

4.6 Digital I/O and Relay Output Module Command

Command Syntax	Command Name	Description	I/O Module
%AANNTCCFF	Configuration	Sets the address, input range, baud rate, and/or checksum status, to a digital I/O module	4050, 4052, 4053, 4060
\$AA6	Digital Data In	Returns the values of digital I/O channels of the addressed module	4050, 4052, 4053, 4060
#AAB(data)	Digital Data Out	Writes specified values to either a single channel or all channels simultaneously	4050, 4060
***	Synchronized Sampling	Orders all digital I/O modules to sample their input values and store them in a special register	4050, 4052, 4053, 4060
\$AA4	Read Synchronized Data	Returns the value that was stored in the specified digital I/O module that was stored after an *** command	4050, 4052, 4053, 4060
\$AA2	Configuration Status	Returns the configuration parameters for the specified digital I/O module	4050, 4052, 4053, 4060
\$AA5	Reset Status	Indicates whether a specified digital I/O module was reset after the last time the \$AA5 command was issued	4050, 4052, 4053, 4060
\$AAF	Read Firmware Version	Return firmware version code from the specified digital I/O module	4050, 4052, 4053, 4060
\$AAM	Read Module Name	Return the module name from the specified digital I/O module	4050, 4052, 4053, 4060

%AANNTTCCFF

Name	Configuration
Description	Configure address, baud rate and/or checksum status of the addressed digital I/O module.
Syntax	<p>%AANNTTCCFF(cr)</p> <p>% is a delimiter character.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module to be configured.</p> <p>NN represents the new hexadecimal address of the digital I/O module. Range is from 00h to FFh.</p> <p>TT represents the type code which is always set to 40 for a digital I/O module. (ADAM-4050, 4052, 4053, 4060)</p> <p>CC represents the baud rate code. (See next page, Table 4-5)</p> <p>FF is a hexadecimal number that equals the 8-bit parameter that represents the checksum status. (See Figure 4-3). Bits 0 through 5 and bit 7 are not used and set to 0.</p> <p>(cr) is the terminating character, carriage return (0Dh).</p>

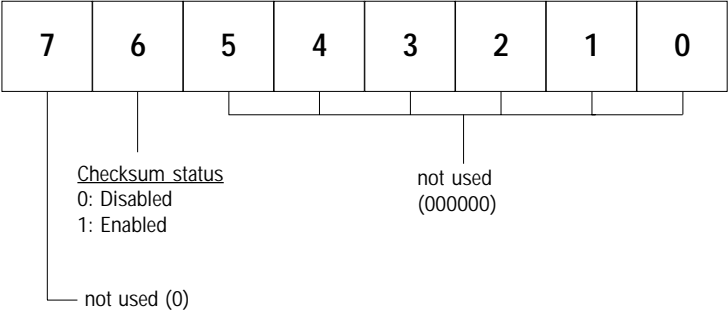


Figure 4-3 Checksum Parameter

%AANNTTCCFF

Response !AA (cr) if the command is valid.
 ?AA(cr) if an invalid parameter was entered or if the INIT* terminal was not grounded when attempting to change baud rate or checksum settings.

 There is no response if the module detects a syntax error or communication error or if the specified address does not exist.

 ! delimiter character indicating a valid command was received
 ? delimiter character indicating the command was invalid
 AA (range 00-FF) represents the 2-character hexadecimal address of a digital I/O module.
 (cr) is the terminating character, carriage return (0Dh)

Example command: %2324400600(cr)
 response: !24(cr)

 The command tries to configure module with address 23h to address 24h, baud rate 9600 no checksum checking. The response indicates that the configuration was successful.

Table 4-5
Baudrate Codes

Baud Rate Code (Hex)	Baud Rate
03	1200 bps
04	2400 bps
05	4800 bps
06	9600 bps
07	19.2 Kbps
08	38.4 Kbps

NOTICE: *All configuration parameters can be changed dynamically, except checksum and baud rate parameters. They can only be altered when the INIT* terminal is grounded. (Refer to Baud rate and Checksum, in Chapter 2 for the correct procedure.)*

\$AA6

Name	Digital Data In
Description	This command requests that the specified (AA) module returns the status of its digital input channels and returns a readback value of its digital output channels.
Syntax	<p>\$AA6(cr)</p> <p>\$ is a delimiter character.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module.</p> <p>6 is the Digital Data In command.</p> <p>(cr) is the terminating character, carriage return (0Dh).</p>
Response	<p>!(dataOutput)(dataInput)00(cr) if the command was valid. (ADAM-4050)</p> <p>!(dataInput)0000(cr) if the command was valid. (ADAM-4052)</p> <p>!(dataInput)(dataInput) 00 (cr) if the command was valid. (ADAM-4053)</p> <p>!(dataOutput)0000(cr) if the command was valid. (ADAM-4060)</p> <p>?AA(cr) if an invalid command has been issued.</p> <p>There is no response if the module detects a syntax error or communication error or if the specified address does not exists.</p> <p>! delimiter character indicating a valid command was received.</p> <p>? delimiter character indicating the command was invalid.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module that is responding.</p> <p>(dataOutput) two-character hexadecimal value which either is the readback of a digital output channel or a relay.</p> <p>(dataInput) two-character hexadecimal value representing the input values of the digital I/O module.</p> <p>(cr) is the terminating character, carriage return (0Dh).</p>

\$AA6**Example**

command: \$336(cr)
response: !112200(cr)

The first two characters of the response, value 11h (00010001), indicate that digital output channels 0 and 4 are ON, channels 1, 2, 3, 5, 6, 7 are OFF. The second two characters of the response, value 22h (00100010), indicate that digital input channels 1 and 5 are HIGH, channels 0, 2, 3, 4, 6, 7 are LOW.

Example

command: \$036(cr)
response: !BEDE00(cr)

The first two characters of the response, value BEh(10111110), indicate that digital input channels 8 and 14 are LOW, channels 9, 10, 11, 12, 13 and 15 are HIGH. The second two characters of the response value DEh (11011110) indicate that digital input channels 0 and 5 are LOW, channels 1, 2, 3, 4, 6, 7 are HIGH.

#AABB

Name Digital Data Out

Description The command either sets a single digital output channel or sets all digital output channels simultaneously.

Syntax #AABB(data)(cr)

is a delimiter character.

AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module you want to set its output value.

BB is used to indicate whether all channels will be set or a single channel will be set. In the last case BB also indicates which channel. Writing to all channels (write a byte): both characters should be equal to zero (BB=00). Writing to a single channel (write a bit): First character is 1, second character indicates channel number which can range from 0 to 7.

(data) is the hexadecimal representation of the digital output value(s).

When writing to a single channel (bit) the first character is always 0. The value of the second character is either 0 or 1.

When writing to all channels (byte), both characters are significant (range 00h-FFh). The digital equivalent of these two hexadecimal characters represent the channels values.

The amount of channels on the ADAM-4050 and ADAM-4060 differs. The value 7A would mean the following for the 8 channels on the ADAM-4050:

digital value:	0	1	1	1	1	0	1	0
ADAM-4050 channel no.	7	6	5	4	3	2	1	0

Since the ADAM-4060 has only four output channels all the meaning full values lie between 00h and 0Fh. The value 0Ah would mean the following for the ADAM-4060:

digital value:	0	0	0	0	1	0	1	0
ADAM-4060 channel no.	-	-	-	-	3	2	1	0

#AABB**Response**

>(cr) if the command was valid.

?AA(cr) if an invalid command has been issued.

There is no response if the module detects a syntax error or communication error or if the specified address does not exist.

> delimiter character indicating valid command was received.

? delimiter character indicating the command was invalid.

AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module that is responding.

(cr) is the terminating character, carriage return (0Dh).

Examples

command: #140005(cr)

response: >(cr)

An output byte with value 05h (00000101) is sent to the digital I/O module at address 14h (Either ADAM-4050 or ADAM-4060). Its channels 0 and 2 will be set to ON. Other channels are set to OFF.

command: #151201(cr)

response: >(cr)

An output bit with value 1 is sent to channel 2 of a digital I/O module at address 15h (Either ADAM-4050 or ADAM-4060).

Channel two of the digital I/O module is set to ON.

Name	Synchronized Sampling
Description	Orders all (analog or digital) input modules to sample their input values and store them in a special register.
Syntax	<p>***</p> <p># is a delimiter character.</p> <p>** is the actual Synchronized Sampling command.</p> <p>The terminating character, in the form of a carriage return (0Dh), is not required.</p>
Response	The digital I/O modules will not respond to the Synchronized Sampling command. In order to retrieve the data, you must execute a Read Synchronized Data command for every module separately.

\$AA4

Name	Read Synchronized Data
Description	The addressed digital I/O module is instructed to return the value that was stored in its register by a Synchronized Sampling command.
Syntax	<p>\$AA4(cr)</p> <p>\$ is a delimiter character.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module who's data is to be returned.</p> <p>4 is the Read Synchronized Data command.</p> <p>(cr) is the terminating character, carriage return (0Dh).</p>
Response	<p>!(status)(dataOutput)(dataInput)00(cr) if the command was valid. (ADAM-4050)</p> <p>!(status)(dataInput)0000(cr) if the command was valid. (ADAM-4052)</p> <p>!(status)(dataInput)(dataInput)00(cr) if the command was valid. (ADAM-4053)</p> <p>!(status)(dataOutput)0000(cr) if the command was valid. (ADAM-4060)</p> <p>?AA(cr) if an invalid command has been issued.</p> <p>There is no response if the module detects a syntax error or communication error or if the specified address does not exists.</p> <p>! delimiter character indicating a valid command was received</p> <p>? delimiter character indicating the command was invalid</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module that is responding.</p> <p>(status) will tell you if the data (data) from the last Synchronized Sampling command (#**) has already been sent. If (status=1), then data has been sent for the first time after an Synchronized Sampling command was issued. If (status=0), then the data has been sent at least once after a Synchronized Sampling command was issued.</p>

\$AA4

(dataOutput) two-character hexadecimal value which either is the readback of a digital output channel or a relay.

(dataInput) two-character hexadecimal value representing the input values of the digital I/O module.

(cr) is the terminating character, carriage return (0Dh).

Example

command: \$064(cr)

response: !1055100(cr)

The command asks the ADAM-4050 digital I/O module at address 06h to send its digital input data that was gathered during the last Synchronized Sampling command. The module returns 1055100, meaning status = 1 : data has not been sent before; dataOutput = 05h (00000101): digital output channels 0 and 2 are ON and channels 1, 3, 4, 5, 6, 7 are OFF; dataInput = 51h (01010001): digital input channels 0, 4, 6 are HIGH and channels 1, 2, 3, 4, 5 are LOW.

The digital I/O module responds with data = 055100 and status = 1, which means that this is the first time that the data has been sent.

command: \$064(cr)

response: !0055100(cr)

The command asks the digital I/O module at address 06h to sent its digital input data.

The digital I/O module responds with data = 055100 and status = 0, which means that it has sent the same data at least once before. This may indicate that a previous Synchronized Sampling command was not received!

\$AA2

Name	Configuration Status command
Description	Returns the configuration parameters of the addressed digital I/O module.
Syntax	<p>\$AA2(cr)</p> <p>\$ is a delimiter character.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module to be interrogated.</p> <p>2 is Configuration Status command.</p> <p>(cr) is the terminating character, carriage return (ODh).</p> <p>This command requests the return of the configuration data from the digital I/O module at address AA.</p>
Response	<p>!AATTCCFF(cr) if the command is valid.</p> <p>?AA(cr) if an invalid command has been issued.</p> <p>There is no response if the module detects a syntax error or communication error or if the specified address does not exists.</p> <p>!delimiter character indicating a valid command was received.</p> <p>?delimiter character indicating the command was invalid.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of a digital I/O module.</p> <p>TT represents the type code, which is always 40.</p> <p>CC represents the baud rate code. (See next page, Table 4-6).</p> <p>FF is a hexadecimal number that equals the 8-bit parameter that represents checksum status and module identification. Bits 3 through 5 and bit 7 are not used and are being set to 0. (See figure 4-4 on the next page.)</p> <p>(cr) is the terminating character, carriage return (ODh)</p>

\$AA2

Example command: \$452 (cr)
 response: !45400600 (cr)

The command asks the digital I/O module at address 45h to send its configuration data.

The digital I/O module at address 45h responds with baud rate 9600, no checksum function and the module is identifies as ADAM-4050

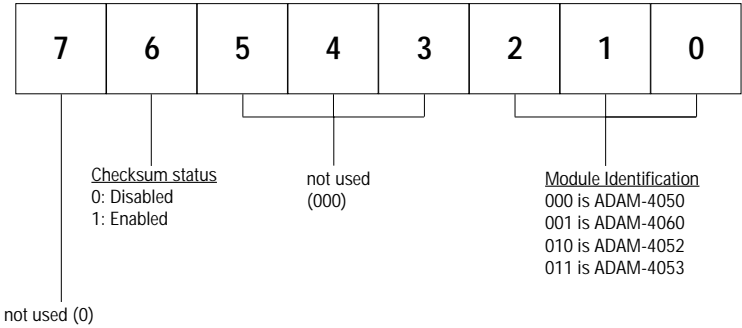


Figure 4-4 *Checksum & Identification Parameter*

Table 4-6
Baudrate Codes

Baud Rate Code (Hex)	Baud Rate
03	1200 bps
04	2400 bps
05	4800 bps
06	9600 bps
07	19.2 Kbps
08	38.4 Kbps

\$AA5

Name	Reset Status command
Description	Requests the Reset Status of the addressed digital I/O module to see whether it has been reset since the last Reset Status command.
Syntax	<p>\$AA5(cr)</p> <p>\$ is a delimiter character.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the analog output module whose Reset Status is to be returned.</p> <p>5 is the Reset Status command.</p> <p>(cr) is the terminating character, carriage return (0Dh).</p>
Response	<p>!AAS(cr) if the command was valid.</p> <p>?AA(cr) if an invalid command has been issued.</p> <p>There is no response if the module detects a syntax error or communication error or if the specified address does not exist.</p> <p>! delimiter character indicating a valid command was received.</p> <p>? delimiter character indicating the command was invalid.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module that is calibrated.</p> <p>S represents the Status bit that is returned by the digital I/O module. If S=1, the module has been reset since the last time it was issued. If S=0, the module has not been reset since the last Reset Status command was issued.</p> <p>(cr) is the terminating character, carriage return (0Dh).</p>

\$AA5**Example**

command: \$395(cr)

response: !390(cr)

The command tells the digital I/O module at address 39h to return its Reset Status.

The digital I/O module at address 39h returns the value S=0, which indicates that the digital I/o module has not been reset or powered on since it was last issued a Reset Status command.

\$AAF

Name	Read Firmware Version
Description	The command requests the digital I/O module at address AA to return the version code of its firmware
Syntax	<p>\$AAF (cr)</p> <p>\$ is a delimiter character.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module that you want to interrogate.</p> <p>F identifies the version command.</p> <p>(cr) is the terminating character, carriage return (ODh)</p>
Response	<p>!AA(Version)(cr) if the command is valid.</p> <p>There is no response if the module detects a syntax error or communication error, or if the specified address does not exist.</p> <p>! is a delimiter character indicating a valid command was received.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of a digital I/O module.</p> <p>(Version) is the version code of the module's firmware at address AA.</p> <p>(cr) is the terminating character, carriage return (ODh).</p>

\$AAM

Name	Read Module Name
Description	The command requests the digital I/O module at address AA to return its name
Syntax	<p>\$AAM (cr)</p> <p>\$ is a delimiter character.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of the digital I/O module that you want to interrogate.</p> <p>M is the Read Module Name command.</p> <p>(cr) is the terminating character, carriage return (ODh)</p>
Response	<p>!AA(Module Name)(cr) if the command is valid.</p> <p>There is no response if the module detects a syntax error or communication error, or if the specified address does not exist.</p> <p>! is a delimiter character indicating a valid command was received.</p> <p>AA (range 00-FF) represents the 2-character hexadecimal address of a digital I/O module.</p> <p>(Module Name) is the name of the module at address AA.</p> <p>For example: 4052</p> <p>(cr) is the terminating character, carriage return (ODh).</p>