



SyringePump.com

ANA-BOX-21

PC & Digital Sensor Interface Addendum

Model: ADPT-ANABOX-PC

Addendum to Standard Ana-Box User Manual

***WARNING
NOT FOR CLINICAL
USE ON HUMANS***

1. General Information

Thank you for purchasing the Ana-Box. Please familiarize yourself with the Ana-Box's operation by reading this user's manual. For future reference, record the serial number, located on the bottom identification label, and the date of purchase.

New Era Pump Systems Inc., located in Farmingdale, NY USA, can be contacted at:

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www.SyringePump.com

This Operating Manual, and the Ana-Box's hardware, electronics, and firmware are copyrighted.

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1.1 Warnings and Cautions

-  Read the user's manual
-  No user serviceable parts are inside.
-  Do not immerse in liquid
-  Prevent liquids from entering openings.
-  Only connect to a power source as specified on the power supply label.
-  Do not push objects of any kind into openings, except for appropriate cables and connectors.
-  Discharge static from control cables before connecting by touching the cable to ground.

1.2 Disclaimer

New Era Pump Systems Inc. makes no representations or warranties, expressed, statutory or implied, regarding the fitness or merchantability of this product for any particular purpose. Further, New Era Pump Systems Inc. is not liable for any damages, including but not limited to, lost profits, lost savings, or other incidental or consequential damages arising from ownership or use of this product, or for any delay in the performance of its obligations under the warranty due to causes beyond its control. New Era Pump Systems Inc. also reserves the right to make any improvements or modifications to the product described in this manual at any time, without notice of these changes.

New Era Pump Systems Inc. products are not designed, intended, or authorized for use in applications or as system components intended to support or sustain human life, as a clinical medical device for humans, or for any application in which the failure of the product could create a situation where personal injury or death may occur.

All brand and product names used in this manual are the trademarks of their respective owners.

1.3 Warranty

New Era Pump Systems Inc. warranties this product and accessories for a period of two years, parts and labor, from the date of purchase. The repaired unit will be covered for the period of the remainder of the original warranty or 90 days, whichever is greater.

A return authorization number must be obtained from New Era Pump Systems Inc. before returning a unit for repair. Warranty covered repairs will not be performed without a return authorization number. At the option of New Era Pump Systems Inc., a defective unit will be either repaired or replaced.

This warranty does not cover damage by any cause including, but not limited to, any malfunction, defect or failure caused by or resulting from unauthorized service or parts, improper maintenance, operation contrary to furnished instructions, shipping or transit accidents, modifications or repair by the user, harsh environments, misuse, neglect, abuse, accident, incorrect line voltage, fire, flood, other natural disasters, or normal wear and tear. Changes or modifications not approved by New Era Pump Systems Inc. could void the warranty.

The foregoing is in lieu of all other expressed warranties and New Era Pump Systems Inc. does not assume or authorize any party to assume for it any other obligation or liability.

1.4 Packing List

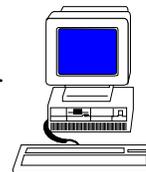
Included with the Ana-Box are the following items:

- Basic Operating Manual.
- CBL-NET-7: Interface cable to pump

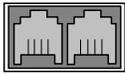
2. Overview

6. RS-232 Communications

The Ana-Box can communicate with any computer or device with an RS-232 communications port or converter.



6.1 Connection and Networking



On the side of the Ana-Box are 2 square RJ-11 (“phone jack” style) sockets. Connect a Primary RS-232 cable (CBL-PC-PUMP-7, not included with the Ana-Box) into the socket labeled “Computer”. Connect the other end to the serial port of the computer, control device, or sensor.

The Ana-Box can also be used within a pump network. A network cable (CBL-NET-7) attached to a previous device can be attached to the Ana-Box’s “Computer” socket. Additional devices can be networked after the pump under control of the Ana-Box.

Each device on the network needs to be set to the same baud rate and set to a unique network address. The address identifies the device to the computer, and to each Ana-Box. Network addresses are from 00 to 99. The Ana-Box's factory **default address is 9**. The default address of the pump under control of the Ana-Box is 0.

The settings are saved on the device and only need to be set once. Attach each device individually to the computer and then use the '*ADR' command to set the network address and baud rate. A maximum of 8 Ana-Box's can be on the network.

6.2 Digital Sensor Mode

A sensor with a digital serial output can be attached to the Ana-Box’s “Computer” jack. In Digital Mode, the sensor data output will override the analog input. The sensor must output ASCII data as floating point or integer data, which will be interpreted by the Ana-Box as voltage. Floating point data will be interpreted directly as voltage. Integer data will be first divided by 1000, then interpreted as voltage.

The Ana-Box will automatically enter digital mode after receiving a packet whose first 3 bytes are ASCII digits. The Ana-Box can be set to digital mode by adding 50 to the operational mode setting. For example, mode 1 will become mode 51. When commands are sent to the Ana-Box, digital mode will be disabled.

The maximum data packet is 4 digits plus one decimal point. Each data packet is terminated by a non-digit, or a minimum 0.4 Second delay between packets. The maximum interpreted digital voltage is 65V. Digits beyond 4 will be ignored.

A smoothing algorithm will prevent large jumps in digital data causing erratic changes to pumping control. Due to hardware limitations, occasional digital packets can be lost if sent while communicating with the pump.

6.3 Command Mode: RS-232 Protocol

Precede each command with a network address. Devices will ignore all commands that do not have their defined network address. If the network address is not specified with the command, the address will default to 0.

After a command is sent to a device, the device will not accept any further communications until the current command has been processed. Completion of the command processing is indicated when the first byte of the response packet is transmitted.

While the Ana-Box is actively controlling a device (LED solid), only commands addressed to that Ana-Box, or device under control, will be accepted. Commands addressed to other devices, networked to the device under control, physically past an active Ana-Box, will be ignored.

To set the address on a device, individually attach that device to the PC. Use the command *ADR to set the address.

On the Ana-Box, to set the address of the device under control of the Ana-Box, use the command ADRP.

Addresses will be saved to memory. They only need to be set once.

Communication to and from the Ana-Box uses the following data frame:

Ana-Box Default Network Address: 9

Supported RS-232 Data Frame

Selectable Baud Rates: 2400, 9600, 19200, 38400
 Default Baud rate: 19200
 Frame: 10-bit data frame (8N1):
 Start bit: 1
 Data bits: 8
 Stop bits: 1
 Parity: None

Every command received by a device on the network is acknowledged by the device with a response packet that includes a status character indicating the current operational state of the device.

6.3.1 RS-232 General Syntax Legend

The following syntax expansion legend is common to all syntax expansions:
 Except where indicated, all command and response characters are ASCII data.

<float> => <f> [<float>]	Floating point number. Maximum of 4 digits plus 1 decimal point. Maximum of 3 digits to the right of the decimal point.
<on-off> => 1 0	On, enabled Off, disabled
<count data> => <n> [<n>]	Valid values: 1 to 99
<number data> => <n> [<n>]	Valid values: 0 to 99
<text> => "any printable character" [<text>]	
<f> => { <n> . }	Floating point digits
<n> => { 0 1 2 3 4 5 6 7 8 9 }	Digits
<byte> => "one byte of any data"	
()	One byte of data expressed as (0xhh), where 'hh' is the data in hexadecimal.
=>	Is defined by. Syntax expands to next level of expansion.
<>	Non-terminal syntax expansion
[]	Optional syntax
{ }	Required syntax
	Or. Choose one of the syntax options.
λ	None. Syntax expands to nothing (lambda production).
" "	Description of syntax expansion

6.3.2 RS-232 Protocol: Basic Mode

Command syntax (to device):

<basic command protocol> => <command data> <CR>

Response syntax (from device):

<basic response protocol> => <STX> <response data> <ETX>

In the "Basic" communications mode, a master-slave protocol is used, whereby the device will only transmit in response to a received command.

When the device receives the <basic command protocol>, <command data> will automatically be stripped of all space and control characters, and all text will be converted to upper case. This simplifies communications with the device when commands are being manually typed in from a generic terminal emulator.

6.3.3 RS-232 Protocol: Basic Mode Common Syntax

<transmitted data> => { <command data> <response data> }	
<command data> => [<address> *] [<command>]	To device
<response data> => <address> <status> [<data>]	From device
<status> => { <prompt> <alarm> }	Operational state of device
<prompt> =>	
S	Ana-Box control Stopped
R	Ana-Box control Active
A	Ana-Box Alarm
<alarm> => A ? <alarm type>	Alarm
<alarm type> =>	
R	Power was reset (power was interrupted)
E	Error
O	Out of range
H	High voltage alarm
<address> => <n> [<n>]	Device network address, 0 to 99
*	System command (overrides network address)
<data> => <text>	Response to command
<CR> => (0x0D)	Carriage return
<STX> => (0x02)	Start of packet transmission indicator
<ETX> => (0x03)	End of packet transmission indicator
<length> => <byte>	Number of bytes remaining in packet, including this byte

6.4 Command Errors and Alarms

If a command received by the device is not recognized or the data is invalid, an error message will be in the <data> field of the response packet following the <prompt> field. The following are the error responses:

<command error> => ? <error>	
<error> =>	
λ	General command error. '?' only.
NA	Command is not currently applicable.
OOR	Command data is out of range.
COM	Invalid communications packet received.
IGN	Command ignored due to a conflict.

When an alarm occurs, the alarm must be acknowledged before any data is changed or the device is started. Alarms are acknowledged by the user clearing the alarm message on the keypad, or the alarm status being sent in response to any valid RS-232 command.

6.5 RS-232 Command Set

A packet without a command is interpreted as a status query. The addressed device responds with a status only response packet.

Except where noted, a setting command without its parameter queries the command setting. The response packet data will include the requested data. In general, the query response data will be in the same format as the parameter for setting the command. For example, the query voltage command 'VLT' will respond with '<n.nnn>' as the response '<data>'.

Otherwise, the command is a set command. If the data was set, a status only response packet will be sent. If the data was not set, the response packet will include an error (<command error>) message indicating why the data was not set.

All commands are upper case. Spaces are optional. Lower case letters are converted to uppercase when received. Settings will be saved to memory and will be recalled on power up.

6.6 RS-232 Commands

<command> =>

CONTROL COMMANDS

START ANA-BOX CONTROL

RUN Enter active mode, actively controlling the attached pump according to the mode setup.

STOP ANA-BOX CONTROL

STP Exit active mode. Stops controlling the attached pump.

Status and Setup Commands

CONTROL MODE

MOD Query control mode according to settings on attached pump
Query response: <n.nn>

CONTROL MODE PARAMETERS

PAR <n> Queries control mode parameter <n> according to settings on attached pump Where parameter <n> is the parameter set at Pumping Program Phase 30+n. Valid values for <n> are 1 to 6 (???).
Query response <float>

VOLTAGE INPUT QUERY

VLT Query Voltage input reading
Query response: <float>

USER CONTROL SWITCH

IN0 Query setting of user control switch, where 1 indicates Run and 0 indicates Stop
Query response: { 0 | 1 }

EXTERNAL CONTROL INPUT

IN1 Query setting of external control input, where 1 indicates Run and 0 indicates Stop
Query response: { 0 | 1 }

FIRMWARE VERSION

VER [B] Query firmware version.
Query response:: NE700V<n>.<nn>
VER B Query firmware build date

GENERAL SETUP COMMANDS

ENABLE AUTO-LOGGING OUTPUT

LOG [< 0 | 1 >] Query/Set Automatic logging output of status information to computer
0 = Off; 1=On
Default value: 0 (Logging off)
Query response: { 0 | 1 }

COMMAND MODE

CMD [< 0 | 1 >]

Enable of disables command only mode. Due to hardware limitations, communications with the computer can be lost while the Ana-Box is communicating with the pump under control. Command mode disables status communications with the pump under control, improving communications with the computer.

Can only be set when the Ana-Box is stopped. Automatically disabled when the Ana-Box enters Run mode.

SET NETWORK ADDRESS AND BAUD RATE

* ADR [P [<n>] | D | <address> [B { 38400 | 19200 | 9600 | 2400 }]]

Set/query pump network address and baud rate

<address> => <n> [<n>]

<address> Valid range: 0 to 99

Query response: <nn>

Default address = 9 Default baud rate = 19,200

B { 38400 | 19200 | 9600 | 2400 } If specified, will change the baud rate as indicated. NOTE: The command response and all further communications will be at the specified baud rate.

D Force digital reception mode.

P [<n>] Set/Query address of device under control of the Ana-Box.

<n> Address of device. Valid range: 0 to 7.

Query response: <n>

Default address = 0

This is a special system command that will be accepted by the pump regardless of its current address or mode. The Ana-Box's current address can be substituted for the * symbol to direct the command to one device. Once set, the device will only respond to commands with the set address and at the specified baud rate.

Example: *ADR	Query current network address setting
*ADR 3	Set network address to 3. The Ana-Box will now only respond to commands with address 3
*ADR 5 B 9600	Set the Ana-Box's network address to 5 and the baud rate to 9600. The command's response will be at 9600 baud
*ADR P 3	The Ana-Box will control the device at network address 3.

7. Accessories

7.1 RS-232 Network Cables

RS-232 Network Primary Cable

7-foot cable Part #: CBL-PC-PUMP-7
25-foot cable Part #: CBL-PC-PUMP-25

Cable to connect the first device of an RS-232 network to a standard PC's serial port with a DB-9 connector.

RS-232 Network Secondary Cable

7-foot cable Part #: CBL-NET-7
25-foot cable Part #: CBL-NET-25

Cable to connect additional devices, after the first, to an RS-232 network.

USB to RS-232 Converter Cable

USB to RS-232 cable
Part #: CBL-USB232

Attaches to the RS-232 Network Primary Cable to allow communication through a PC's USB port. Includes a CD with software drivers.

8. Specifications

Power requirements
Power consumption

Controller case dimensions

RS-232 network protocol	Baud rates: 38400 19200 9600 2400 Default: 19,200 Data Frame: 8N1
RS-232 network address range	00 to 99 (100 devices maximum). Default address: 9