ACCES I/O PRODUCTS, INC.
10623 Roselle Street, San Diego, CA 92121 • (858) 550-9559 • Fax (858) 550-7322
info@accesio.com • www.accesio.com

MODEL WM-IIRO-8

USER MANUAL

Notice

The information in this document is provided for reference only. ACCES does not assume any liability arising out of the application or use of the information or products described herein. This document may contain or reference information and products protected by copyrights or patents and does not convey any license under the patent rights of ACCES, nor the rights of others.

IBM PC, PC/XT, and PC/AT are registered trademarks of the International Business Machines Corporation.

WARNING!!

ALWAYS CONNECT AND DISCONNECT YOUR FIELD CABLING WITH THE COMPUTER POWER OFF. ALWAYS TURN COMPUTER POWER OFF BEFORE INSTALLING A CARD. CONNECTING AND DISCONNECTING CABLES, OR INSTALLING CARDS INTO A SYSTEM WITH THE COMPUTER OR FIELD POWER ON MAY CAUSE DAMAGE TO THE I/O CARD AND WILL VOID ALL WARRANTIES, IMPLIED OR EXPRESSED.

Warranty

Prior to shipment, ACCES equipment is thoroughly inspected and tested to applicable specifications. However, should equipment failure occur, ACCES assures its customers that prompt service and support will be available. All equipment originally manufactured by ACCES which is found to be defective will be repaired or replaced subject to the following considerations.

Terms and Conditions

If a unit is suspected of failure, contact ACCES' Customer Service department. Be prepared to give the unit model number, serial number, and a description of the failure symptom(s). We may suggest some simple tests to confirm the failure. We will assign a Return Material Authorization (RMA) number which must appear on the outer label of the return package. All units/components should be properly packed for handling and returned with freight prepaid to the ACCES designated Service Center, and will be returned to the customer's/user's site freight prepaid and invoiced.

Coverage

First Three Years: Returned unit/part will be repaired and/or replaced at ACCES option with no charge for labor or parts not excluded by warranty. Warranty commences with equipment shipment.

Following Years: Throughout your equipment's lifetime, ACCES stands ready to provide on-site or in-plant service at reasonable rates similar to those of other manufacturers in the industry.

Equipment Not Manufactured by ACCES

Equipment provided but not manufactured by ACCES is warranted and will be repaired according to the terms and conditions of the respective equipment manufacturer's warranty.

General

Under this Warranty, liability of ACCES is limited to replacing, repairing or issuing credit (at ACCES discretion) for any products which are proved to be defective during the warranty period. In no case is ACCES liable for consequential or special damage arriving from use or misuse of our product. The customer is responsible for all charges caused by modifications or additions to ACCES equipment not approved in writing by ACCES or, if in ACCES opinion the equipment has been subjected to abnormal use. "Abnormal use" for purposes of this warranty is defined as any use to which the equipment is exposed other than that use specified or intended as evidenced by purchase or sales representation. Other than the above, no other warranty, expressed or implied, shall apply to any and all such equipment furnished or sold by ACCES.

Table of Contents

Chapter 1: Introduction

Features

- RS232 Serial Interface to Host Computer.
- 900 MHz Wireless Connection Between Host Computer Modem and WM-IIRO-8.
- 8 Optically-Isolated, Non-Polarized Digital Inputs with Change of State(COS) Detection.
- 8 SPDT Electro-Mechanical Relay Outputs that Switch Up to 1 Amp Each.
- Digital Outputs May Be Either Level or Pulsed.
- Type 8031 Microcontroller with 8K RAM and 8K EEPROM. (32K X 8 optional)
- Ability to Program with Custom Firmware over Wireless Connection
- NEMA4 Enclosure for Harsh Atmospheric or Marine Environments.

Functional Description

The WM-IIRO-8 is an intelligent 8-bit parallel digital I/O unit that communicates with ACCES's Wireless Serial Modem via a 900 MHz wireless connection. The Wireless Serial Modem connects to a host computer's standard COM port using an RS232 (or RS485) serial communications protocol. Both the WM-IIRO-8 and the Wireless Serial Modem are packaged in NEMA4 enclosures for remote installation in harsh environments. ASCII-based command/response protocol permits communication with virtually any computer system. It can operate at baud rates up to 9600 baud at distances up to 7 miles line-of-sight.

The 8 isolated inputs can be driven by either AC or DC signals and are not polarity sensitive. Input signals are rectified by photocoupler diodes. Standard 12/24 AC control transformer outputs can be accepted as well as DC voltages. The input voltage range is 3 to 28 volts (rms). Unused power dissipates through a 1.8KΩ resistor. External resistors connected in series with this may be used to extend the input voltage range. Each input circuit contains a switchable slow/fast filter that has a 4.7 ms time constant. (Without filtering, the response is 10 µs) The filter must be selected for AC inputs in order to eliminate response to zero crossings, however, it is also valuable for use with slow DC signals in a noisy environment. A filter is individually selected when a jumper is installed onto any of the positions 'FILTER 0' thru 'FILTER 7'.

The electro-mechanical relay outputs may be programmed individually or as an 8-bit byte. These outputs may be latched, pulsed, or set to free-run for a prescribed period of time. The relays are Form C, SPDT, and are de-energized at power-on.

A type 8031 microcontroller (with 8K x 8 RAM, 8K x 8 non-volatile EEPROM, and a watchdog timer circuit) gives the WM-IIRO-8 the capability and versatility expected from a modern distributed control system. To accommodate special programs, the RAM and EEPROM can each be expanded to 32K x 8.

The built-in watchdog timer resets the pod if the microcontroller "hangs up". Data collected by the pod can be stored in local RAM and accessed later through the computer's serial port. This facilitates stand-alone operation.

The module, or pod, address is programmable from 00 to FF hex. Whatever address is assigned to the pod gets stored in EEPROM and used as the default address at the next Power-ON. The use of module addressing allows as many as 256 WM-IIRO-8 units may be connected to a single host computer & wireless serial modem.

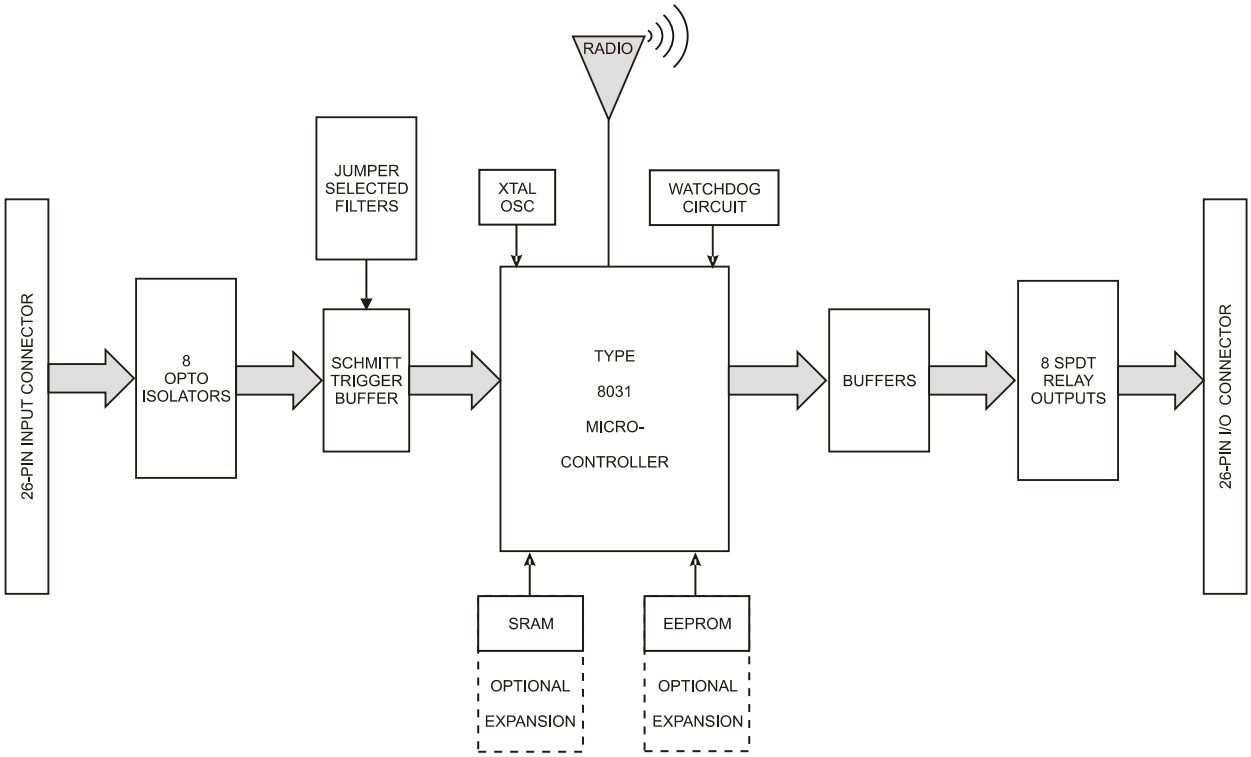

Figure 1-1: Block Diagram

Chapter 2: Installation

POWER

WM-IIRO-8 Plug the provided AC wall adaptor to any standard AC wall outlet.

WIRELESS SERIAL MODEM

Laptops: Plug the provided AC wall adaptor to any standard AC wall outlet.
Desktops: Install the provided two section power cable. The Molex ~ DB9-F cable section goes inside the host computer. The DB9-M ~ Modem cable goes outside the host computer.

SERIAL COMMUNICATION

Plug the provided DB9-F / Modem cable into one of the host computer's COM Ports. The COM Port selected **MUST** be configured for the following settings:

Protocol: RS232
Baud Rate: 9600
Data Bits: 7
Parity: Even
Stop Bits: 1

VERIFY INSTALLATION

1. Locate and run ACCES' **WINRISC.EXE** application program (easy-to-use serial communication terminal program) on the CD-ROM provided at :\disks\Tools.win\WIN32\.

2. Match the pull-down menu settings to the appropriate 'Port' and above configuration.

3. Click the "Connect" button to connect the application to the Wireless Serial Modem then click the cursor into the large "data" area of the WINRISC window.

4. Type "?" and press enter. A "Main Help Screen" will be returned if the two units have been installed properly.

Chapter 3: Option Selection

FILTER RESPONSE SWITCH

Jumpers are used to select input filtering on a channel-by-channel basis. When jumper FLT0 is installed, additional filtering is introduced for input bit 0, FLT1 for bit 1, etc. This additional filtering must be used when AC inputs are applied.

JUMPER SELECTION	Bit Filtered
FLT-0	IN00
FLT-1	IN01
FLT-2	IN02
FLT-3	IN03
FLT-4	IN04
FLT-5	IN05
FLT-6	IN06
FLT-7	IN07

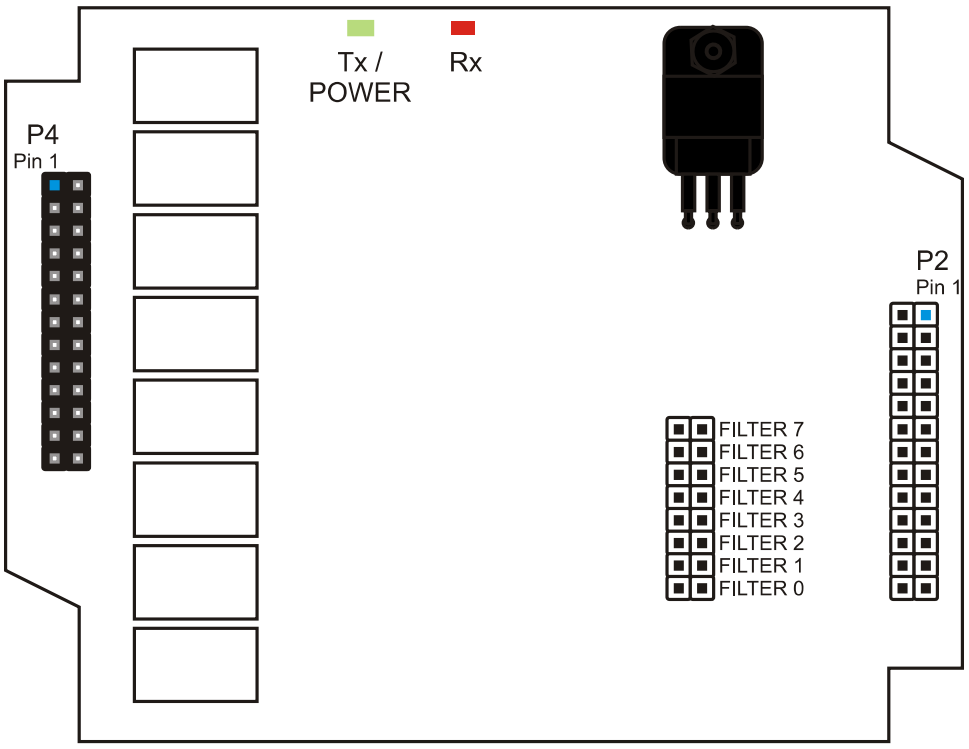

Figure 3-1: Option Selection Map

Connections

The signal assignment to each of the screw terminal board's pins are as follows:

'Isolated Input' Terminal Block PCB	Signal	'Relay Output' Terminal Block PCB	Signal
1	GND	1	Relay 7 - normally closed
2	GND	2	Relay 7 - common
3	+PWR*	3	Relay 7 - normally open
4	+PWR*	4	Relay 6 - normally closed
5	N/C	5	Relay 6 - common
6	N/C	6	Relay 6 - normally open
7	N/C	7	Relay 5 - normally closed
8	N/C	8	Relay 5 - common
9	N/C	9	Relay 5 - normally open
10	N/C	10	Relay 4 - normally closed
11	Isolated Input 7 B	11	Relay 4 - common
12	Isolated Input 7 A	12	Relay 4 - normally open
13	Isolated Input 6 B	13	N/C
14	Isolated Input 6 A	14	N/C
15	Isolated Input 5 B	15	Relay 3 - normally closed
16	Isolated Input 5 A	16	Relay 3 - common
17	Isolated Input 4 B	17	Relay 3 - normally open
18	Isolated Input 4 A	18	Relay 2 - normally closed
19	Isolated Input 3 B	19	Relay 2 - common
20	Isolated Input 3 A	20	Relay 2 - normally open
21	Isolated Input 2 B	21	Relay 1 - normally closed
22	Isolated Input 2 A	22	Relay 1 - common
23	Isolated Input 1 B	23	Relay 1 - normally open
24	Isolated Input 1 A	24	Relay 0 - normally closed
25	Isolated Input 0 B	25	Relay 0 - common
26	Isolated Input 0 A	26	Relay 0 - normally open

Table 3-1: WM-IIRO-8 Screw Terminal Connections

+PWR*:	Power is power from a local power supply. The voltage can be anywhere from 7.5 VDC to 16 VDC. Higher local power, 24 VDC for example, can be used if an external zener diode is used to reduce the voltage applied to RIOD24. (See Temperature de-rating comments in the Specification section of this manual under "Power Required".)

Chapter 4: Software

General

You received ASII-based software on CD for use with WM-IIRO-8. ASCII programming permits you to write applications in any high level language that supports ASCII string functions.

The communication protocol has two forms: addressed and non-addressed. Non-addressed protocol can be used when only one WM-IIRO-8 is in use. When more than one module (pod) is in use, addressed protocol must be used. The only difference is that an address command is sent to enable the specific pod. The address command is only sent once during communication between the pod and the host computer. It enables communication with that specific pod and disables all other pods on the network.

Command Structure

All communication must be 7 data bits, even parity, 1 stop bit. All numbers sent to or received from the pod are in hexadecimal form. The factory default baud rate is 9600 Baud. The pod is considered to be in addressed mode any time its pod address is not 00. The factory default pod address is 00 (non-addressed mode).

Addressed Mode

The address select command must be issued before any other command to the addressed pod. The address command is as follows:

> "!xx[CR]" where xx is the pod address from 01 to FF hex, and [CR] is Carriage Return, ASCII character 13.

The pod responds with "xxN[CR]" or "xxY[CR]" if an input change of state has occurred on enabled bits since the last "Y" or address command, or with "xxN[CR]" otherwise.

Once the address select command has been issued, all further commands (other than a new address select) will be executed by the selected pod. The addressed mode is required when using more than one pod.

Non-Addressed Mode

When there's only one pod connected, no address select command is needed. You can merely issue commands listed in the following table. Terminology used is as follows:

a. The single lower case letter 'x' designates any valid hex digit (0-F).
b. The single lower case letter 'b' designates either a '1' or '0'.
c. The symbol '±' designates either a '+' or a '-'.
d. All commands are terminated with CR, the ASCII character #13.
e. Wherever xx is used to designate a bit number, only 00-07 are valid.
f. All commands are case insensitive; i.e., upper or lower case letters can be used.
g. The symbol '*' means zero or more valid characters (total msg length <255 decimal).

Command List

I	Read all 8 digital bits.	xxCR
Ixx	Read a single digital bit. (00<=xx<=07)	bCR
Oxx0xx	Output all 8 digital bits.	CR
Ox±	Output either high or low on bit x	CR
Oxx±	Output either high or low on bit xx	CR
Ox±xx	Output either high or low on bit x for time xx	CR
Oxx±xx	Output either high or low on bit xx for time xx	CR
Y	Read digital input COS bit and clear bit	Y or N
Txx	Set bit 00-07 Mask for COS bit flag, 1=change will set COS	CR
Dx±	Set digital input active state high or low on bit x	CR
Dxx±	Set digital input active state high or low on bit xx	CR
Cxx	Read digital input xx counter (counts each active pulse)	xxCR
or	Read pulse/free-run output xx counter and reload value	xxCR
Rxx	Reset digital input counter xx to 0000	CR
Rall	Reset all digital input counters to 0000	CR
V	Read the Firmware version number	x.xxCR
N	Resend last response	varies
H*	Greeting message: copyright, firmware version number	varies
BAUD=xxx	Set new baud rate. Each x is code number for new baud	=:Baud:0x
POD=xx	Set pod address to xx	varies
PROGRAM=	Begin process of uploading custom program to pod	special
D	Download historical storage of digital input data again	varies
FASTDATA	Acquire bits 0-7 as fast as possible, then display	varies

Command Functions

The following paragraphs give details of the command functions, describe what the commands cause, and give examples. Please note that all commands have an acknowledgment response. You must wait for a response from a command before another command is sent.

Read Digital Inputs

I	Read 8 bits
Ixx	Read bit number xx

These commands read the digital input bits from the pod. All byte or word wide responses are sent most-significant nibble first.

Examples:

Read ALL 8 bits.

SEND: I
RECEIVE: FF[CR]

Read only bit 2

SEND: I02
RECEIVE: 1[CR]

Write Digital Outputs

Oxx	Write to all 8 digital output bits
Ox±	Set bit x hi or low
Oxx±	Set bit xx hi or low
Ox±xx	Pulse bit x hi or low for time xx
Oxx±xx	Pulse bit xx hi or low for time xx
bx±xx	Identical to Ox±xx
bxx±xx	Identical to Oxx±xx

These commands write outputs to digital bits. Any attempt to write to a bit configured as input will fail. Writing to a byte or word wherein some bits are input and some are output will cause the output latches to change to the new value, but the bits which are inputs will not output the value until/unless they are placed in output mode.
Single bit commands will return an error (4) if an attempt is made to write to a bit configured as input.

Writing a one to a port asserts the pull-down. Writing a zero de-asserts the pull-down. Therefore, if the factory installed +5V pull-up is installed, writing a one will cause zero volts to be at the connector, and writing a zero will cause +5 volts to be asserted. If the factory installed pull-up has been removed, the user supplied pull-up will be asserted.

Write a zero to bit 2 (set output to +5V or user pull-up)

SEND: O2-
or
SEND: O02-
RECEIVE: [CR]

Write zeros to every odd bit

SEND: OAA

RECEIVE: [CR]

Read Change-of-state

Y Read COS bit.

The pod can set a change-of-state flag for any input that has been configured to do so. This command will read then reset that bit. Therefore, this command will always return "N[CR]" unless the T command has first been used to enable change-of-state detect for any given bit.

If a change-of-state has been detected since the last "Y" command (see note), the pod will return "Y[CR]" otherwise "N[CR]" will be returned.

Examples:

Read COS bit

SEND: Y

RECEIVE: N[CR]

Note: The address command for any given pod will also return "Y" or "N" and clear the Change-of-state flag in the pod.

Enable Change-of-State Detection

Txx Set COS mask

These commands configure the bit-by-bit mask to enable change-of-state to set the COS flag on the pod for readback by the "Y" or address commands. If a one is set for a particular bit, that bit will set the COS flag if/when the bit changes state. A zero will disable change-of-state detection.

Note: The COS Flag is read via either the "Y" command or a valid address command. The COS Flag is reset to FALSE by either command.

Selecting Which Edge Will Increment Counter

dx± Set Digital input active state on bit x

dxx± Set Digital input active state on bit xx

These commands allow you to set whether a rising or falling edge will increment the digital input counter; i.e., if all bits are set to rising edge, the digital input counter for any given bit will increment each time a rising edge is detected. "+" is rising edge, "-" is falling edge.

Examples:

Set bit 1 to rising edge active

SEND: D1+

or

SEND: D01+

RECEIVE: [CR]

Note: The digital input counters are read with the "cxx" command, and reset with the "rxx" command.

Read Digital Input Counter

cxx Read digital input counter xx

Tthis command will read how many times bit xx has changed to its active state (as configured with dx± or dxx±) since the last reset command (rxx).

Input counters are configured as 16-bit counters. Counter content is provided most significant bit first.

Output return values are divided into two eight-bit counters. The first byte of the output counters is the time-remaining before the output pulse expires, the second byte is the originally-programmed period of free-run outputs. The second byte is zero for pulse outputs.

Examples:

Read digital input counter for bit #1

SEND: C01

RECEIVE: 0213[CR];assuming 213hex edges since last reset

Reset Counter

rxx Reset digital input counter xx

This command is normally used to reset a digital input counter to zero.

Examples:

Reset digital input counter for digital input number 3

SEND: r03

RECEIVE: [CR]

Read Firmware Revision Number

V Read the firmware revision number

This command is used to read the version of firmware installed in the pod. It returns "X.XX[CR]".

Example:

Read the WM-IIRO-8 version number

SEND: V

RECEIVE: 1.00[CR]

Note: The "H" command returns the version number along with other information.

Resend Last Response

n Resend last response

This command will cause the pod to return the same thing it just sent. This command works for all responses less than 255 character in length. Normally this command is used if the host detected a parity or other line fault while receiving data, and needs the data to be sent a second time.

The "n" command may be repeated.

Example:

Assuming that the last command was "I", ask pod to resend last response

SEND: n

RECEIVE: FF[CR];or whatever the data was

Note: This command may not be used for the FASTDATA command, as they exceed the 255 character limit. Use the "D" command to perform the same task for these three commands.

Hello Message

H* Hello message

Any string of characters starting with "H" will be interpreted as this command. ("H[CR]" along is also acceptable.) The return from this command takes the form (without the quotes):

"=Pod aa, WM-IIRO-8 Rev 1.01 Firmware Ver:x.xx ACCES I/O Products, Inc."

aa is the pod address

rr is the hardware revision, such as "B2"

x.xx is the software revision, such as "1.01"

Example:

Read the greeting message

SEND: Hello?

RECEIVE: =Pod 00, WM-IIRO-8 Rev B2 Firmware Ver:1.01 ACCES I/O Products, Inc.[cr]

Programming Pod Address

A=xx Program the currently selected pod to respond at address xx

This command changes the pod's address to xx. If the new address is 00, the pod will be placed into non-addressed mode. If the new address is not 00, the pod will not respond to further communications until a valid address command is issued. Hex numbers 00-FF are considered valid addresses. The RS485 specification allows only 32 drops on the line, so many addresses will be unused.

The new pod address is saved in EEPROM and will be used even after power-down until the next "A=xx" command is issued. Note that, it the new address is not 00 (i.e., the pod is configured to be in addressed mode), it is necessary to issue an address command to the pod at the new address before it will respond.

The pod returns a message containing the pod number as confirmation.

Example:

Set the pod address to 01

SEND: A=01

RECEIVE: =:Pod#01[CR]

Set the pod address to F3

SEND: A=F3

RECEIVE: =:Pod#F3[CR]

Take the pod out of addressed mode

SEND: A=00

RECEIVE: =:Pod#00[CR]

Read and Store Digital Input Data

FASTDATA Read digital bits 0-7 as fast as possible

These commands read the respective byte of digital input data and store it in SRAM at the fastest possible rate: 21 microseconds between samples. The commands will store as much data as the pod can hold: RAM size-1KByte. Typically, this is 7Kbytes of data, however, a 32k RAM version is optionally available, which would provide 31Kbytes of data storage.
Once the data has been stored, it is dumped to the serial port. The data is formatted into 3-byte chunks, followed by a space: xxxxxx xxx...etc. There are no carriage returns until the last byte has been sent.

All normal pod activities (parsing commands, receiving commands, pulse output countdowns, free-run generation, COS detect, etc.) STOP until the serial data is done transmitting. NOTHING else works until the data has been dumped.

Re-send Data

D This will dump the last stored historical data to the serial port.

Data can be resent by issuing a "D" command. This will dump the last stored historical data to the serial port and can be used, for example, if line noise or similar problems are suspected.

This command should only be used after FASTDATA has been issued, because random data fills the buffer until one of these commands acquire data.

The format of the data is identical to the FASTDATAx commands. See the previous description of the FASTDATAx command for more information about the format and length of returned data.

Example:

Resend the data buffer
SEND: D
RECEIVE: xxxxxx xxxxxx xxxxxx ... xxxxxx for size of buffer.

Entering a New Program
PROGRAM= This command initiates the transfer of a new program to the WM-IIRO-8.

This command should be used carefully. If you accidentally issue a "PROGRAM=" command, ESC (ASCII 27) will restart the pod as if power had been reset.

This feature is designed to allow ACCES to provide field-upgrades to the WM-IIRO-8 firmware, and, for advanced users, the opportunity to customize the firmware in the pod. Documentation relating to the use of this command is provided with the CD, or is available separately for a small fee.

Error Codes

The following error codes can be returned from the pod:

1: Invalid channel number (too large, or not a number. All channel numbers must be between 00 and 17, in hex. (0-24 decimal))
3: Improper Syntax. (Not enough parameters is the usual culprit)
4: Channel number is invalid for this task (For example, if you try to output to a bit that is set as an input bit, this error code will occur)
9: Parity error. (This occurs when some part of the received data contains a parity or framing error)

Additionally, several full-text error codes are returned. All begin with "Error, ", and are useful when using a terminal to program the pod.

Error, Unrecognized Command: {command received} [CR]
This occurs if the command is not recognized.

Error, Command not fully recognized: {Command received} [CR]
This occurs if the first letter of the command is valid, but the remaining letters are not.

Error, Address command must be CR terminated [CR]
This occurs if the address command (!xx[CR]) has extra characters between the pod number and the [CR].

Chapter 5: Specification

General

- Connectivity: A serial cable connects the host computer's COM port with ACCES's WM-DP-232 modem, which in turn communicates with the WM-IIRO-8 via a 900 MHz wireless connection.
- Intelligence: Type 8051 microcontroller family provides capability of local control.
- Protection: Watchdog Timer circuit
- Memory: Up to 32k RAM & 32k EEPROM.
- Size of NEMA4 box: 4.53" long by 3.54" wide by 2.17" high
- Weight: 19.0 oz

Power Requirements

- Voltage Range: 7.5 to 15 volts
- Current Range: 130 mA - idle mode
  30 mA - increase per relay activation
  100 mA - increase during constant transmission
  470 mA - maximum
  Idle mode may be reduced to 70 mA with cyclic sleep mode

900 MHz Radio

- Frequency Range: 902 to 928 MHz, Unlicensed ISM Band
- Type: Frequency Hopping Spread Spectrum Transceiver
- Throughput: 9600 baud
- Transmit Power: 100mW
- Receiver Sensitivity: -110dBm
- Outdoor Range: 7 miles (theoretical with line of sight)
- Interference Rejection: 70dB at pager and cellular phone frequencies

900 MHz Antenna

- Frequency Range: 902 to 928 MHz
- Impedance: 50 Ω nominal
- Gain: 2.1 dBi
- Length: 7"
- Polarization: Vertical
- Wave: Half Wave
- Connector: SMA reverse polarity plug (RPSMA)

Isolated Inputs

- Number: Eight
- Type: Non-polarized, optically isolated from each other and from the computer. (CMOS compatible)
- Logic Input Low: -0.5 V to 0.8 V
- Logic Input High: +3.0 V to +33.0 V
- Isolation: 60V channel-to-ground or channel-to-channel
- Input Resistance: 1.8K ohms in series with two diodes and an LED.
- Change of State Detection: Change-of-state flags can be set on either the rising or falling edge of any enabled input bit and can be read via the serial port.

Relay Outputs

- Number: Eight.
- Contact Form: SPDT (form C)
- Contact Type: Single Crossbar
- Contact Material: Silver + Gold-clad
- Rated Load: 0.5 A at 125 VAC; 1 A at 24 VDC
- Max. Switching Current: 1 A
- Max. Switching Voltage: 125 VAC; 60 VDC
- Max. Switching Capacity: 62.5 VA; 30 W
- Contact Resistance: 100 mΩ max.
- Operate Time: 5 ms
- Release Time: 5 ms
- Contact Life (mechanical): 5 million operations

Environmental

- Operating Temperature Range: 0 °C. to 65 °C.
- Temperature De-rating: Based on the power applied, maximum operating temperature may have to be de-rated because internal power regulators dissipate some heat.

For example, when 7.5VDC is applied, the temperature rise inside the enclosure is 7.3 °C. above the ambient temperature.

Maximum operating temperature can be determined according to the following equation:

$$V_{I(TJ = 100)} < 19.6 - T_A/6.83$$

Where T_A is the ambient temperature in °C. and $V_{I(TJ = 100)}$ is the voltage at which the integral voltage regulator junction temperature will rise to a temperature of 100 °C.
(Note: The junction temperature is rated to 120 °C. maximum.)

For example, at an ambient temperature of 25 °C., the voltage V_I can be up to 15.9V.
At an ambient temperature of 100°F (37.8°C), the voltage V_I can be up to 14V.

- Storage Temperature Range: -20 °C. to +70 °C.
- Humidity: 5% to 95% RH non-condensing.

Customer Comments

If you experience any problems with this manual or just want to give us some feedback, please email us at: ***manuals@accesio.com.*** Please detail any errors you find and include your mailing address so that we can send you any manual updates.

ACCES I/O PRODUCTS, INC.

10623 Roselle Street, San Diego CA 92121
Tel. (858)550-9559 FAX (858)550-7322
www.accesio.com