Remote I/O Control

IN CONTROL FOR AUTOMATION

duTec

Remote I/O Controllers from duTec provide cost effective solutions to real world process control needs

Product Data Sheet - I/O PLEXER

Real world process control requires reliable analog and digital I/O. duTec's responsive technical support minimizes the hassle and cost of system design, trouble shooting, and successful operation.

The I/O PLEXER is a complete, industrial-grade, remote I/O controller which can operate under the control of a host computer via a serial communications link, or in a STANDALONE mode, with or without supervision. By locating I/O PLEXERS near the process, the serial link eliminates the expense of lengthy, noise-prone analog sensor and actuator field wiring. Because the I/O PLEXER supports *any mix* of a large variety of analog and digital I/O signals, the requirements of virtually any process can be accommodated. Omni-isolated I/O modules provide 1,500 volts of isolation protection between each and *every* I/O line, host computer and power supplies.

Omni-isolated I/O, and the ability to mix and match individual analog or digital signals* from virtually any sensor or actuator reduces system design, installation and trouble shooting costs, as well as simplifying future maintenance and system expansion. I/O PLEXERS, complete with a built-in wide range power supply, are shipped ready to connect to your sensors, actuators, host's serial port and power. A single I/O PLEXER can handle any mix of 16 analog and/or digital I/O points. With expanders, the number of digital I/O points can be increased by up to 48. An I/O PLEXER *network* can serve a mix of over 1,000 analog and digital I/O lines.

The host computer uses RS-232 or RS-422/485 to communicate with I/O PLEXERS spaced up to 4,000 feet apart. Using telephone or radio modems, the distance is virtually unlimited.

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Remote Operation

There are several dozen third-party HMI/MMI/SCADA software packages that have I/O PLEXER drivers for polling sensor data. Most have extensive graphics displaying the process, only a few have the capability to transmit control commands to actuators. The open architecture communication protocol instructions are readily available for those writing their own proprietary software.

duTec's universal DDE driver can be used with all Windows® DDE compliant software packages. This includes most HMI/MMI/SCADA packages as well as Visual BASIC ® , spread sheets such as Excel® and numerous other programs. In addition to working with polling software packages, which use a speak-only-when-spoken-to communications protocol, the duTec DDE Driver allows a remote I/O PLEXER to initiate a scan when it detects user specified events. This Speak-On-Event (SOE) capability materially reduces the need for host initiated scans and communications circuit traffic, and in large networks reduces the time to detect problems. While the duTec DDE Driver has minimal graphics, it has a screen for the user to monitor and control the state or values of all analog and digital I/O points. It is particularly useful during system trouble shooting as it makes it possible to verify that the hardware is operating correctly before the application software is exercised.

STANDALONE Operation

Built-in LCFs (Local Control Functions) allow an I/O PLEXER to perform control operations with or without host supervision. LCFs include logic gates, analog compare and math, dead-band and PID control, and ladder logic. Because analog and digital modules are available on the same unit, LCFs can perform closed-loop control operations.

LCFs not only provide for faster, more predictable real-time response, but they allow an I/O PLEXER to assume control in the event of communications or host computer failure. The process continues to operate safely!

The unit can also be programmed to override an operator command which would result in an unsafe condition.

LCFs often eliminate the need for more expensive auxiliary hardware. Because LCFs can perform simple control tasks, the host computer needs to transmit fewer instructions, thus allowing both the computer and the network to serve higher-priority tasks. After LCF configurations are developed using duTec's Windows LCF Program Generator, they are down loaded and stored in the I/O PLEXERS EEPROM.

LCFs have virtual analog input and output "modules" which provide the means for the host to send and receive data without using an actual module position. The transfer of PID set point values to a remote unit is a common use for virtual analog "modules".

* See duTec's I/O Module Data Sheet for complete specifications

Setup

No jumpers are needed to configure an I/O PLEXER communications network address or baud rate, instead they are selected during initial setup via a single push-button, or remotely via the RS-232 port. Configuration information is saved in an EEPROM and is continually displayed to make it easy to verify the settings.

Data Integrity

Each command issued by the host includes a checksum. If the checksum calculated at the remote unit fails to match, the command is ignored and error message is returned. When the checksum matches, the command is executed and an acknowledgment is returned.

A built-in hardware watchdog timers ensure safety by responding to both communications or hardware failures. If the communications watchdog time out occurs, both analog and digital outputs can be programmed to specified values. Should there be an I/O PLEXER failure, all outputs are returned to an OFF state. Each time the unit is powered up, built-in diagnostics test system operation and display any detected faults.

Trouble shooting

Receive and transmit indicators provide a means for verifying the communications circuit operation. The use of only ASCII printing characters in the communications protocol provides a means of observing what is actually being transmitted and received.

With the included Magic program disc, individual I/O points can be operated making it possible to verify wiring, and sensor and actuator operation before the application software is started.

In addition, duTec's readily available technical support helps to ensure worry-free installation, operation and product satisfaction. Several utility programs and, DDE and LCF demonstration software are available here.

Plug-in Connections

Should a unit need to be replaced, downtime can be minimized, by unplugging the 16 I/O point field wiring terminal block. In addition both the RS-232 and RS-422/485 connectors can be unplugged.

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Specifications

<table>
<tr><th colspan="8">Operational Functions</th></tr>
<tr><th colspan="2">Analog (12 bit resolution)</th><th colspan="6">Digital</th></tr>
<tr><th>Inputs</th><th>Outputs</th><th colspan="2">Inputs</th><th colspan="4">Outputs</th></tr>
<tr><td>Signal levels
10mSec/point</td><td>Set Levels
10mSec</td><td colspan="2">Read input state</td><td colspan="4">Set output state</td></tr>
<tr><td>Linearized temperature
Thermocouples
& RTDs</td><td>Generate
Waveforms
Square waves
Sawtooths
Triangular
Ramps
Periods: 100mSec
to 10.9 min.</td><td colspan="2">Count pulses
Up to 65,535
Up to 500 Hz</td><td colspan="4">One-shot pulses
Durations up to 655Sec</td></tr>
<tr><td>Frequency
Up to 10KHz</td><td rowspan="4"></td><td colspan="2">Pulse durations
Single or multiple pulses
10 mSec resolution</td><td colspan="4">Pulse trains
1-65,535 pulses</td></tr>
<tr><td>Sample & Hold
Max and mins</td><td colspan="2">Frequency
Up to 500Hz</td><td colspan="4">Square waves Continuous
Periods: 2mSec-5Sec</td></tr>
<tr><td>Calculate averages
Up to 65,535 samples</td><td colspan="2">Contact de-bounce
Periods up to 255mSec</td><td colspan="4">Delay ON / Delay OFF
Periods: 10mSec - 655Sec</td></tr>
<tr><td>Detect Out-of- Range
high or low</td><td colspan="2">Edge detection
1mSec acquisition time</td><td colspan="4"></td></tr>
<tr><th colspan="8">Local Control Functions</th></tr>
<tr><th>AND/NAND</th><th>OR/NOR</th><th colspan="3">Analog Compare</th><th colspan="3">Analog Math</th></tr>
<tr><td>2-input AND, NAND
3-input AND, NAND
4-input AND, NAND</td><td>2-input OR, NOR
3-input OR, NOR
4-input OR, NOR
2-input XOR, XNOR</td><td>A < B
A > B
A = B</td><td>A <= B
A => B
A <> B</td><td>A + B
A - B</td><td colspan="2">Avg A and B
Max of A or B
Min of A or B</td></tr>
<tr><th>Latch</th><th>State Machine</th><th colspan="3">Controllers</th><th colspan="3">Ladder Logic</th></tr>
</table>

Digital latch D-Flip Flop Analog sample & hold Analog gate	Truth table Alternate High Low	Deadband Multiband PID	Ladder
			Miscellaneous
			Time proportional/ PWM Constants

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Communications

(click here for information regarding our Ethernet option)

Link	**Host to first**	**I/O PLEXER**	**Network**
Standard	RS-232	RS-422/485	RS-422/485
Type	DCE	Multidrop or repeater	Multidrop or repeater
Range Host to first IOP	50'	4,000'	
Multidrop			4,000' Total
Repeater			4,000' unit-to-unit
Handshake	None or RTS/CTS	None	None
Data Format	10 bit ASCII	1 start, 1 stop, 8	data, no parity
Data Integrity	Message checksum or message checksum plus 4-pass mode		
Baud Rate	300-600-1200-2400-4800-9600-19,200-38,400		
Wiring	3 wire, 5 wire with RTS/CTS	Dual twisted pair + secondary ground + AWG 18 or 30 solid, stranded or flexible	
Connections	DB9F	Terminal block	

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Scanning Rate

Communication baud rate and the mix of analog and digital I/O modules determines the speed with which an I/O PLEXER can provide data to a host computer. The table below summarizes maximum performance when operating at a baud rate of 38,400.

Digital only I/O modules	1,600 points/Sec
Analog only I/O modules	640 points/Sec
Analog and Digital I/O modules	500 points/Sec

The host operating system and application program limit the rate at which the host can request data. These delays are often more significant than the baud rate.

Physical Specifications

Power (standard)	90-264 Vac, 47-440Hz, 30 watts; 3.0A fuse; (optional: 9-18Vdc and 18-36Vdc, 25 watts each)
Operating Temperature	0-60^{o} C

Package	4 pounds, stainless steel
Humidity	95% non-condensing
Envelope	17.25"L x 5"W x 3.5"H (overall)

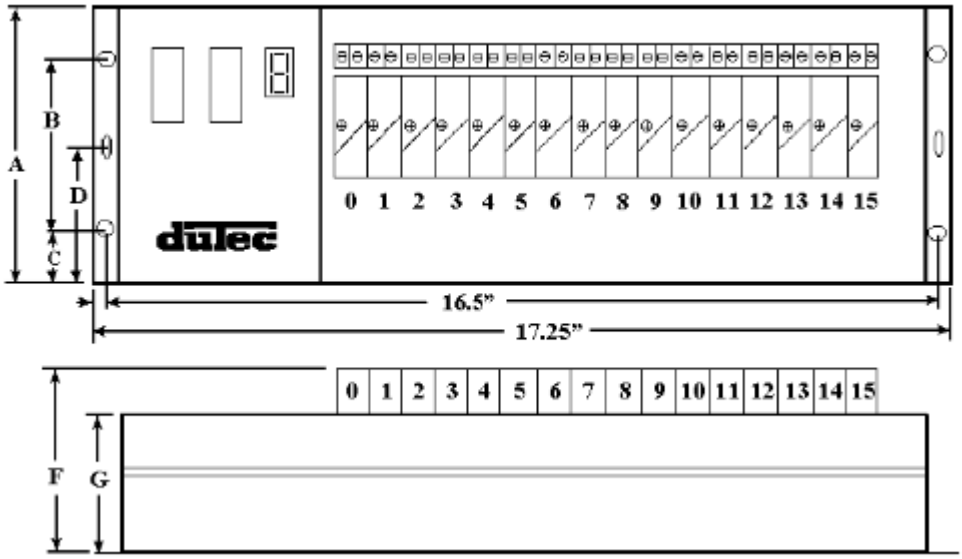

Figure 1: Outline drawings for I/O PLEXER, I/O PLEXER Repeater, and Digital Expander.
Dimensions follow.

A	B	C	D	E	F	G
5.0"	3.5"	.75"	2.5"	.375"	3.5"	2.00"

Ordering Information

Model Number	Description
IOP-AD	16 sockets for any mix of analog and digital modules
IOP-D	16 sockets for digital modules only
Option Codes	**Description of I/O Controller Options**
/3+	Controller logic & connectors for adding up to 3 IOP-DE, 16 I/O digital expanders
IOP-DE	Expansion chassis with sockets for 16 digital only I/O modules, no power supply required; prerequisite is /3+ option above
/B	Alternate power supply for operation from 9-18Vdc @ 33W
/C	Alternate power supply for operation from 18-36Vdc @ 33W

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