

NETWORK INTERFACES

8063 LAN TO PARALLEL DIGITAL INTERFACE BOX

DESCRIPTION

ICS's Model 8063 Ethernet to Parallel Interface provides 48 digital I/O lines that can be controlled via an 10 or 100 Mb Ethernet network. Each data line has a pullup resistor for sensing contact closures or TTL/CMOS inputs. As outputs, each line is latched and can source 24 mA or sink up to 48 mA. The 8063's high-power TTL type signals can easily drive small relays or other logic elements.

The 8063 can also be configured to monitor up to 15 input lines for changes. Flexible control lines let the user handshake data and easily control external devices. Applications include controlling devices with digital signals from the network, monitoring digital signals for changes and adding an Ethernet interface to a test chassis.

Versatile Digital Interface

The 8063's digital interface can be configured and controlled with commands from the host computer. The configuration commands permit the user to designate the data lines as inputs and/or outputs in 8-bit byte increments, to combine bytes into a multi-byte wide data word, to set data polarity, data format, and handshake modes. The setup configuration can be saved in the 8063's Flash memory and it becomes the new power-on configuration. At power turn-on, the Digital I/O lines are initially tristated and then configured and set to the user's levels. The 8063 provides a Stable signal, which turns on after the I/O lines are configured, to enable external logic, to apply power to relays etc.



8063 Interface

Data Transfer Methods

Data transfer capabilities between the computer and the 8063's digital interface depends upon the link to the 8063. When linked to *inst0* the user can access all setup commands and control the digital interface by individual bits, by bytes, or as strings of data values to multiple bytes as shown in Figure 2. When linked to *inst1* data is transparently transferred to the digital interface.

- Bit commands set or reset specific bits in a byte or query a bit's status. New pulse commands let the user pulse single or multiple output lines at the same time.
- Byte commands set all 8 bits in a specific byte or read data from a byte.
- String transfer commands send strings of data characters to one or more output bytes to make a multi-byte output word or read a string of data from one or more input bytes. The user designates these bytes as inputs or outputs when configuring the board.

When linked to *inst1*, the user can send or receive strings of data without commands. The 8063 transparently passes strings of data to user configured output bytes or reads data from user configured input bytes. The data is output or

read without having to parse any commands, eliminating the parsing time and speeding up the data transfer. When the binary data format is used, the 8063 can output data at its maximum output rate.

- User-definable, 48-bit parallel interface with bit, byte or multi-byte data transfers. *Fully configurable to the user's needs.*
- Signal monitor feature detects signal changes on 15 inputs. *Relieves controller of time consuming polling task.*
- High-current TTL drivers and input pullup resistors. *Drives more devices over longer lines and inputs CMOS signals or switch contacts.*
- Device configuration, user's IDN message and network settings stored in Flash memory. *Easily setup and change the configuration.*
- Ethernet interface is VXI-11.3 Compliant and supports Raw Socket connections. *Works with virtually any computer or test language.*
- Network settings configurable with a web browser or RPC. *Easy network configuration from any computer.*
- Includes ICS's VXI-11 keyboard program. *The easy way to test digital operations before writing a test program.*

CE Approved

RoHS



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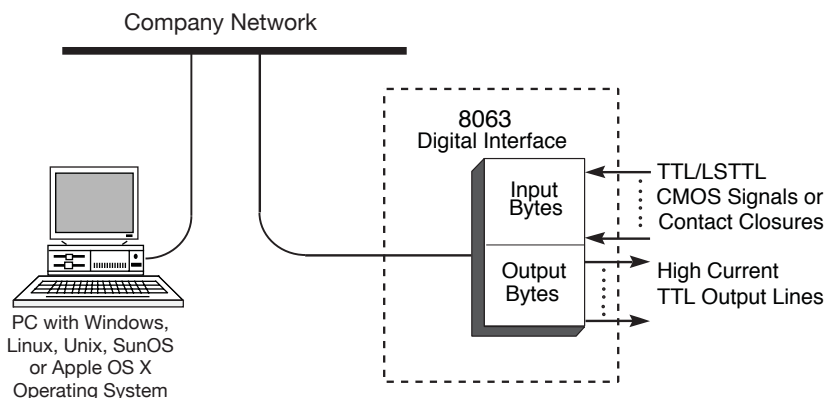


Figure 1 A typical 8063 Application

8063: Application

Configuring the 8063's Digital Interface

The 8063's digital interface is configured with commands from the host computer. The configuration commands permit the user to set multiple bytes as inputs or as outputs to make a wide data word, to set data polarity, data format, and handshake modes. The Bit and byte commands automatically set their bytes as outputs. String accessed bytes are preset as input or output bytes by the CONFigure command.

Formatting options let the user select a decimal value, hex or binary characters for each byte. An input translation table lets the user create his own input set with special characters when inputting data. When done, the user sets the outputs to their power-on values and saves the current configuration in the 8063's Flash memory as the new power-on configuration.

At power turn-on, the Digital I/O lines are initially tristated and then configured and set to the saved levels after the 8063 passes its self test. The 8063 provides a Stable output signal, which turns on after the 8063's digital lines are configured for controlling power to external devices or to enable external logic. The time from power turn-on to the Stable signal depends on the network settings and network's response to the 8063.

Outputting Data

The 8063 has three ways to control the digital interface and output data as shown in Figure 2:

- Bit commands set, reset or pulse bits in a specific byte.
- Output byte commands set all bits in a byte and latch an output value (0 to 255) into a specific byte. Data Strobes can be manually generated if needed.
- Strings of data can be outputted to multiple bytes with a command or transferred transparently. The 8063 converts the data string characters into packed HEX bytes, latches the data in the configured output bytes and generates a data strobe pulse to update the external device. The data strings can be a series of decimal values, ACSII HEX characters, or the 30-3F HEX characters used in ICS's earlier interfaces.

Reading The Input Signals

The 8063 has three ways to read the digital interface lines and input digital data as shown in Figure 2:

- Bit queries read the status of an individual bit from a specific byte.
- Input byte commands read 8 bits of data from a specific byte.
- Strings of data can be read from multiple bytes with a data transfer command or inputted transparently. These bytes are preset as string input bytes by the CONFigure command. For input strings, the 8063 reads the configured input bytes, converts the data to the selected output format, and outputs it as a string of characters. Data can be inputted with or without handshaking. The input data can be formatted as decimal numbers, as ASCII HEX characters, or into a user selected character set.

Transparent Data Transfer

The user can input and output data without using a string command by linking to the 8063 at *inst1*. Data is read from the configured input bytes each time the 8063 receives a *device_read* rpc. The data is input and formatted just as it would be for reading strings of data.

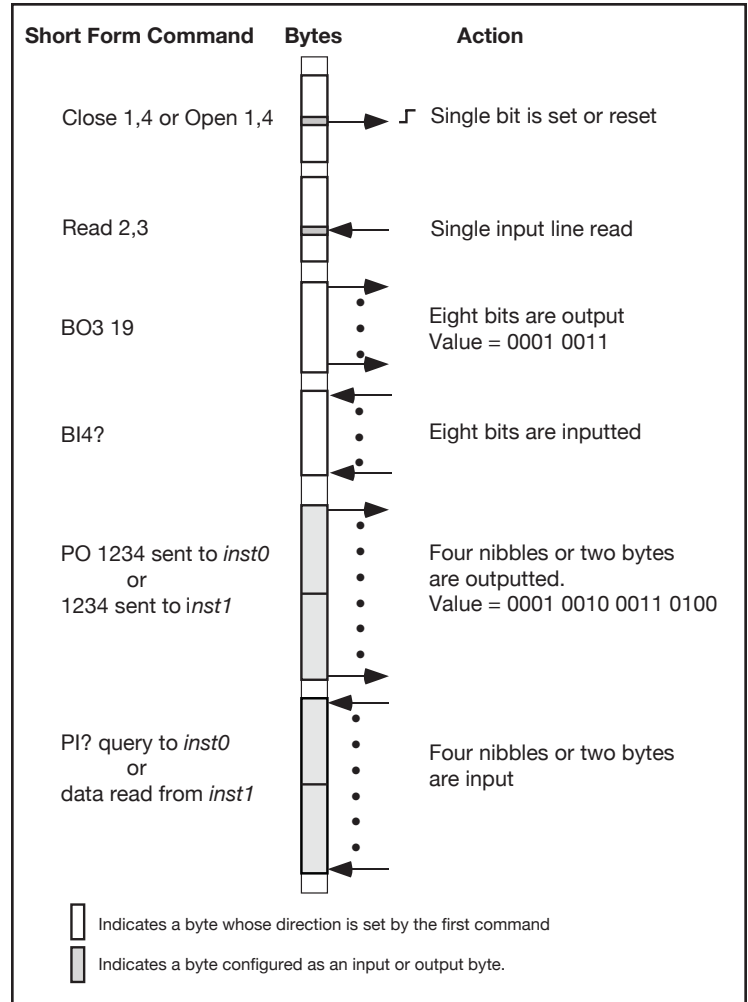


Figure 2 8063 Digital Interface Data Transfer Methods

(Figure shows 8 bytes for illustrative purposes. Actual 8063 has 6 bytes)

When outputting data sent to *inst1*, the 8063 converts the data and outputs it to the bytes that the user has previously configured as outputs. Data can be outputted with or without handshaking. The 8063 automatically generates a data strobe each time it loads all of the configured output data bytes. Multiple data words can be transmitted by inserting a comma between data words.

Input Signal Monitoring

The 8063 can monitor up to fifteen lines for signal changes and generate the VXI-11 equivalent of an SRQ to notify the Application program when changes occur. Monitoring is done by setting the 8063's Questionable Transition register to detect positive and/or negative signal transitions and enabling bits in the Questionable Event register. When the enabled bit(s) are detected, the 8063 generates a *device_intr_srq* message (SRQ) to alert the Application to the event. The user's Application program can query the 8063's Questionable Condition Register to determine the input signal states and the Event Register to learn which signal changed state. ICS's Application Bulletin AB80-4 describes how to use a Reverse Channel for SRQ notification.

8063: Application

SCPI Command Tree

Table 1 shows the 8063's configuration and data transfer commands as a SCPI Command Tree. Most SCPI commands have a corresponding Short Form command for quick programming. Most of the functions can also be queried to verify the command setting. (i.e. FT? a short form query that reads back the talk format).

The CONFigure branch assigns the input-output bytes for string data transfer and sets their data polarity and handshaking rules. The CONFigure branch also sets the control signal polarities.

The FORMat branch sets the data conversion method and the characters in the user's Talk conversion table.

The ROUTe branch sets, resets or pulses individual bits.

The SENSE branch gives the user a way to read digital data from a bit, from a byte or from configured input bytes. When reading data from a specific byte, input data polarity can be assigned on a bit-by-bit basis.

The SOURce branch provides a way to write values to a byte or to configured output bytes. When data is outputted to a specific byte, output data polarity can be assigned on a bit-by-bit basis.

The STATus branch (not shown) is used to setup and query the Operational and Questionable registers so that changes in the digital inputs or status inputs can be used to generate 488 Service Requests (SRQs). The Questionable registers can be used to monitor and query the first 15 digital I/O lines. The Operational registers can be used to examine or monitor the two external Status inputs.

The CALibrate branch provides a way to customize the 8063 with the user's own IDN message and to lockout the configuration parameters from being accidentally changed by another user. The DEFault command restores the 8063 to ICS's factory defaults.

Ethernet Protocols

The 8063 is controlled by commands received over its Ethernet interface. The 8063 supports the VXI-11 and Raw socket protocols. The VXI-11 protocol makes it easy to control from a PC or over the company network. VXI-11 operates over Sun RPC and is a more secure protocol that mimics GPIB control of an instrument and provides secure communication over a company network or over the Internet. Raw socket lets you telnet to the unit and is best used with direct PC to instrument connections.

VXI-11 Programmability

The 8063 can be easily controlled by several programming techniques and languages because it is a VXI-11.3 compliant instrument. If you program with LabVIEW, National Instruments' VISA supports VXI-11.3 instruments. NI's Measurement and Automation Explorer sees the 8063 as a TCP/IP compliant device.

Keysight's (Agilent) VISA library supports VXI-11.3 instruments and the Connection Manager sees the 8063 as a TCP/IP instrument.

If you are a Visual Basic, VB.Net or C/C++ programmer and work with Windows, you can write your programs to call Keysight's or National Instruments' VISA or Keysight's SICL library.

If you use LINUX or any other flavor of UNIX like SunOS, IBM-AIX, HP-UX, or Apple's OS X, you can communicate with the 8063 through RPC over TCP/IP. RPC (or Remote Procedure Calls) provides an invisible communication medium for the developer. The VXI-11 specification provides an RPCL (Remote Procedure

TABLE 1 8063 SCPI COMMAND TREE

SCPI Commands	Short Form Cmds
SYSTEM	System Settings
:ERRor?	
:VERSion?	
CONFigure	Configure I/O
[:DIGital]	
:INPut	<channel list> N
:POLarity	0 1 TP
:HANDshake	<boolean> TH
:OUTput	<channel list> LN
:POLarity	0 1 LP
:HANDshake	<boolean> LH
:CLEar	0 1 C
:EDR	0 1 E
:INHibit	0 1 I
:REMote	0 1 R
:RESet	0 1 X
:STRobe	0 1 S
:TRIGger	0 1 TR
:ASTatus	0 1 A
:BSTatus	0 1 B
FORMat	
:TALK	<ASCIi Hex HEXL Table> FT
:TRANSlation	<16 char string> V
:LISTen	<ASCIi Hex HEXL 4833>
ROUTe	Bit Commands
:CLOSe	byte, bit CLOSE
:OPEN	byte, bit OPEN
:RESET	byte BRESET
:PULSe	byte,bit PL
:CHANnel	number or channel list PC
:WIDTh	10-30000 [50] PW
SENSe	Input Data
[:DIGital]	
:DATA	
[:VALue]?	PI?
:PORT?	number or <channel list> BI?
:PORTn?	BIn?
:POLarity?	IPn
:RESet:EDR	ER
:BIT?	0-1 READ?
:BYTe?	0-255 BREAD?
[SOURce]	Output Data
[:DIGital]	
:DATA	
[:VALue]	0-255 PO
:PORTn	0-255 BOOn
:POLarity	0-255 OPn
:STRobe	SP
CALibrate	Calibrate Configuration
:IDN	string (72 char max)
:DATE	mm/dd/yy
:DEFault	
:LOCK	1(On) 0(Off) [0]

Call Library) that can be used by virtually any operating system to control the 8063. VXI-11 devices like the 8063 can operate in test systems with LXI instruments.

If you program with Java then you can write a 8063 control program that can be easily moved to many different operating systems.

8063: Application

Raw Socket Operation

The 8063's "Raw Socket" connection enables sending commands to the instrument over the LAN connection using TCP/IP. Raw Socket commands can completely control the 8063's digital I/O lines with SCPI and the related Short Form commands. Raw Socket does not support *instl* data transfers, Service Requests or other VXI-11.3 functions.

The 8063 is always ready for a telnet connection when Raw Socket is enabled. When connected, the 8063 outputs its IDN message to confirm the connection. All raw socket messages are terminated with a linefeed. Carriage returns and ignored. A backspace character causes the prior character to be deleted. Communication timeout is two minutes and it is recommended that the client issue a Space-BS sequence on an occasional basis, less than the timeout, to reset the timeout counter.

Keyboard Controller

The 8063 includes ICS's VXI-11 Keyboard program for Windows which provides interactive control of VXI-11 instruments from the computer keyboard without having to write a program. The VXI-11 Keyboard program is the ideal utility program for configuring and testing the 8063's connections or for trying out commands before using them in a program.

With the VXI-11 Keyboard program you can find and link to the 8063 and control its digital interface. Besides reading and writing data strings, the VXI-11 Keyboard also has controls for Device Clear, Device Trigger, and Read Status Byte.

Easy Network Setup

The 8063 includes an internal WebServer with HTML web pages that can be accessed by a web browser from any computer. The web pages let the user quickly review and change the 8063's network settings. Linux/Unix or for similar operating systems users can use ICS's defined RPC calls in their program to change the 8063's network settings.

Digital I/O Connection Options

All of the 8063's digital I/O signals are on a 62-pin connector on the rear panel of the 8063. There are several ways to connect to the 8063:

The user can solder wires to the mating connector that is supplied with each 8063. The mating connector accepts 24 to 28 AWG wire sizes.

The user can purchase a five foot long, open-end cable (P/N 114508) and connect a connector to the open end by soldering or by crimp pins. The cable wires can be connected directly to his PC board or devices.

The user can purchase a Digital I/O extension cable with male connectors that provides a pin-to-pin extension of the 8063's Digital I/O signals. The user mounts a female right-angle connector on his PC board to complete the signal connection.

See the Parts Selection Tree in the Ordering Guide for a list of the 8063's connection options.

OEM Board Version

A board version of the 8063 is available with short threaded standoffs for easy mounting to a plate or side panel. Mounting dimensions are shown in the 8063 OEM Board Outline drawing. OEM boards have the same 62-pin Digital I/O connector as does a standard enclosed 8063. A mating digital connector is included with each OEM board.

OEM boards have an on board switching regulator and can be powered with 3 VA of 6 to 32 Vdc power. Power connections are made via a two screw terminal strip on the side of the 8063 PC board.

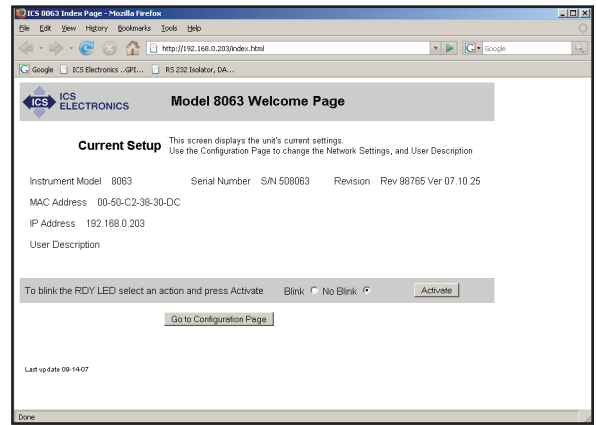


Figure 3 8063 Welcome Screen

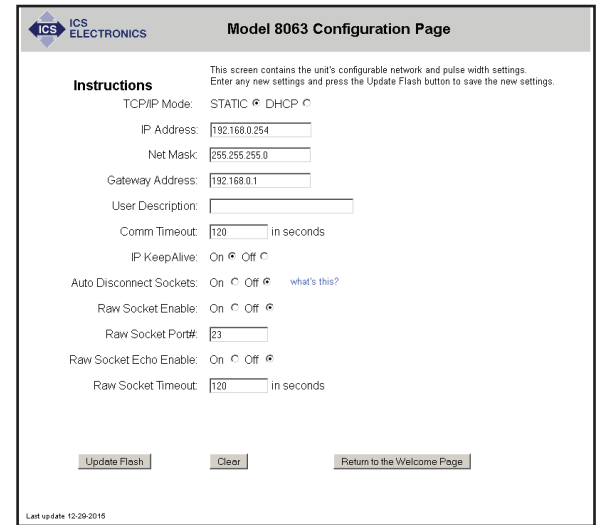


Figure 4 8063 Configuration Screen

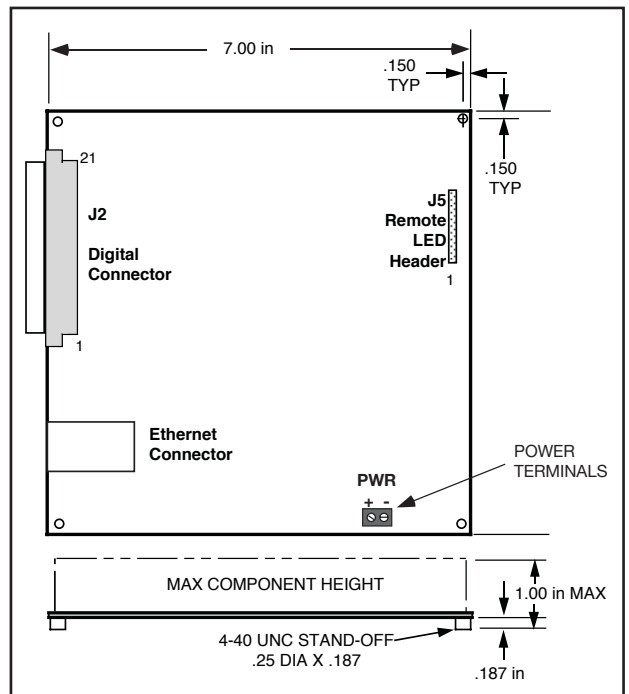


Figure 5 8063 OEM Board Layout

8063: ORDERING GUIDE

Select the 8063 and then pick your accessory items.

Part Selection Tree

	Qty	Part Number
Standard 8063 Minibox with 48 I/O lines. Includes a 62-pin mating connector and hood	(1)	8063
— Select an extra mating digital I/O connector, 62-pin male - solder eyelet hood	(1)	902270
	(1)	902105
— Select an Open end, 62 conductor, 28 AWG wire cable assembly, 5 feet long	(1)	114508
or		
Select the Digital Extension Cable, pin-to-pin connections, male connectors (Dash number is cable length in feet)	(1)	114714-004 (Note 1)
and		
Select mating female connector with right angle PCB tails	(1)	902268
— Select a Rack Mounting Kit		
single	(1)	114212
dual	(1)	114213
8063 OEM board with 48 I/O lines. Includes a 62-pin mating connector and hood	(1)	115621
— Select a Chassis Wiring Kit - with 1 foot long cable	(1)	115606
with 2 foot long cable	(1)	115607
— Select an extra mating digital I/O connector, 62-pin male - solder eyelet hood	(1)	902270
	(1)	902105
or		
Select an Open end, 62 conductor, 28 AWG wire cable assembly, 5 feet long	(1)	114508
or		
Select the Digital Extension Cable, pin-to-pin connections, male connectors (Dash number is cable length in feet)	(1)	114714-004 (Note 1)
and		
Select mating female connector with right angle PCB tails	(1)	902268

1. The dash number is the cable length in feet.

ICS's Wiring Kits can be used to extend the 8063's LAN connection to the rear panel. The Digital I/O connector is a right angle 62-pin connector with lock studs. An LED header allows easy extension of the 8063's LEDs to the user's front panel.

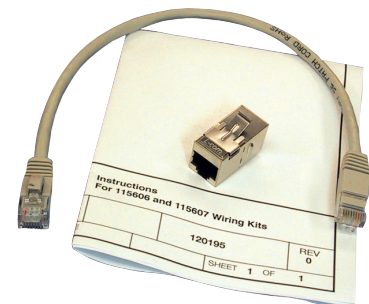
User Customization

The 8063's firmware allows the user to store a custom IDN message and other parameters in the 8063's Flash memory which makes the 8063 appear as part of the OEM's product. The IDN message can be changed to show the OEM's company and product

identification including serial number and product revision. A lock function hides the setup variables from the end user and prevents accidental changes to the setup.

The OEM can customize the 8063's Webserver pages to match your company's colors and theme. ICS's logo can be replaced with your company's logo and other images added to the HTML pages. ICS supplies a utility for uploading your HTML pages and graphics to the 8063.

ICS's Application Bulletin AB80-5 provides guidelines and detailed directions for customizing the 8063's web pages.



ICS Wiring Kit with 1 foot cable

Supported Standards**VXI-11 Capabilities**

Fully VXI-11.3 compliant

VXI-11.3	Device Interface
Sockets	15 + 1 for UDP
Channel types	Data, Abort and Interrupt
Links	64
Interface Names	inst0 for general use inst1 for transparent data

VXI-11.3 Functions

All VXI-11.3 functions including device read, write, local, remote, clear, trigger, readstb, lock and unlock.

RPC Protocol

Conforms to ONC RPC Version 2, VXI-11

Raw Socket Protocol

Port	23
Echo	None
ICS Prompt	None
Sockets	4
Timeout	120 sec
Terminator	Linefeed
Logon Message	8063 IDN message

Ethernet Interface

Type	IEEE 802.3 compliant
Speeds	10BaseT (10 Mb/s) 100BaseT (100 Mb/s)
IP Address	Static or DHCP
Factory setting	192.168.0.254 static
Interface name	any [inst0], [inst1]

WebServer Capabilities

Provides the following HTML 4.01 compatible web pages:

Welcome
Configuration
Confirmation
Reboot
404, 500 and 501 Error pages

IEEE 488.2 Capabilities:

Runs all required 488.2 Common Commands, incorporates an extended IEEE-488.2 Status Reporting Structure and the Message Exchange Protocol.

SCPI Capabilities:

Incorporates the SCPI Command Tree shown in Table 1. Complies with SCPI version 1994.0.

Signal Characteristics

The 8063's parallel I/O signals have the following electrical characteristics. All time delays listed here are maximums, all pulse widths are minimums.

Inputs	48 Digital I/O , 2 Status lines
Input Logic Levels	High => +2.0 V @ ±10 μA Low =<0.8 V @ 250 μA with 33 Kohm pullup to +5 Vdc for sensing contacts. Max High = 5.5 V

Input Timing	External Data Inhibit line SETS within 1 μs of the active edge of the EDR Input signal and resets after data is loaded. Data loading time for 6 BCD/HEX characters is 0.15 ms (typ.) after the 8063 has been sent a read request.
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Output Logic Levels	High =>3 V with 3 mA source High =>2 V with 24 mA source Low = 0.0 to +0.55 Vdc, 48 mA sink
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Output Timing	Data is transferred to the output 2 to 3 ms after receipt of a message depending upon data transfer mode and command.
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Pulse	10-30000 ms, 50 ms default
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Data Stb Trigger Remote	Output pulse width, 5 μs. Output pulse width, 5 μs Output level asserted when in the remote state
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Clear	Output pulse width, 30 μs when 8063 reset.
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Reset	Output pulse width, 2 ms when 8063 power turned on.
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Stable	Output level asserted after IO lines are configured, approximately 3.7 sec after power turn-on
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Indicators

PWR	Indicates power on
LAN	Unit connected to an active LAN
ACT	Transferring messages to/from the network
RDY	Unit has passed self test
TALK	Unit asked to send data
LSTN	Unit sent a command or data
SRQ	Device Service Request asserted
ERR	Blinks for a soft VXI-11 error and On for command errors

Controls

Power	- Front panel switch
LAN Reset	- Rear panel push-button that resets the network settings.

Physical**Size, L x W x H**

7.29 x 7.45 x 1.52 inches
(1185.2 x 189.2 x 38.6 mm)

Weight 1.6 lbs. (0.73 kg.) plus pwr adapter

Construction Lead Free

Connector and Headers

Digital I/O:	62-pin female, metal DC shell connector with lock studs
LEDs:	8-pin male header
Ethernet:	RJ-45

Temperature

Operation	-10° C to +55° C
Storage	-40° C to +70° C

Humidity

0-90% RH without condensation

Power

9 to 32 Vdc @ 3 VA

Approvals

EEC Standards EN 61000-6-4:2001, EN 61000-6-2:2001, EN 55024:2003, and EN 55022:2003.

Included Accessories

Instruction Manual
Mating Connector and Hood
LAN Crossover Cable
Support CD with VXI-11 Keyboard Controller program and Configuration Utility.
UL/CSA/VDE approved universal 100-230 Vac, 50/60 Hz, AC Power Adapter with Australia, China, Europe, Japan, UK and US plugs.

Rack Mounting Kits and other accessories shown in the Parts Selection Tree on the preceding page

ORDERING INFORMATION

	Part Number
Ethernet to Parallel Digital Interface (Includes Manual, Mating Connector, Support CD and Power Adapter)	8063
OEM Board version of 8063 Ethernet to Digital Interface (Includes Manual, Mating Connector and Support CD)	115621
8063 Mating Connector and Hood	902270+902105
Wiring Kit with Shielded Bulkhead Adapter and 1 ft long Ethernet extension cable	115606
Wiring Kit with Shielded Bulkhead Adapter and 2 ft long Ethernet extension cable	115607