nVision Programming Instructions

for Reference Recorder & Lab Reference

Crystal *pressure*

AMETEK®
TEST & CALIBRATION INSTRUMENTS

Contents

INTRODUCTION

Thank you for choosing the nVision Reference Recorder from Crystal Engineering Corporation. Your nVision is a combination of leading edge technology and rugged industrial design.

We hope your nVision meets your expectations, and we're interested in any comments or suggestions you may have. You can send us a note at:

crystal@ametek.com Many features in this and our other products are a direct result of your comments!

The nVision can be connected to a personal computer via mini-USB, using the provided USB cable. The nVision can be operated remotely, as if you were pressing the buttons. You can use a simple terminal program to send the commands, or, you can incorporate them into your own software program.

I/O Settings

The serial interface settings are:

Baud Rate	Data Bits	Parity	Stop Bits	Flow Control
115200	8	None	1	None

NVISION COMMUNICATION FORMAT

The nVision is a sophisticated instrument that may allow the use of any number of modules in either bay. Therefore all communication must include all the relevant information to either communicate with the chassis or all the way down to the specific module.

All queries end with a question mark (**?**) and all commands end with an exclamation mark (**!**). Input is case-sensitive; all instructions should be sent in UPPER-CASE. Instructions must be terminated with a single carriage return (CR) character followed by an optional linefeed (LF) character. Note that while the nVision expects either CR or CR/LF as command termination on its input, it always appends a CR/LF pair to its output. For reference, CR is ASCII value 13 decimal, while LF is ASCII character 10 decimal.

Chassis Communication:

The chassis allows you to query (**?**) or command (**!**) such items as: AutoOff feature, firmware version, the stored chassis message, model, the available modules, and the serial number.

The chassis communication format takes the following form:

Query: [**Query?**]

Command: [**Command!**] [command parameter if applicable]

Module Communication:

The module reports items such as the firmware versions, full scale ranges, module message stores, models, readings, serial numbers, units, and water references (pressure module).

Query:
MOD:[**Query?**] [**module number**]

Command:
MOD:[**Command!**] [**module number**][**command parameter** (if applicable)]

Where the lower module number is 1, the upper module number is 2, and the BARO module is 3. A space is required in front of the module number.

Query and Command Responses:

The nVision always returns some indication to let you know a query or command was received and acted on. See the Acknowledgement of a Command section for details.

CHASSIS QUERIES AND COMMANDS

Queries

▶ **Automatic Shutoff Timer**

    AO? . . . . Returns the auto off time in seconds. For example, 1200 is 20 minutes.

▶ **Firmware Version**

    VER? . . . . Returns the nVision firmware version in a R08XXXX.XX format.

▶ **Message Store**

    MSG? . . . . Returns the data from the chassis message store.

▶ **Model**

    MOD? . . . . Returns the model name of the chassis. **NV** is the nVision reference recorder, and **NL** is the nVision Lab Reference.

▶ **Modules Available**

    MODSA? . . . . . . The available modules are returned as a sum of the following descriptors:

            Lower Module = **1**

            Upper Module = **2**

            BARO Module = **4**

Therefore, a number of 3 returned means that both the lower and upper modules are populated.

▶ **Recording**

  REC:STA! . . . (Run Tag) Starts a recording on the nVision, bypassing the screen lock if enabled (without unlocking the nVision)

    Examples . . . **REC:STA!**

           Starts a recording with a tag of "Run # N", N being the number of recordings on the nVision.

           REC:STA!Location1

           Starts a recording with a tag of "Location1." (Allows up to 22 characters.)

    If you want to have spaces in the run tag, use: **REC:STA! HEX [Run Tag*]**

        ● Run Tag* is the run tag string converted to a hexadecimal represented string

          Example... **REC:STA! HEX 4c6f636174696f6e31**

              Starts a recording with a tag of "Location1." (Allows up to 22 characters.)

        ● If a blank run tag is desired use: **REC:STA! HEX 20**

  REC:STO! . . . Stops the current recording run, bypassing the screen lock if enabled (without unlocking the nVision)

▶ **Serial Number**

    SN? . . . . The serial number is returned as a six digit number.

Commands

▶ **Automatic Shutoff Timer** (CRYSTALCONTROL)

AO!XXXX   Set the auto off time for the chassis. (3600 seconds is the max auto off time.)

XXXX = 0 disables Automatic Shutoff (always on)						
XXXX = seconds:						
30	45	60	120	180	240	
seconds	seconds	(1 min)	(2 min)	(3 min)	(4 min)	
300	600	900	1200	1800	2700	3600
(5 min)	(10 min)	(15 min)	(20 min)	(30 min)	(45 min)	(1 hr)

These values can be set to anything from 1 to 3600 seconds. However, once connected to CrystalControl this value will be reset to the closest value shown in the table. For example, sending the command **AO!75** instructs the nVision to set the Automatic Shutoff time to 1 minute.

▌MODULE QUERIES AND COMMANDS

Communication with the module requires you to specifically identify the module location. As shown below, this is done by appending a 1, 2, or 3 to the end of the query.

Queries

▶ **Firmware Version**

    MOD:VER? 1 . . . Returns the nVision firmware version of the lower module in the RXXXXXX.XX format.

    MOD:VER? 2 . . . Returns the nVision firmware version of the upper module in the RXXXXXX.XX format.

    MOD:VER? 3 . . . Returns the nVision firmware version of the BARO module in the RXXXXXX.XX format.

▶ **Full Scale Range**
    MOD:FR?

Note: This query is not applicable to the RTD100 module. Full scale range for MA20 switch test is "1". Full scale range for BARO is "15".

▶ **Message Store**
  `MOD:MSG? #`

▶ **Model**
  `MOD:MOD? #`

▶ **Reading**
  `MOD:RD? #`

Note: The MA20 switch test states are "1" for open, and "0" for closed. Units for MA20 module are either "mA, % 4-20mA, %10-50mA
      (for MA-20+ modules only), VDC, or Switch Test."

▶ **Serial Number**
  `MOD:SN? #`

▶ **Unit**
  `MOD:UNIT? #`

Response: `PSI`, `kg/cm2`, `inHg`, `inH2O`, `mmHg`, `mmH2O`, `kPa`, `bar`, `mbar`, `MPa`, `user`, `C`, `F`, `R`, `K`, `Ohm`, `mA`, `%4-20mA`, `%10-50mA`, `VDC`, or `SwitchTest`

Note: This query is only available when the nVision has R080007 or greater firmware.

▶ **Water Reference**
  `MOD:H2O? #`

Response: `4C`, `60F`, or `68F`

Note: This query is only available when the nVision has R080007 or greater firmware and is populated with a pressure module (PM).

Commands

▶ **Water Reference** (CRYSTALCONTROL)

Sets the module to the water reference entered.

    MOD:H2O! # 4C

    MOD:H2O! # 60F

    MOD:H2O! # 68F

Note: This command is only available when the nVision has R080007 or greater firmware and is populated with a pressure (PM) or barometric (BARO) module.

▶ **Unit**

Changes the module to the unit of measure entered.

Pressure (PM) & Barometric (BARO) Modules	Resistance Temperature Module (RTD100)	Milliamp Modules (MA20)
MOD:UNIT! # PSI	MOD:UNIT! # C	MOD:UNIT! # mA
MOD:UNIT! # kg/cm2	MOD:UNIT! # F	MOD:UNIT! # %4-20mA
MOD:UNIT! # inHg	MOD:UNIT! # R	MOD:UNIT! # %10-50mA
MOD:UNIT! # inH2O	MOD:UNIT! # K	MOD:UNIT! # VDC
MOD:UNIT! # mmHg	MOD:UNIT! # Ohm	MOD:UNIT! # SwitchTest
MOD:UNIT! # mmH2O		
MOD:UNIT! # kPa		
MOD:UNIT! # bar		
MOD:UNIT! # mbar		
MOD:UNIT! # MPa		
MOD:UNIT! # user... Changes the module to user unit*		

***Note:** Not for BARO module

Acknowledgement of a Command

The nVision always returns some indication to let you know a command or query was received and acted on. The return code for a command is eight hexadecimal digits.

▶ **After the query or command the nVision will give the following responses:**

Query:

[**answer to query**]|[**error code**]

Command:

|[**error code**]

▶ **General Error Codes**

The error code can give you valuable information and can be broken down as follows:

Form: ABBCCCCC	A	BB	CCCCC
	Error/Success	Section	Error/Status Code

When |00000000 is returned you have successfully communicated with the nVision.

A- Error/Success

    0 = Success

    8 = Error

Note: All other values have a reserved meaning.

BB- Section

    00 = Success

    01 = Microprocessor

    02 = Chassis

    03 = Module

Note: All other values have a reserved meaning.

CCCCC- Error/Status Code (represented as hexadecimal values)

    00000 = Success

    00001 = General (unspecified error)

    00006 = Zero limit exceeded

    00008 = Changes not allowed while administrator password is set

    0000F = Command not supported

    00100 = Message from PC too long (max of 254 characters) or command is too long – Run Tag max length is 22 characters

    00102 = Command not found

    00105 = Incorrect number of parameters for the command

    00106 = Module requested is not present

    00107 = Parameter is not valid for the command

    0010C = Chassis in not in the correct state to accept the command

    00200 = Parameter is out of range for the command

Note: All other values have a reserved meaning.

▶ **Recording Error Codes**

Recording error codes can be broken down as follows:

Form: `ABBDDEEE`	A	BB	DDEEE
	Error/Success	Section	Error/Status Code

On success, a default success response `|00000000` is returned. On error, a default error code format is returned.

Below are the specific error codes that will be seen using REC:STA! and REC:STO!

A - Error/Success

`0` = Success

`8` = Error

BB - Section

`04` = Record

DDEEE - Error/Status Code

First 2 characters denote recording status

`01EEE` = Currently recording

`02EEE` = Not recording

Last 3 characters denote specific error

`DD000` = Unable to Start/Stop recording because of nVision recording status (cannot start recording when already started, or stop recording when already stopped)

`DD112` = nVision is currently erasing recordings

`DD113` = User needs to complete operation on nVision

`DD114` = User needs to wait for nVision to complete current operation

`DD115` = nVision memory is full

`DD116` = nVision batteries are low

EXAMPLES

`|80100100` = Bad command or Run Tag supplied is too long

`|80401000` = Cannot start recording; nVision is already recording

`|80402112` = Cannot start recording; nVision is currently erasing recordings

`|80401113` = Cannot stop recording; user needs to complete operation on nVision

PROGRAMMING TIPS

The nVision is a very straightforward device to communicate with, provided you follow these tips. This advice is derived from our own experiences automating systems based on the nVision, as well as the experiences of our users; following these tips will help save you some time.

Anytime you establish (or re-establish) communications with the unit, you should use the following initialization sequence, which will help you deal with possible noise due to reset, etc.:

Note: Replace # with either 1, 2, or 3 when module query/commands are used.

1 Send a carriage return to clear any unprocessed characters in the nVision's input buffer.

2 An error code like `|80100102` will be returned; this is normal.

3 Use the `MOD:UNIT? #` and `MOD:UNIT! #` query and command to select the unit you want to use.

4 *If appropriate*, zero the nVision by sending the `MOD:ZER! #` command, since the zero value may need resetting.

5 If you are logging data, you should log the serial number of the unit for traceability purposes by using the `SN?` or `MOD:SN? #` query. You should also log the product code, hardware revision, and firmware version with the `VER? #` or `MOD:VER? #` query.

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