B' is now 50% open. If the gate is somehow prevented from reaching 50% open, R2 will never equal R22.

All device alarms are honored so that register equivalence cannot take place.

The Scanner Side of the UIO

The UIO communicates with all of the EDI and VGC drives on its own RS-485 serial multi-drop network. Each drive has a single character address assigned to it. On every scan cycle all of the 20 possible addresses is interrogated to see if there is a connected drive. If there is a response, the status value of that drive is stored in a buffer. If there is no response, a zero is stored in the buffer. After the scan is complete the buffer information is translated to the selected protocol and sent to the PLC to be stored in the 'position' registers R1-R20.

Immediately following that transmission, a request is sent to the PLC to transmit back to the UIO, the contents of the 'request' registers R21-R40. The UIO unpacks the returned packet and compares each 'request' value with the corresponding value still present in the scan buffer. A difference in values may initiate a command from the UIO to the respective drive.

It is important to note that the UIO (or the PLC) does not control the positioning of any drive. I only requests that the selected drive be in a certain position. It is

up to each EDI or VGC device to properly handle the request by starting the maneuver, handling any errors or remedial functions and confirming it is at the requested position by accurately reporting its status.

Properly addressed devices may be added and removed from the EDINet without re-configuring the UIO or PLC. An inexpensive wiring hub with RJ-12 connections is often used instead of daisy chaining. This allows removal of a device without interrupting the network.

Configuring the UIO

The UIO must be setup to work with the PLC. Depending on the method used it may need to know what protocol, starting memory location and IP address to use. A program to run on a PC called UIO_Cfg.exe has been developed to field configure the UIO as necessary. The UIO is connected to the PC using a serial cable that is supplied with the UIO.

UIO EDINet Network

The layout on the second page shows how EDI distributors and VGC gate drives are connected to the UIO via the EDINet network. EDINet is a RS-485 based multi-drop network. Each device is connected in parallel to the network using a cable with 5 or more wires (CAT 5 is often used). The farthest node can be up to 4000’ from the UIO.

Each of the devices on this network is assigned a unique single character address. A maximum of 20 devices can be assigned to a UIO. If it is required to control more than that, a second UIO may be used.

The PLC is located on the same local Ethernet as the UIO. If a serial connection has been selected, the EDINet does not change but the Ethernet module is not supplied and the PLC is connected to the UIO’s DB-9 serial port. This connection uses the RS-232 protocol. In this case the UIO is placed within 50’ of the PLC.

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