I-87028VW Command Sets

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Revision: 1.0
2015/06/12

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1 Introduction

1.1 Default Settings

▫   Module address: 01
▫   Analog output type: 0 to 10 V
▫   Baud Rate: 115200 bps
▫   Checksum disabled
▫   Engineering units format

1.2 Calibration

Warning:

It is not recommended that calibration be performed until the process is fully understood.

The calibration procedure is as follows:
1. Warm up the module for 30 minutes.
2. Set the type code to 2, 0 to 10 V. Refer to Section 2.11 for details.
3. Send command to output 10 V. Refer to Section 2.2 for details.
4. Repeat to send the trim command and check the meter until the meter's reading is nearest to 10 V. Refer to Section 2.4 for details of sending the trim command.
5. Send the 10 V calibration command. Refer to Section 2.8 for details.
6. Repeat steps 1 to 5 for channel 1..

1.3 Configuration Tables

Baud Rate Settings (CC)

Bits 5:0

Code	03	04	05	06	07	08	09	0A
Baud Rate	1200	2400	4800	9600	19200	38400	57600	115200

Bits 7:6
    00: no parity, 1 stop bit
    01: no parity, 2 stop bits
    10: even parity, 1 stop bit
    11: odd parity, 1 stop bit

Analog Output Type Settings (TT)

Set to 3F for I-87028VW

Data Format Setting (FF)

7	6	5	4	3	2	1	0
0	CS	0				DF	

Key	Description
DF	Data format 00: Engineering units 01: % of FSR (full scale range) 10: 2's complement hexadecimal
CS	Checksum settings 0: Disabled 1: Enabled

Analog Output Type and Data Format Table

Type Code	Input Type	Data Format	Max.	Min.
2	0 to 10 V	Engineering units	+10.000	+00.000

Analog Output Slew Rate Control

0   Immediate change
1   0.0625V/Second or 0.125mA/Second
2   0.125V/Second or 0.25mA/Second
3   0.25V/Second or 0.5mA/Second
4   0.5V/Second or 1.0mA/Second
5   1.0V/Second or 2.0mA/Second
6   2.0V/Second or 4.0mA/Second
7   4.0V/Second or 8.0mA/Second
8   8.0V/Second or 16mA/Second
9   16V/Second or 32mA/Second
A   32V/Second or 64mA/Second
B   64V/Second or 128mA/Second
C   128V/Second or 256mA/Second
D   256V/Second or 512mA/Second
E   512V/Second or 1024mA/Second

2 DCON Protocol

All communication with I-87K I/O modules consists of commands generated by the host and responses transmitted by the modules. Each module has a unique ID number that is used for addressing purposes and is stored in non-volatile memory. The ID is 01 by default and can be changed using a user command. All commands to the module contain the ID address, meaning that only the addressed module will respond. The only exception to this is command ~** (Section 2.35), which is sent to all modules, but in this case, the modules do not reply to the command.

Command Format:

Leading Character	Module Address	Command	[CHKSUM]	CR

Response Format:

Leading Character	Module Address	Data	[CHKSUM]	CR

CHKSUM   A 2-character checksum that is present when the checksum setting is enabled. See Sections 1.3 and 2.1 for details.

CR   End of command character, carriage return (0x0D)

Checksum Calculation:

1. Calculate the ASCII code sum of all the characters in the command/response string, except for the carriage return character (CR).
2. The checksum is equal to the sum masked by 0ffh.

Example:

Command string: $012(CR)

1. Sum of the string = "$"+"0"+"1"+"2" = 24h+30h+31h+32h = B7h
2. Therefore the checksum is B7h, and so CHKSUM = "B7"
3. The command string with the checksum = $012B7(CR)

Response string: !01200600(CR)

1. Sum of the string = "!"+"0"+"1"+"2"+"0"+"0"+"6"+"0"+"0" = 21h+30h+31h+32h+30h+30h+36h+30h+30h = 1AAh
2. Therefore the checksum is AAh, and so CHKSUM = "AA"
3. The response string with the checksum = !01200600AA(CR)

Note:

All characters should be in upper case.

2.1 %AANTTCCFF

Description:
This command is used to set the configuration of a specific module.

Syntax:
%AANTTCCFF[CHKSUM](CR)

%	Delimiter character
AA	The address of the module to be configured in hexadecimal format (00 to FF)
NN	The new address of the module in hexadecimal format (00 to FF)
TT	For the I-87028VW, this field should be set to 3F.
CC	The new Baud Rate code, see Section 1.3 for details. To change the Baud Rate, the module should first be switched to INIT* mode.
FF	The command used to set the data format, checksum, and filter settings (see Section 1.3 for details). To change the checksum settings, the module should first be switched to INIT* mode.

Response:

Valid Response:	**!AA[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter for a valid response
?	Delimiter for an invalid response (If the Baud Rate or checksum settings are changed without first switching to INIT* mode, the module will return an invalid response.)
AA	The address of the responding module in hexadecimal format (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Note:
Changes to the address, Type Code, Data Format and Filter settings take effect immediately after a valid command is received. Changes to the Baud Rate and checksum settings take effect at the next power-on reset.

Examples:
Command: %0102000600   Response: !02
    Changes the address of module 01 to 02 and returns a valid response.
Command: %0202000602   Response: !02
    Sets the data format of module 02 to type 2 (2's complement hexadecimal). The module returns a valid response.
Command: %0101000A00   Response: ?01
    Attempts to change the Baud Rate of module 01 to 115200bps and returns an invalid response, because it was not switched to INIT* mode before setting the command.
Command: %0101000A00   Response: !01
    Changes the Baud Rate of module 01 to 115200bps and the module is in INIT* mode. The module returns a valid response.

Related Command:
Section 2.3 $AA2

Related Topics:
Section 1.3 Configuration Tables

2.2 #AAN(Data)

Description:

This command is used to set the analog output value for channel N of a specified module.

Syntax:

#AAN(Data)[CHKSUM](CR)

#	Delimiter character
AA	The address of the module to be set in hexadecimal format (00 to FF)
N	The channel to be set, zero based.
(Data)	The analog output value, see Section 1.3 for details of the data format.

Response:

Valid Response:	**>[CHKSUM](CR)**
Out of Range:	**?[CHKSUM](CR)**
Invalid Response:	****
>	Delimiter character for a valid response
?	Delimiter character to indicate that the (Data) value is out of range. The output will revert to the closest value in the range set for the module.
!	Delimiter character to indicate that the Host Watchdog flag for the module has been set. The output command will be ignored and the output will be set to define the safe value.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $019020   Response: !01

    Sets the configuration for channel 0 of module 01 to an output range of 0 to 10 V, sets a slew rate of immediate change, and returns a valid response.

Command: #010+05.000   Response: >

    Sets the analog output for channel 0 of module 01 to 5 V and returns a valid response.

Related Commands:

Section 2.1 %AANNTTCCFF, Section 2.3 $AA2, Section 2.10 $AA9N, Section 2.11 $AA9NTS

Related Topics:

Section 1.3 Configuration Tables

2.3 $AA2

Description:

This command is used to read the module configuration of a specified module.

Syntax:

$AA2[CHKSUM](CR)

$ Delimiter character

AA   The address of the module to be read in hexadecimal format (00 to FF)

2   The command to read the configuration of the module

Response:

Valid Response: **!AATTCCFF[CHKSUM](CR)**

Invalid Response: **?AA[CHKSUM](CR)**

!   Delimiter character for a valid response

?   Delimiter character for an invalid response

AA   The address of the responding module in hexadecimal format (00 to FF)

TT   Set to 3F for I-87028VW.

CC   The Baud Rate code for the module, see Section 1.3 for details.

FF   The data format, checksum and filter settings for the module, see Section 1.3 for details.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $012   Response: !01000A00
> Reads the configuration of module 01 and returns a valid response indicating that the Baud Rate is 115200, the data format is engineering format and checksum is disabled.

Command: $022   Response: !02000A02
> Reads the configuration of module 02 and returns a valid response indicating that the Baud Rate is 115200, data format is hex format and checksum is disabled.

Related Command:
Section 2.1 %AANNTTCCFF

Related Topics:
Section 1.3 Configuration Tables

2.4 $AA3NVV

Description:

This command is used to trim the calibration for analog output channel N of a specified module.

Syntax:

$AA3NVV[CHKSUM](CR)

$	Delimiter character
AA	The address of the module to be read in hexadecimal format (00 to FF)
3	The command to read the configuration of the module
N	The channel to be calibrated, zero based
VV	A two hexadecimal digits to represent the trim calibration value. A value of 01 to 5F will increase the calibration value by 1 to 95, and values FF to A1 will decrease the calibration value by 1 to 95.

Response:

Valid Response:	**!AA [CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $01301F   Response: !01

Trims the output for channel 0 of module 01 and increases the calibration value by 31 and returns a valid response.

Command: $013060   Response: ?01

Attempts to trim the output for channel 0 of module 01 and increase the calibration value by 96, but returns an invalid response indicating that the value is out of range.

Related Commands:

Section 2.8 $AA7N

Related Topics:

Section 1.2 Calibration

2.5 $AA4N

Description:

This command is used to set the analog output power-on value for channel N of a specified module.

Syntax:

$AA4N[CHKSUM](CR)

$	Delimiter character
AA	The address of the module to be set in hexadecimal format (00 to FF)
4	The command to set the power-on value, and store the current output value as the power-on value
N	The channel to be set, zero based

Response:

Valid Response:	**!AA[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: #012+00.000   Response: >

    Sets the analog output for channel 2 of module 01 to 0.0V and returns a valid response.

Command: $0142   Response: !01

    Sets the power-on value for channel 2 of module 01 to 0.0V and returns a valid response. The power-on value for channel 2 is set to 0.0V immediately.

Command: $014F   Response: ?01

    Attempts to set the power-on value for channel 15 of module 01 and returns an invalid response because channel 15 does not exist.

Related Commands:

Section 2.2 #AAN(Data)

2.6 $AA5

Description:

This command is used to read the reset status of a specified module.

Syntax:

$AA5[CHKSUM](CR)

$	Delimiter character
AA	The address of the module to be read in hexadecimal format (00 to FF)
5	The command to read the reset status

Response:

Valid Response:	**!AAS[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)
S	The reset status of the module:

0:This is not the first time the command has been sent since the module was powered on, which denotes that there has been no module reset since the last $AA5 command was sent.

1:This is the first time the command has been sent since the module was powered on.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $015   Response: !011

    Reads the reset status of module 01. The response indicates that it is the first time the $AA5 command has been sent since the module was powered on.

Command: $015   Response: !010

    Reads the reset status of module 01. The response indicates that there has been no module reset since the last $AA5 command was sent.

2.7 $AA6N

Description:

This command is used to read the value of the last analog output command from channel N of a specified module.

Syntax:

$AA6N[CHKSUM](CR)

$ Delimiter character

AA   The address of the module to be read in hexadecimal format (00 to FF)

6   The command to read the value of the last analog output command

N   The channel to be read, zero based

Response:

Valid Response: **!AA(Data)[CHKSUM](CR)**
Invalid Response: **?AA[CHKSUM](CR)**

!   Delimiter character for a valid response

?   Delimiter character for an invalid response or an invalid type code

AA   The address of the responding module in hexadecimal format (00 to FF)

(Data) The value of the last analog output command

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: #011+10.000   Response: !01

  Sets the analog output value for channel 1 of module 01 to +10.000 and returns a valid response.

Command: $0161   Response: !01+10.000

  Reads the last analog output value for channel 1 of module 01 and returns a valid response with a value of +10.000.

Command: $016F   Response: ?01

  Attempts to read the last analog output value for channel 15 of module 01 and returns an invalid response because channel 15 does not exist.

Related Commands:

Section 2.2 #AAN(Data), Section 2.9 $AA8N, Section 2.11 $AA9NTS

2.8 $AA7N

Description:
Performs a 10 V calibration on a specified channel.

Syntax:
$AA7N[CHKSUM](CR)
$ Delimiter character
AA   Address of the module to be calibrated (00 to FF)
7   Command for the 10 V calibration
N   Specifies the channel to be calibrated, zero based

Response:
Valid Response: **!AA[CHKSUM](CR)**
Invalid Response: **?AA[CHKSUM](CR)**
!   Delimiter character for a valid response
?   Delimiter character for a invalid response
AA   Address of the responding module (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $0170   Response: !01

   Performs a 10 V output calibration on channel 0 of module 01 and returns a valid response.

Related Commands:

Section 2.4 $AA3NVV

Related Topics:

Section 1.2 Calibration

2.9 $AA8N

Description:
This command is used to read the current analog output value for channel N of a specified module.

Syntax:
$AA8N[CHKSUM](CR)

$	Delimiter character
AA	The address of the module to be read in hexadecimal format (00 to FF)
8	The command to read the current analog output value
N	The channel to be read, zero based

Response:

Valid Response:	**!AA(Data)[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for a invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)
(Data)	The current analog output value

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $0180   Response: !01+01.000

   Reads the current analog output value for channel 0 of module 01, and returns a valid response with a value of +01.000V.

Command: $018F   Response: ?01

   Attempts to read the current analog output value for channel 15 of module 01, and returns an invalid response indicating that analog output channel 15 does not exist.

Related Commands:

Section 2.2 #AAN(Data), Section 2.7 $AA6N, Section 2.11 $AA9NTS

2.10 $AA9N

Description:
This command is used to read the analog output configuration for channel N of a specified module.

Syntax:
$AA9N[CHKSUM](CR)

$	Delimiter character
AA	The address of the module to be read in hexadecimal format (00 to FF)
9	The command to read the analog output configuration
N	The channel to be read, zero based

Response:

Valid Response:	**!AATS[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)
T	The analog output type. Refer to the Analog Output Type Settings table in Section 1.3 for details.
S	The analog output slew rate. Refer to the Analog Output Type Settings table in Section 1.3 for details.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $019020   Response: !01

Sets the analog output configuration for channel 0 of module 01 to an output range of 0 to +10V and any changes are immediate. The module returns a valid response.

Command: $0190   Response: !0120

Reads the analog output configuration for channel 0 of module 01 and returns a valid response indicating that the output is -10V to +10V and any changes are immediate

Command: $019F   Response: ?01

Attempts to read the analog output configuration for channel 15 of module 01 and returns an invalid response indicating that analog output channel 15 does not exist.

Related Command:

Section 2.11 $AA9NTS

Related Topics:

Section 1.3 Configuration Tables

2.11 $AA9NTS

Description:

This command is used to set the analog output configuration for channel N of a specified module.

Syntax:

$AA9NTTS[CHKSUM](CR)

$	Delimiter character
AA	The address of the module to be set in hexadecimal format (00 to FF)
9	The command to set the analog output configuration
N	The channel to be set, zero based
T	The analog output type. Refer to the Analog Output Type Settings table in Section 1.3 for details.
S	The analog output slew rate. Refer to the Analog Output Type Settings table in Section 1.3 for details.

Response:

Valid Response:	**!AA[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: $019121   Response: !01

Sets the analog output configuration for channel 1 of module 01 to an output range of 0 to 10V and a slew rate of 0.625V/Second, and returns a valid response.

Command: $0191   Response: !0121

Reads the analog output configuration for channel 1 of module 01 and returns a valid response indicating that the output range is -10V to +10V and the slew rate is 0.625V/Second

Command: $019F331   Response: !01

Attempts to set the analog output configuration for channel 15 of module 01 to an output range of -10 to 10V and a slew rate of 0.625V/Second, and returns an valid response indicating that analog output channel 15 does not exist.

Related Command:

Section 2.10 $AA9N

Related Topics:

Section 1.3 Configuration Tables

2.12 $AAF

Description:

This command is used to read the firmware version information for a specified module.

Syntax:

$AAF[CHKSUM](CR)

$ Delimiter character

AA   The address of the module to be read in hexadecimal format (00 to FF)

F   The command to read the firmware version information

Response:

Valid Response: **!AA(Data)[CHKSUM](CR)**

Invalid Response: **?AA[CHKSUM](CR)**

!   Delimiter character for a valid response

?   Delimiter character for an invalid response

AA   The address of the responding module in hexadecimal format (00 to FF)

(Data) A string indicating the firmware version information for the module

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Example:

Command: $01F   Response: !01A2.0

    Reads the firmware version information for module 01 and shows that it is version A2.0.

2.13 $AAI

Description:
This command is used to read the status of the INIT switch on a specified module.

Syntax:
$AAI[CHKSUM](CR)

$	Delimiter character
AA	The address of the module to be read in hexadecimal format (00 to FF)
I	The command to read the status of the INIT switch on the module

Response:

Valid Response:	**!AAS[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)
S	The status of the INIT switch on the module

0: The INIT switch is currently in the INIT position

1: The INIT switch is currently in the Normal position

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Example:

Command: $01I   Response: !010

    Reads the status of the INIT switch on module 01 and shows that it is currently in the INIT position.

2.14 $AAM

Description:
This command is used to read the name of a specified module.

Syntax:
$AAM[CHKSUM](CR)

$	Delimiter character
AA	The address of the module to be read in hexadecimal format (00 to FF)
M	The command to read the name of the module

Response:

Valid Response:	**!AA(Name)[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)
(Name)	A string showing the name of the module

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Example:
Command: $01M   Response: !0187026P
   Reads module 01 and returns the name "87026P".

Related Command:
Section 2.15 ~AAO(Name)

2.15   ~AAO(Data)

Description:
This command is used to set the name of a specified module

Syntax:
~AAO(Name)[CHKSUM](CR)
~   Delimiter character
AA   The address of the module to be set in hexadecimal format (00 to FF)
O   The command to set the module name
(Name)   The new name of the module (max. 6 characters).

Response:
Valid Response: **!AA[CHKSUM](CR)**
Invalid Response: **?AA[CHKSUM](CR)**
!   Delimiter character for a valid response
?   Delimiter character for an invalid response
AA   The address of the responding module in hexadecimal format (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: ~01O87028V   Response: !01

    Sets the name of module 01 to "87026P" and returns a valid response.

Command: $01M   Response: !0187028V

    Reads module 01 and returns the name "87028V".

Related Commands:

Section 2.14 $AAM

2.16   ~**

Description:
This command is used to inform all the modules on the network that the host is OK.

Syntax:
~[CHKSUM](CR)**
~   Delimiter character
**   The Host OK command

Response:
There is no response to this command.

Example:
Command: ~**   No response
    Sends a "Host OK" command to all modules on the network.

Related Commands:
Section 2.15 ~AA0, Section 2.18 ~AA1, Section 2.19 ~AA2, Section 2.20 ~AA3EVV, Section 2.21 ~AA4N.

2.17   ~AA0

Description:

This command is used to read the status of the Host Watchdog for a specified module.

Syntax:

~AA0[CHKSUM](CR)

~   Delimiter character

AA   The address of the module to be read in hexadecimal format (00 to FF)

0   The command to read the status of the module's Host Watchdog

Response:

Valid Response: **!AASS[CHKSUM](CR)**
Invalid Response: **?AA[CHKSUM](CR)**

!   Delimiter character for a valid response

?   Delimiter character for an invalid response

AA   The address of the responding module in hexadecimal format (00 to FF)

SS   A two-digit hexadecimal value that represents the status of the Host Watchdog, where:

Bit 2: 0 indicates that no Host Watchdog timeout has occurred, and 1 indicates that a Host Watchdog timeout has occurred.

The status information for the Host Watchdog is stored in EEPROM and can only be reset using the ~AA1 command.

Bit 7: 0 indicates that the Host Watchdog is disabled, and 1 indicates the Host Watchdog is enabled.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: ~010   Response: !0100

  Reads the status of the Host Watchdog for module 01 and returns a valid response with a value of 00, meaning that the Host Watchdog is disabled and no Host Watchdog timeout has occurred.

Command: ~020   Response: !0204

  Reads the status of the Host Watchdog for module 02 and returns a valid response with a value of 04, meaning that a Host Watchdog timeout has occurred.

Related Commands:

Section 2.16 ~**, Section 2.18 ~AA1, Section 2.19 ~AA2, Section 2.20 ~AA3EVV

2.18   ~AA1

Description:
This command is used to reset the timeout status of the Host Watchdog.

Syntax:
~AA1[CHKSUM](CR)

~	Delimiter character
AA	The address of the module to be reset in hexadecimal format (00 to FF)
1	The command to reset the timeout status of the Host Watchdog

Response:

Valid Response:	**!AA[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: ~010   Response: !0104

Reads the status of the Host Watchdog for module 01 and returns a valid response showing that a Host Watchdog timeout has occurred.

Command: ~011   Response: !01

Resets the Host Watchdog timeout for module 01 and returns a valid response.

Command: ~010   Response: !0100

Reads the status of the Host Watchdog for module 01 and shows that no Host Watchdog timeout has occurred.

Related Commands:

Section 2.16 ~**, Section 2.15 ~AA0, Section 2.19 ~AA2, Section 2.20 ~AA3EVV

2.19 ~AA2

Description:
This command is used to read the Host Watchdog timeout value for a specified module.

Syntax:
~AA2[CHKSUM](CR)

~   Delimiter character

AA   The address of the module to be read in hexadecimal format (00 to FF)

2   The command to read the Host Watchdog timeout value

Response:

Valid Response: **!AAEVV[CHKSUM](CR)**
Invalid Response: **?AA[CHKSUM](CR)**

!   Delimiter character for a valid response

?   Delimiter character for an invalid response

AA   The address of the responding module in hexadecimal format (00 to FF)

E   0: The Host Watchdog is disabled
          1: The Host Watchdog is enabled

VV   Two hexadecimal digits to represent the Host Watchdog timeout value in tenths of a second, for example, 01 means 0.1 seconds and FF means 25.5 seconds.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Example:

Command: ~013164   Response: !01

    Enables the Host Watchdog for module 01 and sets the Host Watchdog timeout value to 10.0 seconds. The module returns a valid response.

Command: ~012   Response: !011FF

    Reads the Host Watchdog timeout value for module 01 and returns a valid response with a value of FF, meaning that the Host Watchdog is enabled and the Host Watchdog timeout value is 25.5 seconds.

Related Commands:

Section 2.16 ~**, Section 2.15 ~AA0, Section 2.18 ~AA1, Section 2.20 ~AA3EVV

2.20 ~AA3EVV

Description:
This command is used to enable/disable the Host Watchdog for a specified module and set the Host Watchdog timeout value.

Syntax:
~AA3EVV[CHKSUM](CR)

~	Delimiter character
AA	The address of the module to be set in hexadecimal format (00 to FF)
3	The command to set the Host Watchdog
E	0: Disables the Host Watchdog 1: Enables the Host Watchdog
VV	Two hexadecimal digits to represent the Host Watchdog timeout value in tenths of a second, for example, 01 means 0.1 seconds and FF means 25.5 seconds.

Response:

Valid Response:	**!AA[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: ~013164   Response: !01

    Enables the Host Watchdog for module 01 and sets the Host Watchdog timeout value to 10.0 seconds. The module returns a valid response.

Command: ~012   Response: !01164

    Reads the Host Watchdog timeout value for module 01 and returns a valid response with a value of 164, meaning that the Host Watchdog is enabled and the Host Watchdog timeout value is 10.0 seconds.

Related Commands:

Section 2.16 ~**, Section 2.15 ~AA0, Section 2.18 ~AA1, Section 2.19 ~AA2

2.21 ~AA4N

Description:

This command is used to read the analog output safe value for channel N of a specified module.

Syntax:

~AA4N[CHKSUM](CR)

~	Delimiter character
AA	The address of the module to be read in hexadecimal format (00 to FF)
4	The command to read the analog output safe value
N	The channel to be read, zero based

Response:

Valid Response:	**!AA(Data)[CHKSUM](CR)**
Invalid Response:	**?AA[CHKSUM](CR)**
!	Delimiter character for a valid response
?	Delimiter character for an invalid response
AA	The address of the responding module in hexadecimal format (00 to FF)
(Data)	The analog output safe value, see Section 1.3 for details of the data format.

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:

Command: #010+06.000   Response: >

   Outputs the channel 0 of the module 01 to 6V and returns a valid response.

Command: ~0150   Response: !01

   Sets the current analog output value for channel 0 of module 01 as the safe value and returns a valid response.

Command: ~0140   Response: !01+06.000

   Reads the analog output safe value for channel 0 of module 01 and returns a valid response with a value of 6V.

Command: ~014F   Response: ?01

   Attempts to read the analog output safe value for channel 15 of module 01 and returns an invalid response indicating that channel 15 does not exist.

Related Commands:

Section 2.5 #AAN(Data), Section 2.22 ~AA5N

Related Topics:

Section 1.3 Configuration Tables

2.22　~AA5N

Description:
This command is used to set the analog output safe value for channel N of a specified module.

Syntax:
~AA5N[CHKSUM](CR)
~　　　　Delimiter character
AA　　　The address of the module to be set in hexadecimal format (00 to FF)
5　　　　The command to set the analog output safe value
N　　　　The channel to be set, zero based

Response:
Valid Response:　　　　**!AA[CHKSUM](CR)**
Invalid Response:　　　**?AA[CHKSUM](CR)**
!　　　　Delimiter character for a valid response
?　　　　Delimiter character for an invalid response
AA　　　The address of the responding module in hexadecimal format (00 to FF)

There will be no response if the command syntax is incorrect, there is a communication error, or there is no module with the specified address.

Examples:
Command: #010+06.000   Response: >
  Outputs the channel 0 of the module 01 to 6V and returns a valid response.
Command: ~0150   Response: !01
  Sets the current analog output value for channel 0 of module 01 as the safe value and returns a valid response.
Command: ~0140   Response: !01+06.000
  Reads the analog output safe value for channel 0 of module 01 and returns a valid response with a value of 6V.
Command: ~015F   Response: ?01
  Attempts to set the current analog output value for channel 15 of module 01 as the safe value and returns an invalid response indicating that channel 15 does not exist.

Related Commands:
Section 2.5 #AAN(Data), Section 2.21 ~AA4N

Related Topics:
Section 1.3 Configuration Tables