ELEXOL Ether I/O 24

The Ether I/O 24 is an UDP/IP controlled digital Input/Output module. The module features three 8-bit ports with 5V level signal lines. Each of the 24 lines can be independently programmed as either an input or output.
The module connects to any Ethernet network supporting the TCP/IP protocol suite and can communicate with any point on that network. By connection with an Internet Router the device can communicate with any Internet connected device[1].
The module's output pins are able to source or sink up to 30mA[2] to allow for direct connection to a variety of devices. Optional Boards connect to the module to provide Relay Outputs, Isolated Inputs, Switches or Screw Terminals to provide for the easy connection of external sensors, switches or other devices.

The Ether I/O 24 Module

MODULE FEATURES

- Supports ARP, BOOTP, DHCP, ICMP and UDP/IP Protocols
- Industry standard 10BaseT Ethernet Interface with an industry standard RJ-45 Connector
- 24 independently programmable signal lines with configurable CMOS, TTL or Schmitt Trigger thresholds and programmable pull-ups per line
- Easy connection by three 10 way box headers to suit low cost, standard IDC or Crimp connectors
- On-board 50 MIPS flash micro-controller
- Integrated Switch Mode Voltage Regulator allows power from any 8-32V DC Power source
- User 5V 500mA output to power external Interface boards or sensors
- Compact module measures only 72mm x 72mm x 24mm
- Advanced configuration allows the modules to automatically scan the input ports and transmit changes directly to another ETHER I/O 24 module without host connection or to any Internet Port by router connection
- On board EEPROM allows all ports to power up in a user programmable state
- Programmable Fixed IP or Dynamic IP assignment from a DHCP server
- Small packet size and connectionless protocol allows for Real Time sensing and control
- Can be connected to a wireless network gateway or access point for wireless operation
- Low Power consumption only 1.1W fully operational

APPLICATIONS

- Home or Industrial Automation
- Digital Input and Output from any Networked PC
- Remote Data Acquisition and/or Alarm Monitoring by Network or Internet
- PC Controlled Machines and Distributed Machine I/O
- Remote Lighting / Power control and/or monitoring

Notes.
1 The connected device must be able to send or receive UDP/IP packets compatible with the EtherI/O24.
2 The maximum allowable current sourced or sunk from any 8 bit port should be limited to 100mA and the maximum for all 3 ports should not exceed 200mA total.

Functional Description

The Ether I/O 24 is an integrated micro-controller and network interface board with 24 user I/O lines, an on board Switch Mode Voltage Regulator and an Firmware suite with industry standard protocols to allow connection to a generic Ethernet network. Each of the 24 User I/O lines operates at 5V maximum levels and can be independently programmed as, an Input whose state can be remotely sensed via another network linked device, an Input whose state is internally checked and transmitted when a change occurs, or an output whose state can be remotely controlled by another network connected device.

IP Address of the module is determined either automatically by the BOOTP protocol from a DHCP server or can be programmed to be at a Fixed Address. The MAC or Ethernet address of the module is factory programmed and cannot be altered by the user.

Onboard firmware reads the user configuration stored on the modules onboard non-volatile memory and sets the ports to a user configured state at power up. If un-configured, all ports are set as inputs with the pull up function disabled and input thresholds set at TTL levels.

If configured, the module periodically scans any or all of the digital inputs, filters any changes to remove noise and automatically signals a remote unit of the changes. The scan rate can be set from 1 millisecond to 65.5 seconds and the filter can be set to discard any number of inconsistant readings from 1 up to 255. Each of the 24 signals has an independent control bit that controls whether the module detects changes on that pin and the filtering is done on a per port basis with each filtered as a group of eight signals. When any line is set as an output it is not checked for state changes.

If a PC controls the module then the Programmer must have access to an UDP/IP socket in order to communicate with the module. The Winsock control in MS Windows operating systems provides for such communication in a simple and efficient manner. In other operating systems there are different methods of programming, please consult your operating systems specifications, software and language manuals for details of how to open an UDP/IP socket to communicate with the module.

To the programmer the UDP/IP protocol requires two things in order to communicate with the module, an IP address and a Port Number. The Port number for communication with the module is 2424 decimal and this port number is used for all UDP/IP communications module and I/O programming. Other port numbers are used for the ICMP and BOOTP protocols, however the programmer should not use other ports unless the programmer has an extensive knowledge of these protocols.

The IP address of the module can be programmed to a fixed address by a windows PC running the ELEXOL Ether I/O 24 Test and Programming software. Alternately a user program can also set the fixed IP address by using the EEPROM writing commands. Unless the Fixed IP address function is used then the module will have a dynamically assigned IP address from the DHCP server. To find the IP address of any module, simply broadcast a special message to port 2424 and all of the Ether I/O 24 modules on the network will respond, stating their IP address and Serial Number.

Once the IP address and port number are known you can send a message to the module in order to write to or read the I/O lines, configure the I/O lines, read or write the modules' non volatile memory or reboot the module. To read or write ports A, B and C then ASCII commands are A, B & C in upper case to write the port and in lower case to read the port. Each upper case write command must be followed by a data byte for that I/O port.

For details of the other commands please download the Ether I/O 24 users and programmers manual from our website at www.elexol.com

ABSOLUTE MAXIMUM RATINGS

! Warning, Exceeding these ratings may cause irreparable damage to the unit. !

Maximum Power Input Voltage	32V DC
Maximum voltage on any I/O Port line	5V
Minimum voltage on any I/O Port line	0V
Maximum Current Load on any single I/O pin	35mA
Maximum Total current on all I/O pins combined	210mA
Maximum Current drawn from the modules +5v User Pins	500mA

All voltages are with reference to the "–" Power supply connection or Ground on the port connectors

Operational Specifications

Power Consumption	approx 1.1W @ 8-32V DC
Reply Speed from Request to Response	100uS approx from end of request to end of response
Output Speed within single packet	approx 1.8uS per write, 550,000 writes per second
Output Speed sequential packet	approx 100uS per packet, 10,000 packets per second
Maximum Commands per packet	Port Writes 250 max, Port Reads 32 max
Maximum Read Rate	approx 160,000 port reads per second @ 32 reads per packet
Maximum Write Rate	approx 500,000 port writes per second @ 250 writes per packet

Commands

For ease of use we have broken the command set into subgroups based on their function.
All commands are shown as their ASCII characters, text in *italics* represent binary 1 byte values.
The spaces shown are only for clarity and no actual spaces are used in the command set.

The I/O lines are accessed as 3 ports and each line is controlled by its bit value within the data byte.

I/O Port Data Commands

Function	Command	Reply
Write Port A	A *data*	
Write Port B	B *data*	
Write Port C	C *data*	
Read Port A	a	A *data*
Read Port B	b	B *data*
Read Port C	c	C *data*

I/O Port Set-up Commands

Write Direction A	!A *data*
Write Pull Up A	@A *data*
Write Level A	#A *data*
Write Schmitt A	$A *data*

For ports B and C simply substitute the A for B or C. To read any value change to upper case A, B or C to the equivalent lower case character.

The Module search, identification, EEPROM programming and other special commands are fully explained in the Ether I/O 24 Users Manual. Examples are also given for using most commands.

Module Connection

The Ether I/O 24 has 6 user connectors, 3 option links and 1 programming connector.

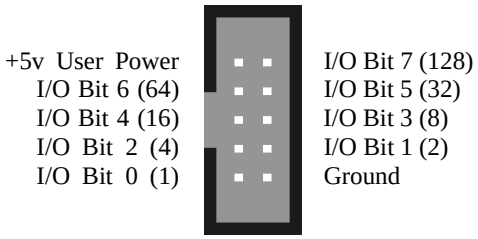
DC IN: There are 2 connectors provided for applying power to the unit, a 2.1mm DC Jack and a 2 way wire screw terminal. Power to the unit must be between 8 and 32 Volts DC for normal operation of the unit. The unit has an onboard diode to protect it from incorrect polarity connection.

NETWORK: An RJ45 connector has been provided for connection to a standard 10/100 Base-T network cable. The module may be connected with Category 3 or 5 cables to a network hub or switch or by a crossover cable directly to another network device.

5V OUT (Optional): When fitted, this connector provides 5V from the onboard voltage regulator for external circuits, powering sensors or other modules. The maximum current that the unit will provide if 500mA and this power rating should not be exceeded.

PORT_A, PORT_B, PORT_C: These are the programmable I/O line ports; each port has 8 I/O lines, a +5V line and a Common or Ground line. These connectors are polarised for ease of connection and can be connected to your own circuitry or to one of the Accessory boards for signal transformation.

I/O Port Pin out Diagram



EEPROM Memory contents

The EEPROM on the Ether I/O 24 is used to store the boards Serial number and other critical factory settings as well user settings for the module, there is also a spare area where you can store your own data to be kept by the module, even when the module loses power.

The EEPROM chip on the module is 1 Kilobit in size or 1024 bits of memory; this is arranged as 64 words of 16 bits each. The first 5 words as addresses 0 to 4 are for factory settings and are not user write able. Words 5-24 are currently used to store the user settings like fixed IP address, port power-up settings and Auto Scan mode settings. Words 25-47 are reserved for future use and words 48-63 are free for your own data storage.

Please refer to the Ether I/O 24 Users manual for the specific functions of each word and examples of how to write your own code to program them.

LED Functions

There are 2 LED indicator lights on the EtherI/O24 module; their operation is as follows.

TOP LED = NETWORK LINK/ACTIVITY This LED is illuminated when the module is powered and the network interface has detected a connection to another network device, network hub or switch, the LED will blink whenever there is activity on the network.

BOTTOM LED = VALID COMMAND This LED illuminates for 0.1 seconds each time the unit processes a valid command, when the commands are arriving faster than 10 times per second the LED will be lit continuously.

Technical Support and Further Information

More complete programming instructions, command descriptions and examples are shown in the Ether I/O 24 Users Manual available from our website or by request.

For any questions relating to the Ether I/O 24 please contact us by Email, Fax or Phone.

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Document Revision History

Ether I/O 24 Datasheet Version 1.0 – Initial document created 6th April 2005

Product Use Limitations, Warranty and Quality Statement

The Ether I/O 24 should not be used in any situation where its failure or failure of the PC or software controlling it could cause human injury or severe damage to equipment. This device is not designed for and may not to be used in any life critical application.

The Ether I/O 24 is warranted to be free from manufacture defects for a period of 12 months from the date purchase. Subjecting the device to conditions beyond the Absolute Maximum Ratings listed above will invalidate this warranty. The Ether I/O 24 is a static sensitive device, anti static procedures should be used in the handling of this device.

All Ether I/O 24 units are extensively tested at time of manufacture to be free of defects.

Elexol is committed to providing products of the highest quality. Should you experience any product quality issues with this product please contact our quality assurance manager at the above address.

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