ASAP3 (ASAP-MC) Implementation

User Manual

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Document Control

	Document category:	Authors Name:	Document Version:
ATI	User Manual	D. Rogers	2.4
	Release Type:	**Publish Date:**	**Status:**
	Public	November 29, 2011	Released
	Customer List:		

Abstract:

User Manual for ASAP3 (ASAP-MC) Implementation

Key words:

VISION Software, ASAP3

ATI Copyright Information

Contents

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Introduction

1.1 ASAP3 (ASAP3 - MC) Implementation

This document is a technical reference for the ASAP3Host device in ATI VISION. It describes the user interface of the ASAP3Host device, and it provides detailed information for most commands implemented from the ASAP3 communications protocol.

> **Note:** Arbeitskreis zur Standardisierung von Applikationssystemen (ASAP) has been renamed Association for Standardization of Automation and Measuring System (ASAM). ASAP and ASAM will be used interchangeably in this document. Measurement Calibration and Diagnostics (MCD)3 specifications are still being modified to include diagnostics as a future feature. Currently ASAP3 protocol follows the ASAP3 V2.1's, which has no documentation or implementation of diagnostics.

1.2 ASAP3 Overview

ASAP3 MC (ASAM-MC) is a measurement and calibration system communication protocol intended for use with automated calibration optimization systems and other high-level control systems.

1.2.1 ASAP3 System Requirements

1.2.1.1 Hardware Requirements

A null-modem cable typically used for RS-232 connection or an Ethernet cable.

> Note: Ethernet connection is not an official part of the standard; however, it can be used for test implementations.

1.2.1.2 Software Requirements

The communication protocol for ASAP3 is defined by serial RS-232 data connection. VISION supports TCP/IP as a communication protocol, which is typically implemented over Ethernet, although it can be used on physical layer that supports TCP/IP.

1.2.1.2.1 Software Setup

The communication protocol for ASAP3 is defined by serial RS-232 data connection. VISION supports TCP/IP as a communication protocol, which is typically implemented over Ethernet, although it can be used on physical layer that supports TCP/IP.
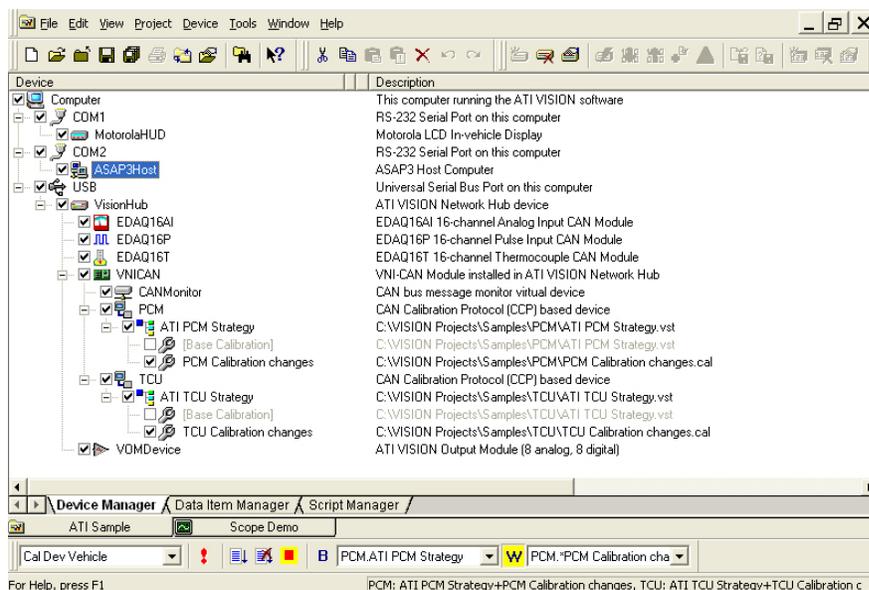
ASAP3Host in a VISION Project

Add ASAP3 Device To VISION Device Tree

1. Add communication port. If this has not been added to the device tree. Do the following:

    a. From the Device Manager Tree, right-click the computer icon, and select Add Device from the context menu.

    > **Note:** You can also select the computer icon and press F5.

    b. Select the appropriate communication port. You can select from RS-232 Serial Port or TCP/IP.

2. Right-click the communication port and select Add Device from the context menu.

3. Select ASAP3Host.

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Configuring the ASAP3

2.1 Defining The Properties of the ASAP3Host

The properties of the ASAP3Host are displayed in a window that contains three property tabs.

Important: Changes made to the ASAP3Host properties do not take effect until the next time the device is re-enabled. Therefore, it is currently necessary to disable the device before editing the properties and re-enable the device after editing the properties.

2.1.1 The ASAP3 Device Properties Window

The ASAP3Host can be configured by using the device's Properties window. You can go to the Properties window for this device by doing one of the following:

  a. Right-click the ASAPHost device in the VISION Device Tree, and select Properties from the shortcut menu.

     OR

  b. Click on the ASAP3Host in the VISION Device Tree to select it, and press F6

The window includes tabs to configure properties for general settings, device and port specific options.

Note: The Device Properties differs according to the device you are configuring. However, the General tab is common to all devices in VISION.

2.1.1.1 General Tab

The General features of all ATI devices are defined on this tab. These properties include the device name, comments, and enabled (online) device.
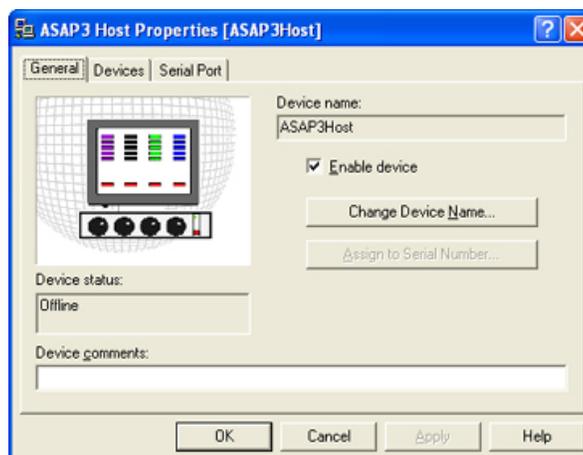
ASAP3Host Properties Window - General Tab

The ASAP3Host Device Properties window - General tab contains the following field definitions:

- **Device Name -** Displays the name of the device. If you accepted the default name, for example, "ASAP3Host," it will be displayed in this field.

- **Change Device Name button** - Allows you to change the name of the device.

- **Assign to Serial Number -** Use this button if the device connected to the computer is not communicating properly.

> **Note:** It is possible to have more than one device of a given type on the Device Tree; in this case, each device name on the VISION Device Tree must be associated with the serial number of the connected hardware. This button should be used to make the association.

- **Enable Device -** Enables and allows you to use the device.

- **Device Status -** A read only field. This field displays the status of the device (online or offline).

- **Device Comments -** A text field. This field can be used to enter any user information regarding the device.

2.1.1.2 Devices Tab

The Devices tab allows you to specify the names of the VISION devices whose data items are calibrated by the ASAP3Host. This setting defaults to the name of the PCM in the VISION device tree.

> **Note:** Earlier versions of VISION (preceding 2.3) can only function with one device at a time and that device must be the "0" Destination. The destination number is the Logical Unit Number (LUN) used for the device in which information is to be retrieved.
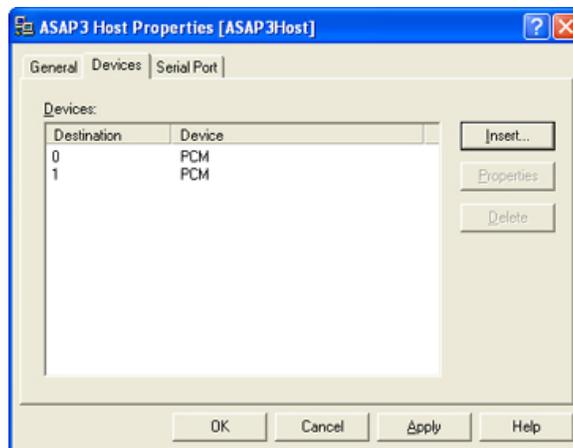
ASAP3Host Properties Window - Devices Tab

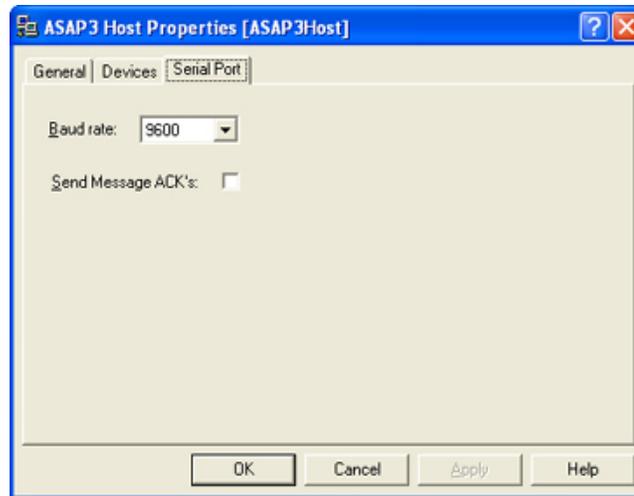**ASAP3Host Properties - Device Properties window**

The ASAP3Host Device Properties dialog window - Device tab contains the following field definitions:

- **Destination -** Logical Unit Number (LUN) used for the device in which information is to be retrieved.

- **Device -** Name of the VISION devices whose data items are being calibrated by ASAP3Host.

- **Insert button -** Allows you to insert specific devices. This button opens ASAP3 Devices Properties window.

- **Properties button -** Allows you define device properties in the ASAP3 Device Properties window. To set the properties using this window do the following:

  1. Go to the ASAP3Host Properties window.

  2. Click on the Devices tab.

  3. Select a device from the list.

  4. Click the properties button. The ASAP3 Device Properties window is displayed.

- **Delete button -** Deletes one device property setting at a time.

2.1.1.3 Serial Port Tab

This tab contains a single control that allows the baud rate of the serial port, RS-232, to be configured. A wide range of baud rate settings are available.

The serial communication settings are fixed to no parity, one start bit, and one stop bit.

ASAP3Host Properties - Serial Port Tab

The ASAP3Host Properties dialog window - Serial Port tab contains the following field definitions:

- **Baud rate -** You can choose from the following baud rates:
    - 9600 (the default).
    - 19,200.
    - 57,600.
    - 115,200.
- **Send Message ACK's box -** Click this box if you require an acknowledge command to be returned.

2.1.1.4   TCP/IP Tab

This tab is displayed in the ASAP3Host Properties only when the ASAP3Host device is connected to the TCP/IP in the VISION Device Tree.

This tab contains a single control that allows the TCP/IP port to be configured for TCP/IP communications. The Port Number is defaulted to 22222. To view this tab, do the following:

1. Right-click on the computer icon.
2. Add the TCP/IP device.
3. Right-click on the TCP/IP device.
4. Add the ASAP3Host.
5. Right-click the ASAP3Host and select the Properties.
6. In the properties window, select the TCP/IP tab.

ASAP3Host Properties - TCP/IP Port Tab

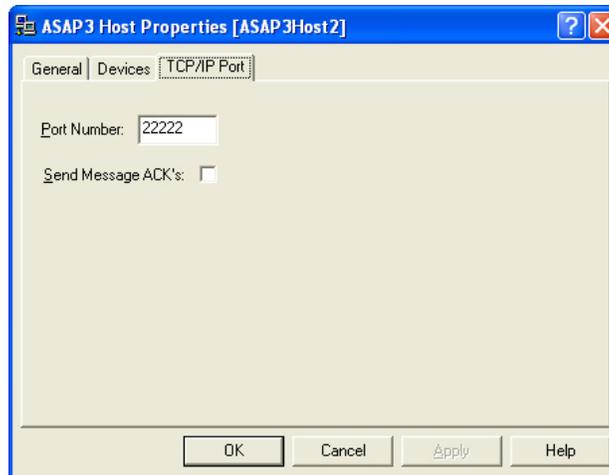The ASAP3Host Properties dialog window - TCP/IP Port tab contains the following field definitions:

- **Port Number** - Port number used for TCP/IP communications. The system defaults this field to 22222.

- **Send Message ACK's box -** Click this box if you require an acknowledge command to be returned.

3

Automatic ECU Calibration

3.1 ASAP3 Interface with VISION

The ASAP3 MC interface description file contains all the basic information about the integration of engine electronic systems in a higher-order test bed system via an engine electronic calibration system (MC System - Measurement Calibration).

The actual integration occurs using a standardized serial RS-232 data connection and the ASAP3 protocol. This allows the automated calibration optimization systems to model the calibration tool, calibration data structures, and the controller hardware interfaces into a single, uncomplicated build using direct command and data exchange between the ASAP3 and MC system.

VISION has the ability to be controlled remotely through the ASAP3 communication protocol. Alternative to the serial RS232 connection, an Ethernet connection with TCP/IP protocol can be used.

> **Note:** Ethernet connection is not an official part of the standard; however, it can be used for test implementations.

The most important functions of the ASAP3 in VISION are online analysis, offline analysis, printer function, data management, ECU flash. The function of data acquisition within the ASAP3 MC system is a device specific solution, it depends on the interface to the ECU (memory emulation, CAN or K-Line), switching to baud rates higher than 9600 Baud, enables you to get higher performance.

ASAP3 Basic Hardware Structure
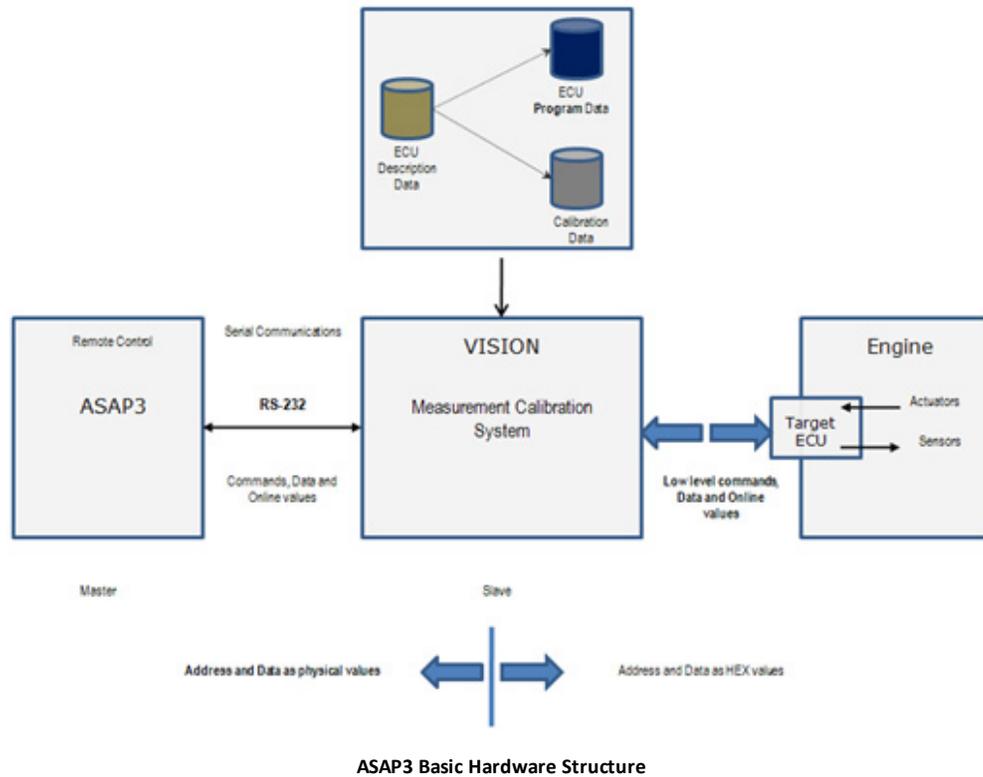
3.2 ASAP3 Protocol Implementation

The ASAP3 implementation in VISION is fully compliant with the ASAP3 V2.1 Specification. However, there are aspects of the protocol that are not completely and precisely defined in the specification, and there are also some interpretations of the commands that need to be tailored to the data models and notation of VISION. Finally, there are some aspects of the implementation that are not completed.

Because system designers and integrators need to know exactly how VISION interprets the various ASAP3 requests, the remainder of this section is devoted to providing this information.

The following is a list that shows which ASAP3 commands are implemented in the current version of VISION. These are accessed via RS232 or TCP/IP, and the ASAP3 spec defines the protocol that is used.

Implement Commands

ACTIVATE RECORDER	GET LOOK-UP TABLE VALUE
CHANGE BINARY FILE NAME	GET PARAMETER
COPY BINARY FILE	GET RECORDER RESULTS
DEFINE DESCRIPTION FILE AND BINARY FILE	GET ONLINE VALUE
DEFINE RECORDER PARAMETERS	GET RECORDER RESULT HEADER
DEFINE TRIGGER CONDITION	GET RECORDER STATUS
EMERGENCY	GET USER-DEFINED VALUE
EXIT	GET USER-DEFINED VALUE LIST
EXTENDED GET LOOK-UP TABLE	IDENTIFY
EXTENDED GET LOOK-UP TABLE VALUE	INCREASE LOOK-UP TABLE
EXTENDED GET ONLINE VALUE	INIT
EXTENDED GET PARAMETER	LOAD RECORDER FILE
EXTENDED GET RECORDER RESULT DATA TYPES	PARAMETER FOR VALUE ACQUISITION
EXTENDED GET RECORDER RESULTS	PUT LOOK-UP TABLE
EXTENDED INCREASE LOOK-UP TABLE VALUE	RESET DEVICE
EXTENDED PARAMETER FOR VALUE ACQUISITION	SAVE RECORDER FILE
	SELECT DESCRIPTION FILE AND BINARY FILE
EXTENDED PUT LOOK-UP TABLE	SELECT LOOK-UP TABLE
EXTENDED SELECT LOOK-UP TABLE	SET CASE SENSITIVE LABELS
EXTENDED SET LOOK-UP TABLE	SET FORMAT
EXTENDED SET PARAMETER	SET GRAPHIC MODE
GET LOOK-UP TABLE	SET PARAMETER SET LOOK-UP TABLE
	SWITCHING OFFLINE/ONLINE

ATI Proprietary Commands

EXTENDED POKE LOOK-UP TABLE

EXTENDED POKE PARAMETER

KAM Save (60301)

KAM Erase (60302)

KAM Load (60303)

POKE LOOK-UP TABLE

POKE PARAMETER

SELECT RECORDER

In case an ASAP3 command cannot be executed successfully, an error message is sent. This list shows the error codes in the error messages.

Return Code	Value
ASAP3_MESSAGE_SYNTAX_ERROR	0
ASAP3_RANGE_ERROR	1
ASAP3_OPERATION_FAILED	2
ASAP3_NOT_INITIALIZED	3
ASAP3_DEVICE_NOT_FOUND	4
ASAP3_EMULATOR_NOT_FOUND	5
ASAP3_MAP_NOT_FOUND	6
ASAP3_DATA_NOT_AVAILABLE	7
ASAP3_COULD_NOT_CHANGE	8
ASAP3_INVALID_ACCESS_MODE	9
ASAP3_VALUE_NOT_FOUND	10
ASAP3_RECORDER_NOT_INITIALIZED	11

3.2.1 Implement Commands

3.2.1.1 Activate Recorder

This command enables you to Activate, Trigger, or Stop the recorder. You can also use this command to control a VISION Recorder, the parameter and its interpretation are as follows:

> **Note:** See "Using VISION Recorders with ASAP3" later in this document.

Parameter	Type	Interpretation
Mode	WORD	0 - Stop recorder
		1 - Activate
		2 - Trigger recorder

Recorder State Change table (see "Table 2: Recorder State Change" below) describes how the Activate Recorder command affects the recorder based on its current state. For a definition of Recorder States, see "Recorder States" later in this document.

Table 2: Recorder State Change

Mode/ Recorder State	Recorder OFF	Recorder Ready	Recorder ON
Mode 0	No effect	Stop recording, May contain pre- trigger data (Recorder Off State)	Stop recording, Contains Pre-trigger data, recorded data, and possibly Post-Stop Trigger data (Recorder Off State)
Mode 1	Activate recorder, start recoding Pre-Start Trigger data (Recorder Ready State)	No effect	No effect
Mode 2	Start recorder, no Pre-Start Trigger data recorded (Recorder On State)	Trigger Recorder, Pre-Start Trigger data recorded, if applicable (Recorder On State)	No effect

The following table shows a list explaining the possible reasons why the ACTIVATE RECORDER command may fail with an ASAP3_OPERATION_FAILED (2) error condition:

Error Code	#	Typical reasons for failure
ASAP3_OPERATION_FAILED	2	Requested operation on recorder failed. Failure was probably caused by an invalid trigger condition(s).

3.2.1.2   Change Binary File Name

The Change Binary File Name allows you to set a new name for the Calibration file you have currently selected to use with the Copy Binary File command. A new Calibration file will appear selected in the VISION Device Tree immediately after the Copy command is run.

3.2.1.3   Copy Binary File

This command allows you to save a Binary file (Calibration file) using a new name. Currently, the only target type supported is File. Use the Change Binary File Name command to set the new name and save it with the Calibration file (save as). Source parameter is ignored.

The following table shows a list explaining the possible reasons why the COPY BINARY FILE command may fail with an ASAP3_OPERATION_FAILED (2) error condition.

Error Code	#	Typical reasons for failure
ASAP3_OPERATION_FAILED	2	• Currently, VISION only supports copying to LOCA-TION - file. • Calibration filename not set by CHANGE BINARY FILENAME command. • Error saving Calibration file.

3.2.1.4 Define Description File and Binary File

This command is similar to SELECT DESCRIPTION FILE AND BINARY FILE, although it adds additional parameters. These parameters for this command and their interpretations are as follows:

Parameter	Type	Interpretation
Description File Name	STRING	Strategy file name.
Program Code File	STRING	Ignored.
Calibration data file name	STRING	Calibration File Name.
Destination ID	WORD	Chooses the VISION device.
Mode	WORD	See "Table 1: Define Description File And Binary File Mode Values" below.

- The Strategy and calibration file names can contain the "%dev%" macro.

- The Mode Parameter contains ATI-defined extensions, consequently, the ASAP3-defined default Mode values are ignored. The Mode parameter can be used to specify ATI VISION specific behavior. This is done by setting the most significant bit to 1 (0x8000).

- Destination ID's are specified in the ASAP3Host Properties (see "Device Properties" earlier in this document).

- If Define Description File and Binary File command fails, the ASAP3 client application should make no assumptions about the current state of the destination device and retry the command with different parameter values.

VISION uses the following specific modes, which are a combination of the bit patterns.

Table 1: Define Description File and Binary File Mode Value

Value/ Bit pattern	Usage	Interpretation
0x8000	Specific mode	Enable the VISION specific modes.
0x0001	Automatic flash	Add the specified Strategy and/or calibration to the device tree and flash target. If this command fails, the previously selected Strategy and Calibration will be re-selected, if applicable.
0x0002	Automatic download	Add the specified Strategy and/or calibration to the device tree and download calibration to target. If this command fails, the previously selected Strategy and Calibration will be re-selected, if applicable.
0x0004	Remove Strategy	Remove the specified Strategy from the device tree. If the Strategy is not specified, the active one is removed. If the active Strategy is removed, the device will be taken OFFLINE and no Strategy will be selected.

0x0008	Remove Cal-ibration	Remove the specified Strategy from the device tree. If the Strategy is not specified, the active one is removed. If the active Strategy is removed, the device will be taken OFFLINE and no Strategy will be selected.
0x0800	Enable Device	Used to Enable a disabled device. If the device is already enabled, this setting has no effect. Typically combined with Automatic Flash or Automatic Download.
0x1000	Require online	Used when reading data with get online value. It requires the device(s) to be online. Otherwise, the command will fail.
0x2000	Skip save	When selecting a new calibration, the normal behavior is to save the current one first. This mode abandons changes done to the cal-ibration.
0x4000	Reload	Reload the calibration from file when selecting the active one. This will abandon changes and flash/download if necessary.
0x8003	Automatic Upload	Add the specified Strategy and/or Calibration to the device tree and upload the calibration data to this Strategy. If this command fails, the previously selected Strategy and Calibration will be re-selected, if applicable. **Note:** Only the calibration data or downloadable regions are changed by this upload.

The following table shows a list explaining the possible reasons why the DEFINE DESCRIPTION FILE AND BINARY FILE command may fail with an ASAP3_OPERATION_FAILED (2) error condition:

Error Code	#	Typical reasons for failure
ASAP3_OPERATION_FAILED	2	• Unable to load Strategy or Calibration file. • Failed to Download or Flash module. • Max number of LUN's reached.

3.2.1.5   Define Recorder Parameters

This command enables you to define conditions such as rate and data items to record. Sending an empty list causes the current list to clear data items. Sending additional lists causes the data items to be appended to the current list. The Recorder Type, Scanning Time, and Divider Factor are taken from the last command sent. The parameters and their interpretations are defined below.

Parameter	Type	Interpretation
Emulator LUN	WORD	LUN of VISION Device (from Select_Description_File_and_Binary_File or Define_Description_File_and_Binary_File)
Recorder Type	WORD	0 - Time base, 1-9 - Event Based.
Scanning Time (ms)	REAL	See comments below.
Divider Factor	WORD	See comments below.
Number of Values	WORD	Number of items to add to the recording.
Name of Value 1	STRING	Name of Item #1 to add.
Name of Value 2	STRING	Name of Item #2 to add.

Recorder Type parameter defines how Scanning Time and Divider Factor parameters are used. For example:

If Recorder Type is 0 (zero)	• Use a timed interval for recording.
	• Divider Factor parameter is ignored.
	• Scanning Time parameter determines minimum recording period between samples.
If Recorder Type is 1-9	• Use Recorder Type parameter as Event # for recording data.
	• Divider factor parameter should be 1.
	• Scanning Time parameter is ignored.
	• Event #'s are not verified as valid.

3.2.1.6 Define Trigger Condition

This command is used to set triggers and recording times for the recorder. The maximum recording length is defined by the following:

(Max Sample Number + (-Start Delay))

This actual recording length may be less if the Start Trigger occurs before the Start Delay is full, or if the Stop Trigger occurs and the Stop Delay is less than the remaining samples in the Max Sample Number. Triggers may be left blank, but this call must be made to setup recording sample counts.

The parameters and their interpretations are shown below:

Parameter	Type	Interpretation
Trigger Start	STRING	Sets the trigger to start the recording.
Trigger Stop	STRING	Sets the trigger to stop the recording.
Max Sample Number	INTEGER4	Defines the maximum number of samples the recorder will take. It does not include Start Delay samples.
Start Delay	INTEGER4	Max number of samples taken before the trigger starts. Must be <= 0.
Stop Delay	INTEGER4	Max number of samples taken after the trigger stops. Must be >= 0.

Triggers can be any valid Boolean expression. VISION will attempt to validate the expression before responding to this command. The following is an example expression:

    PCM.Variables.VBAT > 15.0

- Start Delay is used to define a pre-trigger recording buffer.
- Stop Delay us used to define a post-stop-trigger buffer.

The following table shows a list explaining the possible reasons why the DEFINE TRIGGER CONDITION command may fail with an ASAP3_OPERATION_FAILED (2) error condition:

Error	#	Typical reasons for failure
ASAP3_OPERATION_FAILED	2	Invalid Trigger expression

3.2.1.7 Emergency

This command causes a modal popup window to be displayed in VISION with the message: "ASAM MCD3 Emergency command notification received!" No other action is taken, and VISION ignores the Event field.

3.2.1.8 Exit

This command is used to indicate the end of a communications session. When VISION receives this command, it closes the communications context object, removes its internal associations between ASAP3 logical objects and VISION objects, and un-assigns all associated memory. If a communications context was not initialized with the INIT command, the Exit command is ignored. This command always returns successfully.

3.2.1.9 Extended Get Look-up Table

The ASAP3Host device uses this command to read the x-, y-, and z-axis values from the table. The ASAP3Host passes a map number returned by EXTENDED SELECT LOOK-UP TABLE, and in return, it receives a number of fields that define the current values of the table.

The interpretations of these fields are as follows:

Parameter	Type	Interpretation
Map length	WORD	Number of Map values that follow.
Y(1) .. Y(ny)	Y- Axis DataType	Y-axis values. If this is a 2-D table or 1D array, only Y(1) will be present and it will contain an undefined value
X(1) .. X(nx)	X- Axis DataType	X-axis values.
Minimum Z(ij)	Z- Axis DataType	Z-axis minimum range limit property
Maximum Z(ij)	Z- Axis DataType	Z-axis maximum range limit property
Minimum increment	Z- Axis DataType	Z-axis "small step" property
Z[X(1),Y(1)] .. Z[(X(nx),Y(ny)]	Z- Axis DataType	Z-axis values

3.2.1.10 Extended Get Look-up Table Value

The Extended Get Look-Up Table Value command allows the ASAP3Host to read a particular single z-axis value. In the request message, the x- and y-index values are one-based, meaning that the first z-axis value is selected using the indices (1, 1). If the table is a 2-D table or 1D array, the value for the y-axis is ignored.

In addition, VISION allows using a value of 0 (zero) for the indices. A value of 0 for the y-axis index returns an x-axis value, while 0 for the x-axis returns a y-axis value. An index of (0,0) is not allowed.

3.2.1.11 Extended Get Online Value

This function allows the ASAP3Host to read back the list of values associated with the parameters configured for data acquisition by the EXTENDED PARAMETER FOR VALUE ACQUISITION command(s). This request works according to the communication Specification. If no items have been configured for acquisition, this command returns an empty list.

3.2.1.12   Extended Get Parameter

The Extended Get Parameter command allows the ASAP3Host to retrieve the value of a parameter. The request message includes an Emulator LUN and a Parameter name. The Emulator LUN effectively specifies the VISION device that contains the parameter. A data item within that device is found that matches the specified Parameter name. As with other commands, the data item may be contained in any data item group within the device.

The reply message includes the parameter value as well as three of the data item properties. These fields are interpreted as follows.

Parameter	Type	Interpretation
Data Type	WORD	DataType for remaining values
Value	DATATYPE	Actual current parameter value
Minimum value	DATATYPE	Minimum range-limit property
Maximum value	DATATYPE	Maximum range-limit property
Minimum increment	DATATYPE	Small-step property value

3.2.1.13   Extended Get Recorder Results

This command enables you to retrieve one or more samples of data from the last recording, or a recorder file loaded using LOAD RECORDER FILE. This command returns values for all the data items in each sample.

3.2.1.14   Extended Get Recorder Results Data Type

This command enables you to retrieve the DataType of the data items in the last recording, or a recorder file loaded using LOAD RECORDER FILE. Use this command before calling EXTENDED GET RECORDER RESULTS.

3.2.1.15   Extended Increase Look-up Table Value

This command allows the ASAP3 Host to increase or decrease a range of z-axis values. The request message includes a set of x- and y-axis indices and x- and y-axis delta values. The index values are one-based, and the delta values must be greater than one.

If the table is a 2-D table the value for the y-index must be either 0 (zero) or 1. For a 1D array, the y-index value must be 1.

VISION also allows using a value of 0 (zero) for the indices. A value of 0 for the Y-axis index will increase the X-axis values while a 0 for the X-axis will increase the Y-axis values. The Delta for the axis index using 0 must be 1. An indices of (0, 0) is not allowed

3.2.1.16   Extended Parameter for Value Acquisition

This command enables you to change the list of real-time values that are requested from VISION. The implementation of this request follows the same semantics as defined in the ASAP3 Standard, specifically, that sending a list containing items adds new items to the existing list, and that making a request with an empty list causes the existing list to be cleared.

In this request, the data item names are interpreted such that they may specify data items that may exist in any data item group for the device.

If the request was to clear the list, this request always returns that it succeeded. If the request was to add items to the list, this request succeeds if all of the items were added successfully to the list. If any one of the items could not be found, then none of the items in the request message will be added.

The return data from this command tells the client what DataType should be expected for each data item added to the list. VISION maintains separate lists for PARAMETER FOR VALUE ACQUISITION and for EXTENDED PARAMETER FOR VALUE ACQUISITION.

Data Item types that can be acquired include scalar, state variable (returns the underlying numeric value), data acquisition channel values, CAN Signals, running points for tables, or arrays.

3.2.1.17   Extended Put Look-Up Table

The Extended Put Look-Up Table command enables you to transmit a complete table to VISION. This includes the z-axis table axis values, and in the case of tables that have modifiable x- or y-axis points, these axes are also included in the transmission. The DataType is the type returned for each axis by the EXTENDED SELECT LOOK-UP TABLE command. See "Extended Select Look-Up Table" later in this document.

The following table shows the interpretation of the command request. Note that the parameters that correlate to table property settings are ignored for this command:

Parameter	Type	Interpretation
Map number	WORD	Map number (handle) returned from EXTENDED SELECT LOOK-UP TABLE
Map length	WORD	Number of Map values that follow
Y(1) .. Y(ny)	Y- Axis DataType	These are Y-axis values. If this is a 2-D table or 1D array, only Y(1) will be present and it will contain an undefined value.
X(1) .. X(nx)	X- Axis DataType	These are X-axis values.
Minimum Z(ij)	Z- Axis DataType	Ignored
Maximum Z(ij)	Z- Axis DataType	Ignored
Minimum increment	Z- Axis DataType	Ignored
Z[X(1),Y(1)] … Z[(X(nx),Y(ny)]	Z- Axis DataType	These are Z-axis values.

3.2.1.18   Extended Select Look-Up Table

The Extended Select Look-Up Table command is used to acquire a handle for accessing a look-up table. The ASAP3Host specifies the Emulator LUN and the Map name. The Emulator LUN can be either the value returned by the SELECT DESCRIPTION, or DEFINE DESCRIPTION commands, or it can be zero, in which case VISION implicitly associates the request with its default device, the device associated with Destination ID zero. The ASAP3Host must still run the INIT command prior to this command.

The Map name is the name of the table data item in VISION. VISION searches for a data item with the specified name in all of the data item groups defined for the specified VISION device. The data item must be defined as either a 2D/3D table or 1D /2D array.

As a reply to this request, VISION returns a unique Map number (handle), as well as the map dimensions and the map Address. The map address is the lower 16-bits of the address of the map's z-axis. The returned y-dimension value is always equal to one for 2D tables and 1D arrays. In addition, this command returns the data types that are used to return values by some of the other Extended Map Manipulation commands. The Map number returned by this may only be used with the Extended map manipulation commands.

3.2.1.19   Extended Set Look-Up Table

This command is used to set a range of cells to a particular value. The request message includes a set of x- and y-axis indices and x- and y-axis delta values. The index values are one-based, and the delta values must be greater than or equal to one.

If the table is a 2-D table the value for the y-index must be either 0 (zero) or 1. For a 1D array the y-index value must be 1.

3.2.1.20   Extended Set Parameter

The Extended Set Parameter command allows the ASAP3Host to change the value of a parameter. The request message includes the Emulator LUN, the Parameter name, the DataType, and the value.

3.2.1.21   Get Look-Up Table

The ASAP3Host uses this command to read the x-, y-, and z-axis values of the table. The ASAP3Host passes a map number returned by SELECT LOOK-UP TABLE, and in return receives a number of fields that define the current values of the table. The interpretations of these fields are as follows:

Parameter	Type	Interpretation
Map length	WORD	Number of REAL values that follow
Y(1) .. Y(ny)	REAL	These are the values of the Y-axis. If this were a 2D table or 1D array, only Y(1) would be present and it would contain an undefined value.
X(1) .. X(nx)	REAL	These are the values of the X-axis.
Minimum Z(ij)	REAL	Z-axis minimum range limit property.
Maximum Z(ij)	REAL	Z-axis maximum range limit property.
Minimum increment	REAL	Z-axis small step property.
Z[X(1),Y(1)] .. Z[(X(nx),Y(ny)]	REAL	These are the values of the Z-axis.

3.2.1.22   Get Look-Up Table Value

This command allows the ASAP3 Host to read a particular single z-axis value. In the request message, the x- and y-index values are one-based, meaning that the first z-axis value is selected using the indices (1, 1). If the table is a 2-D table or 1D array, the value for the y-axis must be either 0 (zero) or 1.

VISION also allows using a value of 0 (zero) for the indices. A value of 0 for the Y-axis index will return an X-axis value while a 0 for the X-axis will return a Y-axis value. An indices of (0,0) is not allowed.

3.2.1.23   Get Online Value

This function allows the ASAP3Host to read back the list of values associated with the parameters configured for data acquisition by the PARAMETER FOR VALUE ACQUISITION command(s). This request works as per the communication Specification. If no items have been configured for acquisition, this command returns an empty list.

3.2.1.24   Get Parameter

This command allows the ASAP3Host to retrieve the value of a parameter. The request message includes an Emulator LUN and a Parameter name. The Emulator LUN effectively specifies the VISION device that contains the parameter. A data item within that device is found that matches the specified Parameter name. As with other commands, the Parameter name is not case sensitive, and the data item may be contained in any data item group within the device.

The reply message includes the parameter value as well as three of the data item properties. These fields are interpreted as follows

Parameter	Type	Interpretation
Value	REAL	Actual current parameter value
Minimum value	REAL	Minimum range-limit property
Maximum value	REAL	Maximum range-limit property
Minimum increment	REAL	Small-step property value

3.2.1.25   Get Recorder Results

This command is used to return the current status of the recorder. The reply message includes the data about the current recording. These fields are interpreted as follows:

Parameter	Type	Interpretation
Recorder Status	WORD	Current status Recorder On (1) - Recording in progress, post start trigger Recorder Off (2) - Recorder stopped Recorder Ready (3) - Pre-Start trigger
Current Samples	INTEGER4	Number of samples in recording (includes Pre-trigger samples)
Stop Condition	WORD	Reason why recording was stopped
Stop Information	STRING	String description of Stop Condition

3.2.1.26   Get Recorder Results Header

This command is used to provide general information about the last recording or a recorder file loaded using LOAD RECORDER FILE. The reply message includes the data about the current recording. These fields are interpreted as follows:

Parameter	Type	Interpretation
Start Time	STRING	Time at start of recording

Recording Type	WORD	From Define Parameters
Scanning Time	REAL	From Define Parameters
Divider Factor	WORD	From Define Parameters
Number of Samples	INTEGER4	Number of samples in recording (includes both Pre and Post-trigger buffers)
Start Delay	INTEGER4	Number of samples in the Pre-trigger buffer
Stop Delay	INTEGER4	Number of samples in the Post-trigger buffer
Lost Samples	INTEGER4	Not used, always 0
Max Phase Errors	INTEGER4	Not used, always 0

3.2.1.27   Get Recorder Status

This command is used to return the current status of the recorder. The reply message includes the data about the current recording. These fields are interpreted as follows:

Parameter	Type	Interpretation
Recorder Status	WORD	Current status Recorder On (1) - Recording in progress, post start trigger Recorder Off (2) - Recorder stopped Recorder Ready (3)- Pre-Start trigger
Current Samples	INTEGER4	Number of samples in recording (includes Pre-trigger samples)
Stop Condition	WORD	The reason for which the recording was stopped
Stop Information	STRING	String description of Stop Condition

3.2.1.28   Get User Defined Value

VISION's ASAP3 implementation does not support user-defined value lists. This functionality exists in the protocol primarily to support MC systems that lacked the ability to configure and display data acquisition values while the ASAP3Host is active. Because VISION allows data lists to be displayed and modified con-current to ASAP3 control, there is no need for this function. For this reason, this command always returns an empty list.

3.2.1.29   Get User Defined Value List

For the reasons given in the GET USER DEFINED VALUE command description, this command always causes VISION to reply with an empty list.

> **Note:** See "Get User Defined Value."

3.2.1.30   Identify

This command allows the ASAP3Host and VISION to exchange protocol version numbers and system names. VISION accepts and ignores the information received from the ASAP3Host, and in its reply, it indicates V2.1 (WORD 0x0201) as the protocol version and the string "ATI VISION" as its name

3.2.1.31   Increase Look-Up Table Value

This command allows the ASAP3 Host to increase or decrease a range of z-axis values. The request message includes a set of x- and y-axis indices and x- and y-axis delta values. The index values are one-based, and the delta values must be greater than one.

If the table is a 2-D table the value for the y-index must be either 0 (zero) or 1. For a 1D array, the y-index value must be 1.

VISION also allows using a value of 0 (zero) for the indices. A value of 0 for the Y-axis index will increase the X-axis values while a 0 for the X-axis will increase the Y-axis values. The Delta for the axis index using 0 must be 1. An indices of (0, 0) is not allowed.

3.2.1.32   INIT

This command causes VISION to initialize a new communications context. A context consists of information about all of the ASAP3 logical objects that have been created. Logical objects include emulators, lookup tables, data acquisition lists, and recorders. The INIT command must be called once prior to accessing any of these logical objects.

Each time this command is called, the current communications context is cleared, regardless of whether the EXIT command is used.

3.2.1.33   Load Recorder File

This command is used to load a previously saved recorder file. In addition to loading the file, it will return the number of data items in the recording along with the names of the items.

The following table shows a list explaining the possible reasons why the LOAD RECORDER FILE command may fail with an ASAP3_OPERATION_FAILED (2) error condition:

Error Code	#	Typical reasons for failure
ASAP3_OPERATION_FAILED	2	Unable to load the requested file.

3.2.1.34   Parameter for Value Acquisition

This command is used to change the list of real-time values that are requested from VISION. The implementation of this request follows the same semantics as defined in the ASAP3 Standard, specifically, that sending a list containing items adds new items to the existing list, and that making a request with an empty list causes the existing list to be cleared.

In this request, the data item names are interpreted such that they may specify data items that may exist in any data item group for the device.

If the request is to clear the list, this request always returns that it succeeded. If the request is to add items to the list, this request succeeds only if all of the items are successfully added to the list. If any one of the items could not be found, then none of the items in the request message will be added.

VISION maintains separate lists for PARAMETER FOR VALUE ACQUISITION and for EXTENDED PARAMETER FOR VALUE ACQUISITION.

Data Item types that can be acquired include scalar, state variable (returns the underlying numeric value), data acquisition channel values, CAN Signals, running points for tables, or arrays.

3.2.1.35   Put Look-Up Table

This command is used to transmit a complete table to VISION. This includes the z-axis table axis values, and in the case of tables that have modifiable x- or y-axis points, these axes are also included. The following table shows the interpretation of the command request:

Parameter	Type	Interpretation
Map number	WORD	Map number (handle) returned from SELECT LOOK-UP TABLE
Map length	WORD	Number of REAL values that follow.
Y(1) .. Y(ny)	REAL	These are values of the Y-axis. If this were a 2D table, only Y(1) would be present and it would contain an undefined value.
X(1) .. X(nx)	REAL	These are values of the X-axis.
Minimum Z(ij)	REAL	Ignored
Maximum Z(ij)	REAL	Ignored
Minimum increment	REAL	Ignored
Z[X(1),Y(1)] .. Z[(X(nx),Y(ny)]	REAL	These are values of the Z-axis.

3.2.1.36   Reset Device

This command allows the ASAP3Host to perform a hardware reset of the specified device. The request includes the Emulator LUN that correlates to the VISION device to be reset. The device must support Resetting for this command to have an effect.

The following table shows a list explaining the possible reasons why this command may fail with an ASAP3_OPERATION_FAILED (2) error condition:

Error	#	Typcial reasons for failure
ASAP3_OPERATION_FAILED	2	Failed to reset device

3.2.1.37   Save Recorder File

This command is used to save the last the last recording or a recorder file loaded LOAD RECORDER FILE.

The following table shows a list explaining the possible reasons why this command may fail with an ASAP3_OPERATION_FAILED (2) error condition:

Error	#	Typical reasons for failure
ASAP3_OPERATION_FAILED	2	Unable to save the recorder to the requested filename.

3.2.1.38   Select Description File and Binary File

This command allows the ASAP3 host to initialize a logical emulator object. The parameters and their interpretations are as follows:

Parameter	Type	Interpretation
Description File name	STRING	Strategy file name.

Binary File Name	STRING	Calibration file name.
Destination ID	STRING	Chooses the VISION device.

The Destination selects the VISION device that is associated with this emulator. Destination IDs are specified in the ASAP3Host Properties (see "Configuring the ASAP3").

When specifying the Strategy and Calibration file names, it is possible to use the macro "%dev%" that is replaced with the full path of the directory, which stores the device information. For example, one might specify "%dev%\Strategy1.vst" as the Strategy name string.

If this command fails, the ASAP3 client application should make no assumptions about the current state of the destination device and retry the command with different parameter values.

This table is a list of possible reasons why this command may file with an ASAP3_OPERATION_FAILED (2) error condition:

Error	#	Typcial reasons for failure
ASAP3_OPERATION_FAILED	2	Unable to load Strategy or Calibration file. Failed to Download or Flash module. Max number of LUNs reached.

3.2.1.39 Select Look-Up Table

This command is used to acquire a handle for accessing a look-up table. The ASAP3 host specifies the Emulator LUN and the Map name. The Emulator LUN can be either the value returned by the SELECT DESCRIPTION or DEFINE DESCRIPTION commands, or it can be zero, in which case VISION implicitly associates the request with its default device, the device associated with Destination ID zero. The ASAP3Host must still run the INIT command prior to Select Look-Up Table command.

The Map name is the name of the table data item in VISION. VISION searches for a data item with the specified name in all of the data item groups defined for the specified VISION device. The data item must be defined as either a 2D/3D table or 1D/2D array.

As a reply to this request, VISION returns a unique Map number (handle), as well as the map dimensions and the map Address. The map address is the lower 16-bits of the address of the map's z-axis. The returned y-dimension value is always equal to one for 2D tables and 1D arrays. The Map number returned by this may only be used with the non-Extended map manipulation commands.

3.2.1.40 Set Case Sensitive Labels

This command will cause all data item name and map name lookups to be case-sensitive during the current session.

3.2.1.41 Set Format

This command is used to change the data item values sent to or received from the ASAP3 client application.

Parameter	Type	Interpretation

Logical Data Type	WORD	Specifies data types affected
		0 - ALL
		1 - Map
		2 -" Parameter
		3 -" Actual values
Model	WORD	Specifies what data to return
		0 - Mixed model (see description below)
		1 - Controller Model (raw controller data)
		2 - Physical Model (engineering units)

- When using Model 0 and the Extended commands, VISION returns string values for State Table data items. An example would be returning "Park", "Reverse" OR "Neutral" instead of 0, 1, 2...

- When using Model 0 and the standard commands, VISION returns the physical values for all data items.

- When using Model 1, VISION returns the raw (unconverted) data values for all items. The ASAP3 client should send data values to VISION in raw mode when using Model 1.

- When using Model 2, VISION returns the physical (engineering unit) data values for all items. This is the default Model.

3.2.1.42 Set Graphic Mode

VISION is recognizes this command VISION, but is otherwise not implemented.

3.2.1.43 Set Look-Up Table

This command is used to set a range of cells to a particular value. The request message includes a set of x- and y-axis indices and x- and y-axis delta values. The index values are one-based, and the delta values must be greater than or equal to one. If the table is a 2-D table the value for the y-index must be either 0 (zero) or 1. For a 1D array the y-index value must be 1.

3.2.1.44 Set Parameter

This command allows the ASAP3Host to change the value of a parameter. The request message includes the Emulator LUN, the Parameter name, and the value.

3.2.1.45 Switching Offline/Online

This request is used to control whether data acquisition is on or off for the Parameter For Value Acquisition and Extended Parameter For Value Acquisition lists.

3.2.2 ATI Proprietary Commands

3.2.2.1 Extended Poke Look-Up Table (60111)

This command is used to set a range of cells to a particular value. The request message includes a set of x- and y-axis indices and x- and y-axis delta values. The index values are one-based, and the delta values must be greater than or equal to one. If the table is a 2-D table the value for the y-index must be either 0 (zero) or 1. For a 1D array, the y-index value must be 1. This command behaves like EXTENDED SET LOOK-UP TABLE except it will use the M5/M6's ability to 'Poke' values instead of normal Calibration writes thus it allows 'Poking' Axis values by specifying a Y or X Index of 0.

Parameter	Type	Interpretation
Map Number	WORD	Map number (handle) returned from EXTENDED SELECT LOOK-UP TABLE
Y Index	WORD	Starting Y index for "Poking"
Y Delta	WORD	Number of cells in the y-axis direction to "Poke"
X Index	WORD	Starting X index for "Poking"
X Delta	WORD	Number of cells in the y-axis direction to "Poke"
Value	Z-Axis Data-Type	Value to "Poke" into the cells

3.2.2.2 Extended Poke Parameter (60115)

This command allows the ASAP3Host to change the value of a parameter. The request message includes the Emulator LUN, the Parameter's name, the DataType, and the value. This command behaves like EXTENDED SET PARAMETER, except, it uses the M5/M6's ability to poke a value instead of a normal Calibration write.

Parameter	Type	Interpretation
Emulator LUN	WORD	LUN of VISION Device (from Select_Description_File_ and_Binary_File or Define_Description_File_and_Binary_ File)
Parameter Name	STRING	Name of data item to be poked
Data Type	WORD	Data Type of Value
Value	DATATYPE	Data value to poke

3.2.2.3 Poke Look-Up Table (60011)

This command is used to set a range of cells to a particular value. The request message includes a set of x- and y-axis indices and x- and y-axis delta values. The index values are one-based, and the delta values must be greater than or equal to one. If the table is a 2-D table the value for the y-index must be either 0 (zero) or 1. For a 1D array, the y-index value must be 1. This command behaves like SET LOOK-UP TABLE except it will use the M5/M6's ability to 'Poke' values instead of normal Calibration writes thus it allows 'Poking' Axis values by specifying a Y or X Index of 0.

Parameter	Type	Interpretation

Map Number	WORD	Map number (handle) returned from EXTENDED SELECT LOOK-UP TABLE
Y Index	WORD	Starting Y index for "Poking"
Y Delta	WORD	Number of cells in the y-axis direction to "Poke"
X Index	WORD	Starting X index for "Poking"
X Delta	WORD	Number of cells in the y-axis direction to "Poke"
Value	REAL	Value to "Poke" into the cells

3.2.2.4   Poke Parameter (60015)

This command allows the ASAP3Host to change the value of a parameter. The request message includes the Emulator LUN, the Parameter name, and the value. This command behaves like SET PARAMETER, except, it uses the M5/M6's ability to poke a value instead of a normal Calibration write.

| Parameter	Type	Interpretation
Emulator LUN	WORD	LUN of VISION Device (from Select_Description_File_ and_Binary_File or Define_Description_File_and_Binary_ File)
Parameter Name	STRING	Name of data item to be poked
Value	REAL	Data value to poke

3.2.2.5   Select Recorder (60201)

This command is used to select a VISION Screen Recorder object. The name passed-in is used to search for a recorder with the same name on all VISION screen files. If a recorder is found, that recorder will be used for subsequent recorder commands. The default value for the Screen Recorder object is "ASAP3R-ecorder." An empty string will stop use of the screen recorder unless there is an "ASAP3Recorder" present.

> **Important:**
>
> - Calling this command will clear any traditional ASAP3 recorder.
>
> - Recorder names are case sensitive.
>
> - This command will also work with VISION Stripchart Recorders.

> **Note:** For more information regarding the use of VISION recorders and ASAP3, see "Using VISION Recorders with ASAP3" later in this document.

Parameter	Type	Interpretation
Recorder Name	STRING	Name of VISION Recorder. Must be located on a loaded VISION Screen file (case sensitive).

3.2.2.6 KAM Save (60301)

This command is used to Save KAM data to a file. You may specify zero (0) or more Memory Region names. If you specify no Regions, then all applicable KAM regions are saved. If you specify one or more Regions, only those which you specified are saved. It is important to remember that all the specified Regions must exist or no data will be saved. All regions must have the 'Include in KAM load/save operations' flag set.

When specifying the Save file name, it is possible to use the macro "%dev%" that is replaced with the full path of the directory that stores the device information. For example, one might specify "%dev%\-KamData.kam" as the file name string.

Parameter	Type	Interpretation
Emulator LUN	WORD	LUN of VISION Device (from Select_Description_File_ and_Binary_File or Define_Description_File_and_Binary_ File)
Save Filename	STRING	Name of file in which to save the data.
Region Count	WORD	Number of regions to Erase (may be zero).
Region Name 1	STRING	Name of first KAM region.
Region Name N	STRING	Name of Nth KAM region

3.2.2.7 KAM Erase (60302)

This command is used to Erase KAM data on the target controller. You may specify zero (0) or more Memory Region names. If you specify no Regions, then all applicable KAM regions are erased. If you specify one or more Regions, only those are erased. All the specified Regions must exist or no data is erased. All regions must have the 'Include in KAM load/save operations' flag set.

Parameter	Type	Interpretation
Emulator LUN	WORD	LUN of VISION Device (from Select_Description_File_ and_Binary_File or Define_Description_File_and_Binary_ File)
Region Count	WORD	Number of regions to Erase (may be zero).
Region Name 1	STRING	Name of first KAM region.
Region Name N	STRING	Name of Nth KAM region

3.2.2.8 KAM Load (60303)

This command is used to Load KAM data from a file.

You may specify zero (0) or more Memory Region names. . If you specify no Regions, then all applicable KAM regions are loaded, assuming data for them exists in the loaded file. If you specify one or more Regions, only those will be loaded. All regions must have the 'Include in KAM load/save operations' flag set.

When specifying the Load file name, it is possible to use the macro "%dev%" that is replaced with the full path of the directory that stores the device information. For example, one might specify "%dev%\-KamData.kam" as the file name string.

Parameter	Type	Interpretation
Emulator LUN	WORD	LUN of VISION Device (from Select_Description_File_ and_Binary_File or Define_Description_File_and_Binary_ File)

Save Filename	STRING	Name of file used to load data.
Region Count	WORD	Number of regions to Erase (may be zero).
Region Name 1	STRING	Name of first KAM region.
Region Name N	STRING	Name of Nth KAM region

3.3 Using VISION Recorders with ASAP3

VISION allows you to use pre-defined Recorder and Stripchart Recorders objects with ASAP3. This enables you to setup more complex recordings including DAQing channels at different rates and more complex trigger conditions.

To use a VISION Recorder object, you must configure one or more Recorder objects within VISION, however; only one recorder can be active at any given time. The default name for the recorder is ASAP3Recorder. This can be changed or cleared by using the ATI proprietary command Select Recorder (60201) (see "Select Recorder" earlier in this document). Subsequently, instead of using the commands DEFINE_RECORDER_ PARAMETERS and DEFINE_TRIGGER_CONDITION, you should only use ACTIVATE_RECORDER to control the Recorder object. This allows the ASAP3 client to Start, Trigger, and Stop the recorder. Yet, it is the responsibility of the client to save the recording because the Auto-Save feature of the recorder is automatically disabled.
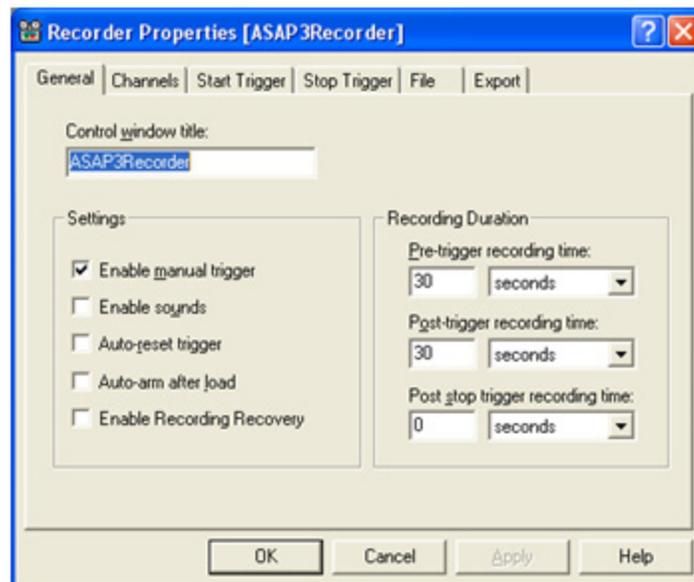
If you are currently using a traditional ASAP3 recorder, it should call either SELECT_RECORDER or DEFINE_ RECORDER_PARAMETERS with no channels to clear the current recorder setup.

Important: When using a VISION Recorder, the client application should limit its use of ASAP3 recording related commands to ACTIVATE_RECORDER, SAVE_RECORDER_FILE and SELECT_RECORDER. Use of any other recorder commands may cause unpredictable results.

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Record of Revisions

Date	Version	VISION Release	ECO
September 13, 2005	Version 1.0	New for VISION 2.3	
July 4, 2006	Version 1.1	New for VISION 3.0	
November 14, 2006	Version 1.2	Updated for VISION 3.2	
December 5, 2006	Version 1.3	Updated for VISION 3.2	
October 30,2007	Version 2.0	Updated for VISION 3.4	07157
June 13, 2008	Version 2.2	Updated for VISION 3.5	08116
August 22, 2011	Version 2.3	Updated for VISION 3.7	11089
November 29, 2011	Version 2.4	Updated for VISION 3.7.2	11082