Millennium Commands

Document Changes

MCMDS30.doc

- Macro status bits mistakenly started at bit 1 in documentation. Changed to bit 0.

MCMDS29.doc

- Updated 17.1 System Resources table.

MCMDS28.doc

- Added Access denied to NAK response codes

MCMDS27.doc

- Changed status information returned for Macro and Sequence to bit oriented fields since it is valid to have something playing and paused at the same time.

MCMDS26.doc

- Added Request Increment Input On Output [08] (next camera on monitor)
- Added Request Decrement Input On Output [09] (previous camera on monitor)

MCMDS25.doc

- Changed NAK to Request Resource Control to include Resource Type and Resource #.
- Altered macro status in macro resource data.
- Added a byte to macro play command to include FWD, BWD. Mainly used for sequence.

1. General Comments

All values shown in this document are in hexadecimal notation.

1.1 Scope of this Document

This document covers the contents (or "payload") of the Millennium protocol. For information regarding the implementation of the protocol itself (the header, addressing, checksum, etc.) please refer to the Millennium protocol manual (this is the Millennium command set manual).

1.2 Data Representations

1.2.1 Bit

In the command listings below, bits are numbered from 0 to 7. Bit 0 is the low order bit in a byte (1) and bit 7 is the highest order bit in a byte (128).

1.2.2 Nibble

A nibble is four bits wide. A byte can be broken up into the upper nibble and lower nibble.

1.2.3 Byte

A byte is eight bits.

1.2.4 Word

A word is sixteen bits.

1.2.5 Long Word

A long word is 32 bits.

1.2.6 Strings

Strings consist of a series of bytes (up to the limit of the data field).

1.3 Scaling Values

This protocol uses sets of standard values to represent things. Devices that are not capable of the resolution or range represented by the values should scale the values to fit the device. An example should help to make this clear. Suppose the protocol states that, for a certain command, the range is a two byte value from 0 to 35999 (decimal) and the thing that uses this is only capable of 0 to 240 in 4 step increments. The device should then scale the command (divide by 240/35999) and then round to the nearest 4 step increment.

Suppose the device received the decimal value 23456. This value, translated to the device's system of measurement would be 156.

(23456) * (240/35999) = 156

This means that the device will operate over its full range over the matching full range of whatever is trying to drive it.

1.4 Structure of Commands

An M protocol message consists of the following fields:
[HEADER] [CONTROL] [COUNT] [ADDRESS] [DATA] [CHECKSUM]

This document covers only the DATA section of an M packet, which contains the command and supporting data. Commands are represented by two bytes. The first byte indicates the device family and the second byte is the command, these are referred to as command and sub-command. There may, or may not, be data following the command bytes.

The format of commands listed in this document is the format of the [DATA] section only.

All data is in Big Endian format, meaning that the MSB is sent first. For example, if a logical monitor number were to be sent in a data packet with a value of 0x0001, first 0x00 would be sent and then 0x01.

1.5 Acknowledgment and Negative Acknowledgment

In the command descriptions below, many commands simply need to be acknowledged (they don't return any data). Acknowledge (ACK) is 00, 00 and negative acknowledge (NAK) is 00, 01. Some devices will be capable of returning more information with the negative acknowledgment. This will be contained in bytes following the NAK and will be command specific.

1.6 Best Approximation

Many devices in the Millennium system will not be capable of handling all of the abilities of that are represented in the protocol. When a device is not capable of performing a task, it should do the "next best thing". If, for example, a command is sent to pan left at speed 23 and the device is a fixed speed device, it should pan left at whatever speed it can. If a device is told to go to a preset position that is higher resolution than it is capable of, it should get as close as it can.

If, on the other hand, the device doesn't have the capability to perform the function in any respect, the device should return a NAK.

2. Definitions

2.1 Local Bus

The "Local Bus" refers to the bus that a single address device physically resides on.

2.2 System Master

The "System Master" is a device in a large system that controls the system's behavior. It is typically responsible for granting users permission to perform certain activities on the system and performs as the system arbiter. Each device in the system is given the address of the System Master, if one exists, by the local Bus Master.

Responsibilities include, but are not limited to the following items:
- Granting permission to control resources. Resources are listed under “System Management” commands.
- Providing data for resources, such as network addresses of the resource.
- Start, stop or pause macros when requested or NAK request.

2.3 Alarm Master

The “Alarm Master” is a device similar to the System Master but deals only with alarms. It is responsible for alarm arming and resetting as well as keeping status on all alarm conditions.

Responsibilities include, but are not limited to the following items:
- Arm / Disarm alarms when requested or NAK request.
- Reset alarms when requested or NAK request.
- Knowing location and network address of all alarms in system.
- Keeping a current status of all triggered and armed alarms in the system.
- Providing next and previous alarm numbers given an alarm number.
- Providing next and previous triggered alarms given an alarm number.

3. Universal Commands [00]

"Universal Commands" are those commands that apply to all devices in the Millennium System. This does not mean that all devices must, or will, support these features. Only that these commands are not device specific.

3.1 Response Codes

3.1.1 Acknowledge (ACK) [00]

Format:
[M_UNIVERSAL_CMDS] [ACK] [CMD] [SUB CMD] [RESPONSE DATA]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
CMD	Reflection of the CMD byte of the command we are responding to.
SUB CMD	Reflection of the SUB CMD byte of the command we are responding to.
RESPONSE DATA	Command dependent field (explained by each command).

Response Format:
NONE (This is the response and there is no response to a response).

Explanation:
An Acknowledge is a response sent back to any device that sets the Request Response Bit in the control byte of a message. Each command may have different data returned in the response, but the format of Acknowledgement response always includes the command and sub-command of the command being acknowledged. This is so that the querying device does not need to remember what is being acknowledged.

3.1.2 Negative Acknowledge (NAK) [01]

Format:
[M_UNIVERSAL_CMDS] [NAK] [CMD] [SUB CMD] [ERROR CODE] [RESPONSE DATA]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
NAK	01
CMD	Reflection of the CMD byte of the command we are responding to.
SUB CMD	Reflection of the SUB CMD byte of the command we are responding to.
ERROR CODE	Why the command is being NAK'd. Error codes are: 00 Device is busy, cannot respond 01 Device did not recognize the cmd (not handled) 02 Device does not support feature 03 Device is out of service 04 Format error or missing data 05 Data is out of range for this device. 06 Access is denied
RESPONSE DATA	Command dependent field (explained by each command).

Response Format:
NONE (This is the response and there is no response to a response).

Explanation:
A Negative Acknowledge is a response sent back to any device that sets the Request Response Bit in the control byte of a message. This message is returned when the responding device does not recognize or cannot carry out the command.

3.2 Get Device Info [02]

3.2.1 Device ID Table

The Device Info command returns a Device ID, and a version and revision of the code running on the device. The Device ID is a word and can be one of the following:

DEVICE ID	DESCRIPTION
0	Reserved
1	Lens
2	Camera
3	Enclosure
4	Positioning Device
5	Alarm Gathering Device
6	Auxiliary Device
7	Switch
8	Recording Equipment
9	Multiplexer
10	Monitor
11	Video Signal Equipment
12	Transmission System
13	Audio System
14	System Manager
15	Reserved
16	GUI

3.2.2 Format for Device Info command

Format:
[M_UNIVERSAL_CMDS] [GET DEVICE INFO]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
GET DEVICE INFO	02

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [CMD] [SUB CMD] [NUM IDS] [DEVICE IDS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
CMD	00
SUB CMD	02
NUM IDS	Unsigned Byte Number of IDS following
DEVICE ID	List of Unsigned Word of NUM IDS length See Device Id Table above.

NAK Response Format:
There is no special data in a NAK.

Explanation:
This command is used to get information regarding what type of device is at the address. Device Ids follow the command byte of the M protocol as closely as possible. The System Master needs this information for various tasks – mainly locating resources on the network.

3.3 Get Version/Revision [03]

Format:
[M_UNIVERSAL_CMDS] [GET VERSION]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
GET VERSION	03

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [CMD] [SUB CMD] [VERSION] [REVISION]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
CMD	00
SUB CMD	03
VERSION	Unsigned Byte Version of Firmware at address
REVISION	Unsigned Byte Revision of Firmware at address

NAK Response Format:
There is no special data in a NAK.

Explanation:
This command is used to get the version and revision of the firmware of the device. Note that there is nothing in the protocol to identify a device as a "Spectra" or "9760 Keyboard". This command is useful only if the device requesting the information knows (by configuration) what device is at the address to which the command is sent.

3.4 Diagnostics

3.4.1 Self-Check [04]

Response = 00, 01, error code

Error code 00 = no errors, all other codes indicate errors and are device specific.

3.4.2 Get Error Map [05]

Different device will have different error maps. These are shown below:

0) Serial Communications Error Map. This is a three byte error count consisting of the number of Parity Errors, Overrun Errors, and Framing Errors since the counts were last cleared. Each byte will count up from zero and will freeze upon reaching 255 (the maximum value a single byte can contain).

1) Protocol Error Map. This is a three byte error count consisting of the number of Bad Commands, Bad Check Sums, and Bad Data errors since the counts were last cleared. Each byte will count up from zero and will freeze upon reaching 255 (the maximum value a single byte can contain).

3.4.3 Clear Errors [06]

Response = Ack or Nak

3.4 Turn Device On [10]

Format:
[M_UNIVERSAL_CMDS] [M_TURN_ON]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
M_TURN_ON	10

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Bus Master to turn local devices on line. The Bus Master will send this command and wait for an ACK. If it receives an ACK, the device is considered on line.

This command clears the "Listen Only" mode.

3.5 Set "Listen Only" Mode [11]

Format:
[M_UNIVERSAL_CMDS] [M_LISTEN_ONLY]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
M_LISTEN_ONLY	11

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Bus Master to make local devices "Listen Only". The Bus Master will send this command and wait for an ACK. If it receives an ACK, the device is considered to be in listen only mode. This means that the device will respond to queries but will not be granted the token except to respond to other devices that initiate a query.

3.6 Turn Device Off [12]

Format:
[M_UNIVERSAL_CMDS] [M_TURN_OFF]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
M_TURN_OFF	12

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Bus Master to turn local devices off line. Normally, the Bus Master will send this command and wait for an ACK before considering the device to be offline. When a device fails, the Bus Master sends this command just to make sure it is off line, but does not expect an ACK back (most likely the device will not be there to hear and respond to the message).

This command clears the "Listen Only" mode.

When a device is placed in the "Off" mode, it will not respond to any queries, and will not execute any commands issued to it (with the exception of the "Turn Device On" command.
All devices will, upon power up, enter this state. Devices can only be turned on by the Bus Master.

3.7 Set Address [13]

Format:
[M_UNIVERSAL_CMDS] [SET ADDRESS] [NETWORK ADDRESS] [HUB ADDRESS] [BUS ADDRESS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
SET ADDRESS	13
NETWORK ADDRESS	Network address of unit.
HUB ADDRESS	Hub address of unit.
BUS ADDRESS	Bus address of unit.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Bus Master to set the full network address of a device it has turned on line. A device is normally responsible for knowing only its local address which it may gain by reading a dip switch or a user interface. The upper three bytes of address are supplied using this command. The Bus Master is responsible for knowing this information.

3.8 Set System Master Address [14]

Format:

[M_UNIVERSAL_CMDS] [SET SYSTEM MASTER ADDRESS] [NETWORK ADDRESS] [HUB ADDRESS] [BUS ADDRESS] [DEVICE ADDRESS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
SET_SYSTEM_MASTER _ADDRESS	14
NETWORK ADDRESS	Network address of System Master.
HUB ADDRESS	Hub address of System Master.
BUS ADDRESS	Bus address of System Master.
DEVICE ADDRESS	Device address of System Master.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Bus Master to set the System Master address in each device it turns on. Devices will need the address of the System Master in order to talk to it. Some commands will operate without a System Master, but must resort to ALL CALL addressing in order to do so and are often limited in functionality. Without the System Master there is no arbitration of resources.

3.9 Set Alarm Master Address [15]

Format:
[M_UNIVERSAL_CMDS] [SET ALARM MASTER ADDRESS] [NETWORK ADDRESS] [HUB ADDRESS] [BUS ADDRESS] [DEVICE ADDRESS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
SET_ALARM_MASTER _ADDRESS	15
NETWORK ADDRESS	Network address of Alarm Master.
HUB ADDRESS	Hub address of Alarm Master.
BUS ADDRESS	Bus address of Alarm Master.
DEVICE ADDRESS	Device address of Alarm Master.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Bus Master to set the Alarm Master address in each device it turns on. Devices will need the address of the Alarm Master in order to talk to it.

3.10 RESET DEVICE [16]

Format:
[M_UNIVERSAL_CMDS] [RESET DEVICE]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
RESET DEVICE	16

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is to reset a device.

3.11 Packet Carrier [C0]

3.12 Up/down load code [C1]

In M Systems, code may be downloaded to a device using these commands.

3.12.1 Proposed Command Sequence

1. Send a start download command to the target until a response is received.

2. If the target has good application code, it waits for a little while on startup for a start download command and then runs the application. If the target does not have good code, it waits forever on startup for a start download command.

3. After receiving a response to the start download command, send a get version command and get the firmware version.

4. Send a get parameters command and get the parameters.

5. Send an erase command to erase the memory that will be programmed.

6. Send a read data command to read one byte in the memory range that has been erased. This is to find out what the state of erased memory (all ones or all zeros) is. This value will be used when the checksum is calculated. This step may not be necessary if erased memory always has the same value.

7. Send a start program command. (Not in code yet)

8. Send repeated program commands to program the target memory.

9. Send an end program command.

10. Send a compute checksum command to compute the checksum over the memory range that was programmed. The downloader computes the expected checksum and makes sure that it matches the received checksum. The erased memory value (from step 5) is used by the downloader for the values of any unprogrammed “holes” in the middle of programmed memory. This is necessary to compute the expected checksum.

3.12.2 Get Version [00]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [GET VERSION]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
GET VERSION	00

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_UNIVERSAL_CMDS] [UP/DOWN CODE] [GET VERSION] [VERSION] [REVISION]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
GET VERSION	00
VERSION	Unsigned Byte
REVISION	Unsigned Byte

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Downloader to get the version of the downloading firmware on the target. This is used to ensure compatibility between the Downloader and the target.

3.12.3 Get Parameters [01]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [GET PARAMETERS][START ADDRESS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
GET PARAMETERS	01
START ADDRESS	Unsigned Long 00000000 – FFFFFFFF Starting Address for where we want to get parameters, helps to identify device we want information about in the case that there is more than one.

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_UNIVERSAL_CMDS] [UP/DOWN CODE] [GET PARAMETERS] [DATA SIZE] [DATA ALIGNMENT]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
GET PARAMETERS	01

DATA SIZE	Unsigned Word 0000 – FFFF
DATA ALIGNMENT	Unsigned Word 0000 – FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Downloader to get parameters necessary for the download process. Gets the maximum allowed data size and the preferred data alignment from the target. This is the data size before M byte stuffing, so in the worst case byte stuffing could double the data length. Preferred data alignment is the boundary on which program data will be sent whenever possible. For example, suppose that there is a block of data to be programmed that starts at 0xF85 (in the target) and is 0x200 bytes long. Also suppose that the maximum allowed data size is such that the maximum number of data byte that can be sent at once is 0x110. If the preferred data alignment is 1 meaning that there is no preferred alignment, then the program data will be sent this way (see the program command below): a record with address 0xF85 and length 0x110, and a record with address 1095 and length 0xF0. If the preferred alignment is 0x40 (64-byte boundaries), the records will be sent as follows: a record with address 0xF85 and length 3B, a record with address 0xFC0 and length 0x100, and a record with address 0x10C0 and length C5. By the way, the reason this command is useful is that some programmable devices such as EEPROM program in blocks of 64 (or some other size). So if the data crosses a boundary, two programming cycles must be done, one for the data below the boundary, and one for the data above the boundary.

3.12.4 Start Code Download [02]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [START CODE DOWNLOAD]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
START CODE DOWNLOAD	02

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Downloader to tell the target to begin the download process. If the target replies with an ACK, the download process begins.

3.12.5 Erase Memory [03]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [ERASE] [START ADDR] [END ADDR]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
ERASE	03

START ADDR	Unsigned Long Starting address to erase 00000000 – FFFFFFFF
END ADDR	Unsigned Long End address to erase 00000000 – FFFFFFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Downloader to erase a section of code memory.

3.12.6 Read Memory [04]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [READ] [START ADDR] [COUNT]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
READ	04
START ADDR	Unsigned Long Starting address to erase 00000000 – FFFFFFFF
COUNT	Unsigned Word Count of how many bytes to read

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_UNIVERSAL_CMDS] [UP/DOWN CODE] [READ] [START ADDR] [DATA]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
READ	04
START ADDR	Unsigned Long Starting address to erase 00000000 – FFFFFFFF
DATA	Unsigned Byte of data for each byte sent back

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Downloader to read a section of code memory. The Downloader will read a section of memory after erasing it in order to calculate a checksum over the entire memory space that is downloaded. It is necessary to read after erasing since the default state of erased memory is not known (depends upon the type of memory and the part).

3.12.7 Start Program Memory [05]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [START PROGRAM]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
START PROGRAM	05

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This signals the target that the downloading of code is beginning.

3.12.8 Program Memory [06]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [PROGRAM] [START ADDR] [DATA]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
PROGRAM	06
START ADDR	Unsigned Long Starting address to program 00000000 – FFFFFFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the Downloader to program a section of memory. The Downloader will wait until an ACK is received before sending another packet of this type.

3.12.9 End Program Memory [07]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [END PROGRAM]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
END PROGRAM	07

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This signals the target that the downloading of code is complete.

3.12.10 Get Checksum [08]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [GET CHECKSUM] [START ADDR] [END ADDR]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
END PROGRAM	08
START ADDR	Unsigned Long 00000000 – FFFFFFFF
END ADDR	Unsigned Long 00000000 - FFFFFFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_UNIVERSAL_CMDS] [UP/DOWN CODE] [GET CHECKSUM] [START ADDR] [END ADDR] [CHECKSUM]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
END PROGRAM	08
START ADDR	Unsigned Long 00000000 – FFFFFFFF
END ADDR	Unsigned Long 00000000 - FFFFFFFF

CHECKSUM	Unsigned Long
	00000000 – FFFFFFFF
	Note: The checksum is calculated in the following manner:
	Unsigned long CS;
	Unsigned char inchar;
	CS = 0;
	For (length of data)
	{
	inchar = data[I];
	CS += inchar;
	}

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This asks the target (or Downloader) to compute a checksum over the memory range provided and return the checksum in an ACK response format.

3.12.11 Run Downloaded Code [09]

Format:
[M_UNIVERSAL_CMDS] [UP/DOWN CODE] [RUN CODE]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
UP/DOWN CODE	C1
RUN CODE	09

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by the device Downloader to start a downloaded application.

3.13 Database up/down load [C2]

3.13.1 Database types

See file U-D Commands.doc for information on database types and structure.

3.13.2 Set Record [00]

Format:
[M_UNIVERSAL_CMDS] [DB UP/DOWN] [SET RECORD] [DB TYPE] [REC NUM] [REC SIZE] [REC DATA]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
DB UP/DOWN	C2
SET RECORD	00
DB TYPE	Unsigned Word See section 3.13.1
REC NUM	Unsigned Word 0001 – FFFF
REC SIZE	Unsigned Word 0001 – FFFF
REC DATA	Unsigned Byte There is REC SIZE number of bytes in the field.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to download a database by setting one record at a time in the database.

3.13.3 Get Record [01]

Format:
[M_UNIVERSAL_CMDS] [DB UP/DOWN] [GET RECORD] [DB TYPE] [REC NUM]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
DB UP/DOWN	C2
GET RECORD	01
DB TYPE	Unsigned Word See section 3.13.1
REC NUM	Unsigned Word 0001 – FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to request a download of one record of a database. This command will cause a Set Record command to be sent back.

3.13.4 Get Number of Records [02]

Format:
[M_UNIVERSAL_CMDS] [DB UP/DOWN] [GET NUM RECORDS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
DB UP/DOWN	C2
GET NUM RECORDS	02

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_UNIVERSAL_CMDS] [DB UP/DOWN] [GET NUM RECORDS] [NUM RECORDS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_UNIVERSAL_CMDS	00
DB UP/DOWN	C2
GET NUM RECORDS	02
NUM RECORDS	Unsigned Word 0001 – FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command returns the number of records in a database of a certain type.

3.13.5 Set Record Range[03]

Format:
[M_UNIVERSAL_CMDS] [DB UP/DOWN] [SET RECORD RANGE] [DB TYPE] [BEGIN REC] [END REC][REC SIZE] [REC DATA]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
DB UP/DOWN	C2
SET RECORD RANGE	03
DB TYPE	Unsigned Word See section 3.13.1
BEGIN REC	Unsigned Word 0001 – FFFF
END REC	Unsigned Word 0001 – FFFF
REC SIZE	Unsigned Word 0001 – FFFF Size of each individual record.
REC DATA	Unsigned Byte There is REC SIZE number of bytes in the field * the number of records being sent. BEGIN REC will be the first REC SIZE of bytes in this field.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to download a database by setting multiple records at a time in the database.

3.13.6 Get Record Range[04]

Format:
[M_UNIVERSAL_CMDS] [DB UP/DOWN] [GET RECORD RANGE] [DB TYPE] [BEGIN REC] [END REC]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
DB UP/DOWN	C2
GET RECORD RANGE	04
DB TYPE	Unsigned Word See section 3.13.1
BEGIN REC	Unsigned Word 0001 – FFFF
END REC	Unsigned Word 0001 – FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to request a download of all or part of a database. This command will cause a SET RECORD or SET RECORD RANGE database command to be sent back.

4. Lenses [01] (Currently not used – see Combination Commands)

Lenses are device type 1 in the Millennium Protocol.

4.1 Zoom

4.1.1 Telephoto / Wide [00]

Format:
[M_LENS_CMDS] [ZOOM_CONTROL] [SPEED]

Where:

FIELD	MEANING
M_LENS_CMDS	01
ZOOM_CONTROL	00
SPEED	Signed Byte Stop = 00 or 80 Telephoto speed = 01 to 7F Wide speed = 81 to FF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to control the zoom motion of a lens.

4.1.2 Zoom Position

4.1.2.1 Get Zoom Position [01]

Format:
[M_LENS_CMDS] [GET_ZOOM_POSITION]

Where:

FIELD	MEANING
M_LENS_CMDS	01
GET_ZOOM_POSITION	01

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_LENS_CMDS] [GET_ZOOM_POSITION] [POSITION]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_LENS_CMDS	01

GET_ZOOM_POSITION	01
POSITION	Unsigned Word Full Wide Angle = 0000 Full Telephoto = FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to get the zoom position of a lens.

4.1.2.2 Set Zoom Position [81]

Format:
[M_LENS_CMDS] [SET_ZOOM_POSITION]

Where:

FIELD	MEANING
M_LENS_CMDS	01
SET_ZOOM_POSITION	81
POSITION	Unsigned Word Full Wide Angle = 0000 Full Telephoto = FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to set the zoom position of a lens.

4.2 Focus

4.2.1 Focus Control [02]

Format:
[M_LENS_CMDS] [FOCUS_CONTROL] [SPEED]

Where:

FIELD	MEANING
M_LENS_CMDS	01
FOCUS_CONTROL	02
SPEED	Unsigned Byte Stop = 00 Auto Focus = 80 Focus Near Speed = 01 to 7F Focus Far Speed = 81 to FF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to control the focus motion of a lens.

4.2.2 Focus Position

4.2.2.1 Get Focus Position [03]

Format:
[M_LENS_CMDS] [GET_FOCUS_POSITION]

Where:

FIELD	MEANING
M_LENS_CMDS	01
GET_FOCUS_POSITION	03

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_LENS_CMDS] [GET_FOCUS_POSITION] [POSITION]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_LENS_CMDS	01
GET_FOCUS_POSITION	03
POSITION	Unsigned Word Full Near = 0000 Full Far = FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to get the focus position of a lens.

4.2.2.2 Set Focus Position [83]

Format:
[M_LENS_CMDS] [SET_FOCUS_POSITION] [POSITION]

Where:

FIELD	MEANING
M_LENS_CMDS	01
SET_FOCUS_POSITION	83
POSITION	Unsigned Word Full Near = 0000 Full Far = FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:

This command is used to set the focus position of a lens.

4.2.3 Auto Focus Timeout

This value will control how long, after manual operation, it will be before the camera reverts to auto-focus.

4.2.3.1 Get Auto Focus Timeout [04]

Format:
[M_LENS_CMDS] [GET_AUTO_FOCUS_TIMEOUT]

Where:

FIELD	MEANING
M_LENS_CMDS	01
GET_AUTO_FOCUS_TIMEOUT	04

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_LENS_CMDS] [GET_AUTO_FOCUS_TIMEOUT] [TIMEOUT]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_LENS_CMDS	01
GET_AUTO_FOCUS_TIMEOUT	04
TIMEOUT	Unsigned Byte No Time-out = 00 (will not automatically go to Auto Focus mode) Time-out in seconds = 01 to FF (4 minutes 15 seconds)

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to get the Auto Focus timeout of a lens.

4.2.3.2 Set Auto Focus Timeout [84]

Format:
[M_LENS_CMDS] [SET_AUTO_FOCUS_TIMEOUT] [TIMEOUT]

Where:

FIELD	MEANING
M_LENS_CMDS	01
SET_AUTO_FOCUS_TIMEOUT	84
TIMEOUT	Unsigned Byte No Time-out = 00 (will not automatically go to Auto Focus mode) Time-out in seconds = 01 to FF (4 minutes 15 seconds)

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:

There is no special data in the NAK to this command.

Explanation:
This command is used to set the Auto Focus timeout of a lens.

4.3 Iris

4.3.1 Iris Control [05]

Format:
[M_LENS_CMDS] [IRIS_CONTROL] [SPEED]

Where:

FIELD	MEANING
M_LENS_CMDS	01
IRIS_CONTROL	05
SPEED	Unsigned Byte Stop = 00 Auto = 80 Open at Speed = 01 to 7F Close at Speed = 81 to FF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to control the iris motion of a lens.

4.3.2 Iris Position

4.3.2.1 Get Iris Position [06]

Format:
[M_LENS_CMDS] [GET_IRIS_POSITION]

Where:

FIELD	MEANING
M_LENS_CMDS	01
GET_IRIS_POSITION	06

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_LENS_CMDS] [GET_IRIS_POSITION] [POSITION]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_LENS_CMDS	01
GET_IRIS_POSITION	06
POSITION	Unsigned Word Full Open = 0000

	Full Close = FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to get the iris position of a lens.

4.3.2.2 Set Iris Position[86]

Format:
[M_LENS_CMDS] [SET_IRIS_POSITION] [POSITION]

Where:

FIELD	MEANING
M_LENS_CMDS	01
SET_IRIS_POSITION	86
POSITION	Unsigned Word Full Open = 0000 Full Close = FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to set the iris position of a lens.

4.3.3 Auto Iris Time-out

This value will control how long, after manual operation, it will be before the camera reverts to auto-iris.

4.3.3.1 Get Auto Iris Timeout [07]

Format:
[M_LENS_CMDS] [GET_AUTO_IRIS_TIMEOUT]

Where:

FIELD	MEANING
M_LENS_CMDS	01
GET_AUTO_IRIS_TIMEOUT	07

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_LENS_CMDS] [GET_AUTO_IRIS_TIMEOUT] [TIMEOUT]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_LENS_CMDS	01
GET_AUTO_IRIS_TIMEOUT	07

TIMEOUT	Unsigned Byte No Time-out (will not automatically change) = 00 Number of Seconds = 01 to FF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to get the Auto Iris timeout of a lens.

4.3.3.2 Set Auto Iris Timeout [87]

Format:
[M_LENS_CMDS] [SET_AUTO_FOCUS_TIMEOUT] [TIMEOUT]

Where:

FIELD	MEANING
M_LENS_CMDS	01
SET_AUTO_IRIS_TIMEOUT	87
TIMEOUT	Unsigned Byte No Time-out (will not automatically change) = 00 Number of Seconds = 01 to FF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to set the Auto Iris timeout of a lens.

5. Cameras [02]

6. Enclosures [03]

7. Positioning Devices [04] (see Combination Commands)

The following commands are in use. All other PT type commands are currently implemented using Combination commands.

7.1 Set Preset Label [0x21]

Format:
[M_PT_CMDS] [PRESET SET LABEL] [LABEL]

Where:

FIELD	MEANING
M_PT_CMDS	04
PRESET_SET_LABEL	0x21
LABEL	Null Terminated ASCII String

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to set the preset label for a preset.

7.2 Set Zone Label [0x32]

Format:
[M_PT_CMDS] [SET ZONE LABEL] [LABEL]

Where:

FIELD	MEANING
M_PT_CMDS	04
SET_ZONE_LABEL	0x32
LABEL	Null Terminated ASCII String

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to set the zone label.

8. Alarms [05]

Alarms refer to sensors that operate in a binary fashion. That is, the alarm is either on, or off. These alarms may be distributed throughout the Millennium system and come from a wide variety of devices. Alarms can, for example: monitor when a VCR is out of tape, or monitor the fluid level in a washer, or monitor relay contacts.

Alarms range from 0001 to FFFF. An alarm value of 0000 is invalid and may be returned as an indication that there is no valid or triggered alarm in the system (Get Next Triggered Alarm).

8.1 Alarm Types

Since alarms may come from a variety of sources, a field is included in each alarm command referring to the source of the alarm. The following table lists the currently defined alarm types:

ALARM TYPE	SOURCE	CONSTANT VALUE
ALL	All Alarm Types	0
INTERNAL	Internal alarm (to an alarm master)	1
EXTERNAL	External alarm (to an alarm master)	2
VIDEO LOSS	This alarm is from the loss of video on a video channel, most likely an input to a matrix bay.	3

8.2 Report Alarm Clear [00]

Format:
[M_ALARM_CMDS] [REPORT ALM CLEAR] [ALARM TYPE] [# ALARMS] [ALARM 1] … [ALARM n]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
REPORT ALM CLEAR	00
ALARM TYPE	Unsigned Byte As explained in section 8.1.
# ALARMS	Unsigned Word 0001 – FFFF Number of alarms
ALARM 1	Unsigned Word 0001 – FFFF First alarm to be cleared.
ALARM n	Unsigned Word 0001 – FFFF Last alarm in sequence.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to report a single or multiple alarms being cleared. This message is sent out as an ALL CALL when an alarm clear event occurs.

8.3 Report Alarm Triggered [01]

Format:
[M_ALARM_CMDS] [REPORT ALM TRIG] [ALARM TYPE] [# ALARMS] [ALARM 1] … [ALARM n]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
REPORT ALM TRIG	01
ALARM TYPE	Unsigned Byte As explained in section 8.1.
# ALARMS	Unsigned Word 0001 – FFFF Number of alarms
ALARM 1	Unsigned Word 0001 – FFFF First alarm to be cleared.
ALARM n	Unsigned Word 0001 – FFFF Last alarm in sequence.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:

This command is used by a device to report a single or multiple alarms being triggered. This message is sent out as an ALL CALL when an alarm set event occurs.

8.4 Report Alarm Armed [02]

Format:
[M_ALARM_CMDS] [REPORT ALM ARMED] [ALARM TYPE] [# ALARMS] [ALARM 1] … [ALARM n]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
REPORT ALM ARMED	02
ALARM TYPE	Unsigned Byte As explained in section 8.1.
# ALARMS	Unsigned Word 0001 – FFFF Number of alarms
ALARM 1	Unsigned Word 0001 – FFFF First alarm armed.
ALARM n	Unsigned Word 0001 – FFFF Last alarm in sequence.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to report a single or multiple alarms being armed. This message is sent out as an ALL CALL when an alarm is armed to let everyone on the system know the arm status of the alarm.

8.5 Report Alarm Disarmed [03]

Format:
[M_ALARM_CMDS] [REPORT ALM DISARMED] [ALARM TYPE] [# ALARMS] [ALARM 1] … [ALARM n]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
REPORT ALM DISARMED	03
ALARM TYPE	Unsigned Byte As explained in section 8.1.
# ALARMS	Unsigned Word 0001 – FFFF Number of alarms
ALARM 1	Unsigned Word 0001 – FFFF First alarm disarmed.
ALARM n	Unsigned Word 0001 – FFFF Last alarm in sequence.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to report a single or multiple alarms being disarmed. This message is sent out as an ALL CALL when an alarm is armed to let everyone on the system know the arm status of the alarm.

8.6 Request Alarm Status [04]

Format:
[M_ALARM_CMDS] [REQUEST ALM STATUS] [ALARM TYPE] [ALARM LO] [ALARM HI]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
REQUEST ALM STATUS	04
ALARM TYPE	Unsigned Byte As explained in section 8.1.
ALARM LO	Unsigned Word 0001 – FFFF Low alarm range.
ALARM HI	Unsigned Byte 0001 – FFFF High alarm range.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to get the status of a range of alarms. This command may be sent directly to the Alarm Master or as an ALL CALL. There is no special ACK to this command, as it causes a Send Alarm Status command to be generated and sent back to the requestor.

8.7 Send Alarm Status [05]

Format:
[M_ALARM_CMDS] [SEND ALM STATUS] [ALARM TYPE] [ALARM LO] [ALARM HI] [STATUS]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
SEND ALM STATUS	05
ALARM TYPE	Unsigned Byte As explained in section 8.1.
ALARM LO	Unsigned Word 0001 – FFFF Low alarm range.
ALARM HI	Unsigned Byte

	0001 – FFFF High alarm range.
STATUS	Consists of a string of bytes, 1 for each alarm in the range. Each byte contains the following bit statuses: Bit 0 1 = Valid (in system), 0 = not Valid Bit 1 1 = Armed, 0 = Not Armed Bit 2 1 = Triggered, 0 = not Triggered (clear)

ACK Response Format:
There is no ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command reports the status of each alarm in the reported range. Normally the Alarm Master will issue this command when receiving a Request Alarm Status command. However, if the Request Alarm Status is sent as an ALL CALL, each alarm device is responsible for reporting back the status of each alarm in the range that is part of the alarm device.

8.8 Arm Alarm [06]

Format:
[M_ALARM_CMDS] [ARM ALARM] [ALARM TYPE] [ALARM LO] [ALARM HI]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
ARM ALARM	06
ALARM TYPE	Unsigned Byte As explained in section 8.1.
ALARM LO	Unsigned Word 0001 – FFFF Low alarm range.
ALARM HI	Unsigned Byte 0001 – FFFF High alarm range.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to arm a range of alarms. This command is sent to the Alarm Master who will ACK or NACK the command.

8.9 Disarm Alarm [07]

Format:
[M_ALARM_CMDS] [DISARM ALARM] [ALARM TYPE] [ALARM LO] [ALARM HI]

Where:

FIELD	MEANING

M_ALARM_CMDS	05
DISARM ALARM	07
ALARM TYPE	Unsigned Byte As explained in section 8.1.
ALARM LO	Unsigned Word 0001 – FFFF Low alarm range.
ALARM HI	Unsigned Byte 0001 – FFFF High alarm range.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to disarm a range of alarms. This command is sent to the Alarm Master who will ACK or NACK the command.

8.10 Clear Alarm [08]

Format:
[M_ALARM_CMDS] [CLEAR ALARM] [ALARM TYPE] [ALARM LO] [ALARM HI]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
CLEAR ALARM	08
ALARM TYPE	Unsigned Byte As explained in section 8.1.
ALARM LO	Unsigned Word 0001 – FFFF Low alarm range.
ALARM HI	Unsigned Byte 0001 – FFFF High alarm range.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to clear a range of alarms that have been triggered. Clear all alarms is performed by setting the range to include all alarms 0000 – FFFF. This command is sent to the Alarm Master who will ACK or NACK the command. If the Alarm Master is not present, the command may be sent as an ALL CALL and any device with alarms receiving this command will perform the command. Devices sending this message will know when the alarms have been cleared when they receive a Report Alarm Clear message.

8.11 Get Next Alarm [09]

Format:
[M_ALARM_CMDS] [NEXT ALARM] [ALARM TYPE] [CURRENT ALARM]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
NEXT ALARM	09
ALARM TYPE	Unsigned Byte As explained in section 8.1.
CURRENT ALARM	Unsigned Word 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_ALARM_CMDS] [NEXT ALARM] [ALARM TYPE] [NEW ALARM] [STATUS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_ALARM_CMDS	05
NEXT ALARM	09
ALARM TYPE	Unsigned Byte As explained in section 8.1.
NEW ALARM	Unsigned Word 0000 – FFFF
STATUS	Unsigned Byte Alarm status (same as Send Alarm Status)

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to get the next alarm of the alarm type. This command would be used if, for example, a keyboard wished to know what the next alarm from the current alarm on its display was. This command is needed since it does not necessarily follow that alarm 2 follows alarm 1. Alarm 2 may not even exist in the system, which the System Master will be aware of and return Alarm 3 or the next logical alarm in the system. It should be noted that 0000 is acceptable in this command. If alarm 0000 is provided in the command, the response would include the first valid alarm. If alarm 0000 is returned as the NEW ALARM, then there are no alarms in the system.

This command is sent to the Alarm Master.

8.12 Get Previous Alarm [0A]

Format:
[M_ALARM_CMDS] [PREV ALARM] [ALARM TYPE] [CURRENT ALARM]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
PREV ALARM	0A
ALARM TYPE	Unsigned Byte As explained in section 8.1.
CURRENT ALARM	Unsigned Word 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_ALARM_CMDS] [PREV ALARM] [ALARM TYPE] [NEW ALARM] [STATUS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_ALARM_CMDS	05
PREV ALARM	0A
ALARM TYPE	Unsigned Byte As explained in section 8.1.
NEW ALARM	Unsigned Word 0000 – FFFF
STATUS	Unsigned Byte Alarm status (same as Send Alarm Status)

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to get the previous alarm of the alarm type. This command would be used if, for example, a keyboard wished to know what the previous alarm from the current triggered alarm on its display was. This command is sent to the Alarm Master. Alarm 0000 is acceptable in this command as in Get Next Alarm.

8.13 Get Next Triggered Alarm [0B]

Format:
[M_ALARM_CMDS] [NEXT TRIG ALM] [ALARM TYPE] [CURRENT ALARM]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
NEXT TRIG ALM	0B
ALARM TYPE	Unsigned Byte As explained in section 8.1.
CURRENT ALARM	Unsigned Word 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_ALARM_CMDS] [NEXT TRIG ALM] [ALARM TYPE] [NEW ALARM] [STATUS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_ALARM_CMDS	05
NEXT TRIG ALM	0B
ALARM TYPE	Unsigned Byte As explained in section 8.1.
NEW ALARM	Unsigned Word 0000 – FFFF
STATUS	Unsigned Byte

	Alarm status (same as Send Alarm Status)

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to get the next triggered alarm of the alarm type. This command would be used if, for example, a keyboard wished to know what the next triggered alarm from the current triggered alarm on its display was. This command is sent to the Alarm Master. It should be noted that 0000 is acceptable in this command. If alarm 0000 is provided in the command, the response would include the first triggered alarm. If alarm 0000 is returned as the NEW ALARM, then there are no triggered alarms in the system.

8.14 Get Previous Triggered Alarm [0C]

Format:
[M_ALARM_CMDS] [PREV TRIG ALM] [ALARM TYPE] [CURRENT ALARM]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
PREV TRIG ALM	0C
ALARM TYPE	Unsigned Byte As explained in section 8.1.
CURRENT ALARM	Unsigned Word 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_ALARM_CMDS] [PREV TRIG ALM] [ALARM TYPE] [NEW ALARM] [STATUS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_ALARM_CMDS	05
PREV ALARM	0C
ALARM TYPE	Unsigned Byte As explained in section 8.1.
NEW ALARM	Unsigned Word 0000 – FFFF
STATUS	Unsigned Byte Alarm status (same as Send Alarm Status)

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to get the previous triggered alarm of the alarm type. This command would be used if, for example, a keyboard wished to know what the previous triggered alarm from the current triggered alarm on its display was. This command is sent to the Alarm Master. Alarm 0000 is acceptable in this command as in Get Next Triggered Alarm.

8.15 Request Alarm Range [10]

Format:

[M_ALARM_CMDS] [REQ ALM RANGE] [ALARM TYPE] [BEG ALM] [NUM ALARMS]

Where:

FIELD	MEANING
M_ALARM_CMDS	05
REQ ALM RANGE	10
ALARM TYPE	Unsigned Byte As explained in section 8.1.
BEG ALM	Unsigned Word 0001 – FFFF Beginning alarm number for range.
NUM ALARMS	Unsigned Word 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_ALARM_CMDS] [REQ ALM RANGE] [ALARM TYPE] [BEGIN ALM] [END ALM]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_ALARM_CMDS	05
REQ ALM RANGE	10
ALARM TYPE	Unsigned Byte As explained in section 8.1.
BEGIN ALM	Unsigned Word 0000 – FFFF
END ALARM	Unsigned Word 0000 – FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device with alarms to get the logical alarm range of the alarms on board the device. This command informs the alarm master of the default beginning alarm number and number of alarms on board the device. If the alarm master returns an ACK, the alarm range will be provided (and may mirror the default). A NACK with a FEATURE NOT SUPPORTED will tell the alarm box to use defaults. If the alarm range returned is smaller than the range of the alarm device, the alarm device should only enable the alarms in the range provided by the alarm master.

9. Auxiliary Outputs [06]

Auxiliaries are a resource in the M protocol. In order to control a resource a request for resource control must be sent to the System Master.

9.1 Set Aux [00]

Format:
[M_AUX_CMDS] [SET_AUX] [AUX LO] [AUX HI] [TIME]

Where:

FIELD	MEANING
M_AUX_CMDS	06

SET_AUX	00
AUX LO	Unsigned Word 0000 – FFFF Low range of auxes to set.
AUX HI	Unsigned Word 0000 – FFFF High range of auxes to set.
TIME	Unsigned Word 0000 – FFFF Time in seconds for auxiliary to remain set. 0 indicates it is latching, any other number indicates momentary for the indicated time.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to set an auxiliary. If the System Master does not exist, this command may be sent as an ALL CALL. Any device receiving an ALL CALL of this command that has auxiliaries will compare the logical range of auxes in the command with its range of auxes and set any matching auxes.

9.2 Clear Aux [01]

Format:
[M_AUX_CMDS] [CLEAR_AUX] [AUX LO] [AUX HI]
Where:

FIELD	MEANING
M_AUX_CMDS	06
CLEAR_AUX	00
AUX LO	Unsigned Word 0000 – FFFF Low range of auxes to set.
AUX HI	Unsigned Word 0000 – FFFF High range of auxes to set.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to clear an auxiliary. If the System Master does not exist, this command may be sent as an ALL CALL. Any device receiving an ALL CALL of this command that has auxiliaries will compare the logical range of auxes in the command with its range of auxes and clear any matching auxes.

9.3 Request GPI Status [02]

Format:
[M_AUX_CMDS] [REQUEST STATUS] [GPI NUMBER]
Where:

FIELD	MEANING

M_AUX_CMDS	06
REQUEST STATUS	02
GPI NUMBER	Unsigned Word 0000 – 1FFF (FFFF total auxes / 8 auxes per GPI)

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to find the status of an auxiliary within a GPI. If the GPI Master does not exist, this command may be sent as an ALL CALL. Any device receiving an ALL CALL of this command that has auxiliaries will respond to the message if the logical aux number in the command is one of the auxes on board the receiving device. The response contains the bit mapped status of all auxes in the GPI. There is no special ACK to this command, as it causes a Send GPI Status command to be generated and sent back to the requestor.

9.3 Send GPI Status [03]

Format:
[M_AUX_CMDS] [SEND STATUS] [GPI NUMBER] [STATUS]

Where:

FIELD	MEANING
M_AUX_CMDS	06
SEND STATUS	03
GPI NUMBER	Unsigned Word 0000 – 1FFF (FFFF total auxes / 8 auxes per GPI)
STATUS	Bitmapped status of each auxiliary within the GPI. Auxiliary 1 is bit 0 of GPI 0.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to send the status of an auxiliary. This may be the response to an ALL CALL request GPI status command.

9.4 Get Next GPI [04]

Format:
[M_AUX_CMDS] [NEXT GPI] [CURRENT GPI]

Where:

FIELD	MEANING
M_AUX_CMDS	06
NEXT GPI	04
CURRENT GPI	Unsigned Word 0000 – FFFF

ACK Response Format:

[M_UNIVERSAL_CMDS] [ACK] [M_AUX_CMDS] [NEXT GPI] [NEW GPI]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_AUX_CMDS	06
NEXT GPI	04
NEW GPI	Unsigned Word 0000 – FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to get the next GPI to a supplied GPI number. This command would be used if, for example, a keyboard wished to know what the next GPI from the current GPI on its display was. This command is sent to the GPI Master.

9.5 Get Previous GPI [05]

Format:
[M_AUX_CMDS] [PREV GPI] [CURRENT GPI]

Where:

FIELD	MEANING
M_AUX_CMDS	06
PREV GPI	05
CURRENT GPI	Unsigned Word 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_AUX_CMDS] [PREV GPI] [NEW GPI]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_AUX_CMDS	06
PREV GPI	05
NEW GPI	Unsigned Word 0000 – FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to get the previous GPI to a supplied GPI number. This command would be used if, for example, a keyboard wished to know what the previous GPI from the current GPI on its display was. This command is sent to the GPI Master.

9.6 Request GPI Range [10]

Format:
[M_AUX_CMDS] [REQ GPI RANGE] [BEG GPI] [NUM GPIS]

Where:

FIELD	MEANING
M_AUX_CMDS	06
REQ GPI RANGE	10
BEG GPI	Unsigned Word 0000 – 8192 Beginning GPI number for range.
NUM GPIS	Unsigned Word 0000 – 8192

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_AUX_CMDS] [REQ GPI RANGE] [BEGIN GPI] [NUM GPIS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_AUX_CMDS	06
REQ GPI RANGE	10
BEGIN GPI	Unsigned Word 0000 – FFFF
NUM GPIS	Unsigned Word 0000 – FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device with auxiliaries to get the logical gpi range of the GPIs on board the device. This command informs the alarm master of the default beginning GPI number and number of GPIs on board the device. If the System Master returns an ACK, the GPI range will be provided (and may mirror the default). A NACK with a FEATURE NOT SUPPORTED will tell the GPI box to use defaults. If the GPI range returned is smaller than the range of the GPI device, the GPI device should only enable the GPIs in the range provided by the System Master.

10. Switches [07]

10.1 Switch CAM to MON Command [00]

Format:
[M_SWITCH_CMD] [SWITCH] [CAMERA] [MONITOR]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
SWITCH CAM TO MON	00
CAMERA	Unsigned Word Logical Camera Number 0000 – FFFF
MONITOR	Unsigned Word Logical Monitor Number 0000 – FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Tells the Switch to perform a switch of a logical camera to a logical monitor.

10.2 Read Switch State
10.3 Read Matrix State
10.4 Lock State
10.5 Unlock State
10.6 Salvo
10.6.1 Set Salvo
10.6.2 Call Salvo
10.6.3 Clear Salvo
10.6.4 Read Salvo
10.6.5 Get Next Available Salvo Number
10.7 Tours
10.7.1 Set Tour
10.7.2 Call Tour
10.7.3 Clear Tour
10.7.4 Read Tour
10.7.5 Get Next Available

11. Recording Equipment [08]

11.1 Play [00]

Format:
[M_REC_CMDS] [PLAY]
Where:

FIELD	MEANING
M_REC_CMDS	08
PLAY	00

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is sent directly to a recording device.

11.2 Stop [01]

Format:
[M_REC_CMDS] [STOP]
Where:

FIELD	MEANING
M_REC_CMDS	08
STOP	01

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is sent directly to a recording device.

11.3 Rewind [02]

Format:
[M_REC_CMDS] [REWIND]
Where:

FIELD	MEANING
M_REC_CMDS	08
REWIND	02

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is sent directly to a recording device.

11.4 Fast Forward [03]

Format:
[M_REC_CMDS] [FAST FORWARD]
Where:

FIELD	MEANING
M_REC_CMDS	08
FAST FORWARD	03

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is sent directly to a recording device.

11.5 Pause [04]

Format:
[M_REC_CMDS] [PAUSE]
Where:

FIELD	MEANING
M_REC_CMDS	08
PAUSE	04

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is sent directly to a recording device.

11.6 Record [05]

Format:
[M_REC_CMDS] [RECORD]
Where:

FIELD	MEANING
M_REC_CMDS	08
RECORD	05

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is sent directly to a recording device.

11.7 Eject [06]

Format:
[M_REC_CMDS] [EJECT]
Where:

FIELD	MEANING
M_REC_CMDS	08
EJECT	06

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is sent directly to a recording device.

11.8 Set Tape Speed (SLP, LP)
11.9 Set Record Speed
11.10 Set Record Length

12. Multiplexers [09]

12.1 Mux Tape [00]

Format:
[M_MUX_CMDS] [MUX TAPE]

Where:

FIELD	MEANING
M_AUX_CMDS	06

MUX TAPE	00

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Switches main monitor to playback from VCR.

12.2 Mux Live [01]

Format:
[M_MUX_CMDS] [MUX LIVE]

Where:

FIELD	MEANING
M_AUX_CMDS	06
MUX LIVE	01

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Switches main monitor to live video.

12.3 Mux Zoom [02]

Format:
[M_MUX_CMDS] [MUX ZOOM]

Where:

FIELD	MEANING
M_AUX_CMDS	06
MUX ZOOM	02

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Switches the zoom mode for the displayed camera.

12.4 Mux PIP [03]

Format:
[M_MUX_CMDS] [MUX PIP]

Where:

FIELD	MEANING

M_AUX_CMDS	06
MUX PIP	03

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Displays a picture-in-picture on the main monitor.

12.5 Mux 2X2 [04]

Format:
[M_MUX_CMDS] [MUX 2X2]

Where:

FIELD	MEANING
M_AUX_CMDS	06
MUX 2X2	04

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Displays a group of 4 cameras on the main monitor.

12.6 Mux 3X3 [05]

Format:
[M_MUX_CMDS] [MUX 3X3]

Where:

FIELD	MEANING
M_AUX_CMDS	06
MUX 3X3	05

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Displays a group of 9 cameras on the main monitor.

12.7 Mux 4X4 [06]

Format:
[M_MUX_CMDS] [MUX 4X4]

Where:

FIELD	MEANING
M_AUX_CMDS	06
MUX 4X4	06

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Displays a group of 16 cameras on the main monitor.

12.8 Mux Switch Channel [07]

Format:
[M_MUX_CMDS] [MUX SWITCH CHANNEL]

Where:

FIELD	MEANING
M_AUX_CMDS	06
MUX SWITCH CHANNEL	07

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Sequentially switches through the channels displayed on the main screen when in live mode.

13. Monitors [0A]

13.1 Toggle Pause Monitor Activity [00]

Format:
[M_MON_CMDS] [TOGGLE PAUSE MON ACTIVITY]

Where:

FIELD	MEANING
M_MON_CMDS	0A
TOGGLE PAUSE MON ACTIVITY	00

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:

This command is used to toggle the monitor PAUSE feature ON or OFF. The monitor PAUSE feature suspends activities on the monitor such as sequences or macros. The exact definition of the monitor PAUSE feature may very from system to system.

14. Video Signal Equipment [0B]

15. Transmission Systems [0C]

15.1 Retrieve Error Log
15.2 Clear Error Log

15.3 Change Device Timeout
This is a command to a bus master that supports this feature to lengthen or shorten the timeout for a specific device address on the bus.

16. Audio Systems [0D]

17. System Management [0E]

17.1 System Resources

Resources are devices or CCTV related equipment that can be controlled on the network. The following are resources in the M protocol:

RESOURCE	NEED CONTROL TO SEND COMMAND	RESOURCE TYPE
MONITOR	YES	00
CAMERA	YES	01
VCR	YES	02
MUX	YES	03
GPI	YES	04
MACRO	NO	05
SEQUENCE	NO	06

Not all commands need prior permission before sending a command. Read commands generally can be sent without gaining permission. However, it is necessary to get the address of the device to talk to it directly. Macros are handled on board the System Master and it is not necessary to ask for permission to control a Macro, but it is not an error to do so either. The System Master can NAK a command for a Macro since it also handles permissions. Other devices, such as cameras, do not know who has permission to control them and will accept any incoming command.

17.1.1 Request Resource Control [00]

Format:
[M_SYS_MGMT_CMDS] [REQ_RESOURCE] [RESOURCE TYPE] [RESOURCE NUMBER] [OVERRIDE]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
REQ_RESOURCE	00
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF
OVERRIDE	0 = Do not override 1 = Attempt to override if resource is already allocated

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_SYS_MGMT_CMDS] [REQ_RESOURCE] [RESOURCE TYPE] [RESOURCE NUMBER] [NETWORK ADDRESS]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_SYS_MGMT_CMDS	0E
REQ_RESOURCE	00
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF
NETWORK ADDRESS	This is the four byte network address of the device being requested. The Requesting device needs this information in order to directly talk to the device it wishes to control. It consists of [Network Address] [Hub Address] [Bus Address] [Device Address].

NAK Response Format:
[M_UNIVERSAL_CMDS] [NACK] [M_SYS_MGMT_CMDS] [REQ_RESOURCE] [ERR CODE] [RESOURCE TYPE] [RESOURCE NUMBER]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
NACK	01
M_SYS_MGMT_CMDS	0E
REQ_RESOURCE	00
ERR CODE	See Negative Acknowledge (NAK)
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF

Explanation:
This command is used by a device to claim control of a resource from the System Master. It is not necessary to request control of all resources.

17.1.2 Release Resource Control [01]

Format:
[M_SYS_MGMT_CMDS] [RELEASE RESOURCE] [RESOURCE TYPE] [RESOURCE NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
RELEASE_RESOURCE	01
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used by a device to release control of a resource from the System Master.

17.1.3 Resource Control Lost [02]

Format:
[M_SYS_MGMT_CMDS] [RESOURCE LOST] [RESOURCE TYPE] [RESOURCE NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
RESOURCE LOST	02
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Sent by the System Master to a device with resource control when the resource is being taken away from it (by a higher priority device).

17.1.4 Request Next Logical Resource Number [03]

Format:
[M_SYS_MGMT_CMDS] [REQ_NEXT_LOG_RES_NUM] [RESOURCE TYPE] [RESOURCE NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
REQ_NEXT_LOG_RES_NUM	03
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_SYS_MGMT_CMDS] [REQ_NEXT_LOG_RES_NUM] [RESOURCE TYPE] [RESOURCE NUMBER]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_SYS_MGMT_CMDS	0E
REQ_NEXT_LOG_RES_NUM	03
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.

RESOURCE NUMBER	Unsigned Word 0000 – FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Sent by a device to find out what the next available logical resource number is given a specified resource number. If a keyboard is displaying CAM 101 and the user hits Next Cam, the keyboard would query the System Master for the next logical camera number using this command and then would request control of the returned camera number.

17.1.5 Request Previous Logical Resource Number [04]

Format:
[M_SYS_MGMT_CMDS] [REQ_PREV_LOG_RES_NUM] [RESOURCE TYPE] [RESOURCE NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
REQ_PREV_LOG_RES_NUM	04
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_SYS_MGMT_CMDS] [REQ_PREV_LOG_RES_NUM] [RESOURCE TYPE] [RESOURCE NUMBER]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_SYS_MGMT_CMDS	0E
REQ_PREV_LOG_RES_NUM	04
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Sent by a device to find out what the previous available logical resource number is given a specified resource number. If a keyboard is displaying CAM 101 and the user hits Previous Cam, the keyboard would query the System Master for the previous logical camera number using this command and then would request control of the returned camera number.

17.2 Resource Data

RESOURCE DATA is defined depending upon the resource as below:

RESOURCE	DATA

*MONITOR	[INPUT RESOURCE TYPE] [INPUT RESOURCE NUMBER] [ALM TYPE] [ALM] [MONITOR STATUS] where: (BYTE) INPUT RESOURCE TYPE is the type of the associated input (WORD) INPUT RESOURCE NUMBER is the number of the resource (BYTE) ALM TYPE is the type of the current alarm on the monitor (WORD) ALM is the current alarm on the monitor (0 if none) (WORD) SEQUENCE number running on monitor (0 if none) (BYTE) MONITOR STATUS contains the following information: Bit 0: 1 = PAUSED, 0 = NOT PAUSED see section 13.1.
CAMERA	[CAMERA STATUS] where: (BYTE) CAMERA STATUS contains the following information: (currently not used)
*VCR	[INPUT RESOURCE TYPE] [INPUT RESOURCE NUMBER] [VCR STATUS] where: (BYTE) INPUT RESOURCE TYPE is the type of the associated input (WORD) INPUT RESOURCE NUMBER is the number of the resource (BYTE) VCR STATUS contains the following information: 00 VCR Playing 01 VCR Stopped 02 VCR Rewinding 03 VCR Fast Forwarding 04 VCR Paused 05 VCR Recording 06 VCR Out of Tape/Eject
*MUX	[INPUT RESOURCE TYPE] [INPUT RESOURCE NUMBER] [MUX STATUS] where: (BYTE) INPUT RESOURCE TYPE is the type of the associated input (WORD) INPUT RESOURCE NUMBER is the number of the resource (BYTE) MUX STATUS contains the following bit encoded information: Bits 0 – 2: 00 Full Screen 01 PIP 02 2x2 Quad 03 3x3 Nano 04 4x4 Hex 05 MUX Zoom for the displayed camera Bits 3 - 5: 00 VCR Playing 01 VCR Stopped 02 VCR Rewinding 03 VCR Fast Forwarding 04 VCR Paused 05 VCR Recording 06 VCR Out of Tape/Eject Bit 6: Undefined (should be zero) Bit 7: 0 LIVE mode 1 VCR mode

MACRO	[MACRO STATUS] (BYTE) MACRO STATUS is a bit field: Bit 0 Macro playing forward Bit 1 Macro playing backward Bit 2 Macro paused Bit 3 Macro stopped
SEQUENCE	[SEQUENCE STATUS] (BYTE) SEQUENCE STATUS will be one of the following: Bit 0 Sequence playing forward Bit 1 Sequence playing backward Bit 2 Sequence paused Bit 3 Sequence stopped

* Monitors, VCRs and MUXs are all potential output devices. All output devices may have an associated input device. For example, a monitor may be associated with a camera since the camera is an input to the monitor.

17.2.1 Request Resource Data Command [05]

Format:
[M_SYS_MGMT_CMDS] [REQ_RESOURCE_DATA] [RESOURCE TYPE] [RESOURCE NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
REQ_RESOURCE_DATA	05
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_SYS_MGMT_CMDS] [REQ_RESOURCE_DATA] [RESOURCE TYPE] [RESOURCE NUMBER] [RESOURCE DATA]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_SYS_MGMT_CMDS	0E
REQ_RESOURCE_DATA	05
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF
DATA	Resource dependent field (see Resource Data)

NAK Response Format:
There is no special data in the NAK to this command.

17.2.2 Update Resource Data Command [06]

Format:
[M_SYS_MGMT_CMDS] [UPDATE_RESOURCE_DATA] [RESOURCE TYPE] [RESOURCE NUMBER] [DATA]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E

UPDATE_RESOURCE_DATA	06
RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
RESOURCE NUMBER	Unsigned Word 0000 – FFFF
DATA	Resource dependent field (see Resource Data)

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

17.3 Request Switch Command [07]

Format:
[M_SYS_MGMT_CMDS] [REQ_SWITCH] [INPUT RESOURCE TYPE] [INPUT RESOURCE NUMBER] [OUTPUT RESOURCE TYPE] [OUTPUT RESOURCE NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
REQ_SWITCH	07
INPUT RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
INPUT RESOURCE NUMBER	Unsigned Word Logical Resource Number 0000 – FFFF
OUTPUT RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
OUTPUT RESOURCE NUMBER	Unsigned Word Logical Resource Number 0000 – FFFF

ACK Response Format:
[M_UNIVERSAL_CMDS] [ACK] [M_SYS_MGMT_CMDS] [REQ_SWITCH] [INPUT RESOURCE TYPE] [INPUT RESOURCE NUMBER] [OUTPUT RESOURCE TYPE] [OUTPUT RESOURCE NUMBER]

Where:

FIELD	MEANING
M_UNIVERSAL_CMDS	00
ACK	00
M_SYS_MGMT_CMDS	0E
REQ_SWITCH	07
INPUT RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
INPUT RESOURCE NUMBER	Unsigned Word Logical Resource Number 0000 – FFFF
OUTPUT RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
OUTPUT RESOURCE NUMBER	Unsigned Word Logical Resource Number 0000 – FFFF

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Tells the System Master to perform a switch of an input resource to an output resource (switching a camera to a monitor).

17.4 Request Next Input On Output [08]

Format:
[M_SYS_MGMT_CMDS] [REQ_NEXT] [INPUT RESOURCE TYPE] [INPUT RESOURCE NUMBER] [OUTPUT RESOURCE TYPE] [OUTPUT RESOURCE NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
REQ_NEXT	08
INPUT RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
INPUT RESOURCE NUMBER	Unsigned Word Logical Resource Number 0000 – FFFF
OUTPUT RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
OUTPUT RESOURCE NUMBER	Unsigned Word Logical Resource Number 0000 – FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Tells the System Master to increment an input resource on an output resource (next camera on monitor).

17.5 Request Previous Input On Output [09]

Format:
[M_SYS_MGMT_CMDS] [REQ_PREV] [INPUT RESOURCE TYPE] [INPUT RESOURCE NUMBER] [OUTPUT RESOURCE TYPE] [OUTPUT RESOURCE NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
REQ_PREV	09
INPUT RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
INPUT RESOURCE NUMBER	Unsigned Word Logical Resource Number 0000 – FFFF
OUTPUT RESOURCE TYPE	Unsigned Byte consisting of a resource listed above.
OUTPUT RESOURCE NUMBER	Unsigned Word Logical Resource Number 0000 – FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:

There is no special data in the NAK to this command.

Explanation:
Tells the System Master to decrement an input resource on an output resource (previous camera on monitor).

17.6 Set Date and Time [10]

Format:
[M_SYS_MGMT_CMDS] [SET DATE_TIME] [YEAR] [MONTH] [DAY] [HOUR] [MIN] [SEC]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
SET DATE_TIME	10
YEAR	Unsigned Word
MONTH	Unsigned Byte Month of Year (1 – 12)
DAY	Unsigned Byte Day of Month (1 – 31)
HOUR	Unsigned Byte Hour of Day (0 – 23)
MIN	Unsigned Byte Minute of Hour (0 – 59)
SEC	Unsigned Byte Second of Minute (0 – 59)

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Sets the time and date on the receiving device.

17.7 Macros

17.7.1 Start Macro [11]

Format:
[M_SYS_MGMT_CMDS] [START_MACRO] [MACRO TYPE] [MACRO NUMBER] [FWD BWD]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
START MACRO	11
MACRO TYPE	This can be a Macro, Tour, Sequence or Salvo (identified by the resource type since Macros, Tours, Sequences and Salvos are all resources).
MACRO NUMBER	Unsigned Word 0000 – FFFF
FWD BWD	1 = Play Forward, 2 = Play in Reverse

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Starts a Macro, Tour, Sequence or Salvo.

17.7.2 Stop Macro [12]

Format:
[M_SYS_MGMT_CMDS] [STOP_MACRO] [MACRO TYPE] [MACRO NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
STOP MACRO	12
MACRO TYPE	This can be a Macro, Tour, Sequence or Salvo (identified by the resource type).
MACRO NUMBER	Unsigned Word 0000 – FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Starts a Macro, Tour, Sequence or Salvo.

17.7.3 Pause Macro [13]

Format:
[M_SYS_MGMT_CMDS] [PAUSE_MACRO] [MACRO TYPE] [MACRO NUMBER]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
PAUSE MACRO	13
MACRO TYPE	This can be a Macro, Tour, Sequence or Salvo (identified by the resource type).
MACRO NUMBER	Unsigned Word 0000 – FFFF

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Pauses a Macro, Tour, Sequence or Salvo.

17.8 Bus Master

The Bus Master reports device status to the System Master. When a device is turned on line by the Bus Master, the Bus Master will issue a command to the System Master informing it of the new device. The System Master may then query the device for its device information if needed using the Get Device Info command. Similarly, if a device fails on the bus, the Bus Master will issue a command to the System Master informing it of the failure. The following commands are used by the Bus Master to inform the System Master of these events.

17.8.1 Set Device Status [20]

Format:

[M_SYS_MGMT_CMDS] [SET DEVICE STATUS] [DEVICE ADDR] [STATUS]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
SET DEVICE STATUS	20
DEVICE ADDR	Unsigned Byte 0 – 253
STATUS	Unsigned Byte Bit 0 1 = Device online, 0 = Device offline Bit 1 1 = Device is listen only, 0 = Device is not listen only Bits 2 – 7 Not used, should be 0

ACK Response Format:
There is no special data in the ACK to this command. A report device status will be issued as a response when the device has a turn on the bus if the status is changed as a result of this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Used by the System Master to tell a Bus Master to change the status of a device.

17.8.2 Get Device Status [21]

Format:
[M_SYS_MGMT_CMDS] [GET DEVICE STATUS] [DEVICE ADDR]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
GET DEVICE STATUS	21
DEVICE ADDR	Unsigned Byte 0 – 253

ACK Response Format:
There is no special data in the ACK to this command. A report device status command is issued as a response when the device has a turn on the bus.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Used by the System Master to tell a Bus Master to report the status of a device.

17.8.3 Report Device Status [22]

Format:
[M_SYS_MGMT_CMDS] [REPORT DEVICE STATUS] [DEVICE ADDR] [STATUS]

Where:

FIELD	MEANING
M_SYS_MGMT_CMDS	0E
REPORT DEVICE	22

STATUS	
DEVICE ADDR	Unsigned Byte 0 – 253
STATUS	Unsigned Byte Bit 0 1 = Device online, 0 = Device offline Bit 1 1 = Device is listen only, 0 = Device is not listen only Bits 2 – 7 Not used, should be 0

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Spontaneously sent by the Bus Master to inform the System Master of a device's change in status.

18. Combination Commands [0F]

Combination commands are those commands that cross a range of device types but for some reason, need to be sent together. An example is the "Remote Movement" command. Pan, Tilt, Zoom, Focus, and Iris control are done frequently and are expected to be done in real time. To keep these efficient, they have been lumped together into this command.

18.1 Remote Movement

18.1.1 P Data Cmd [00]

Format:
[M_COMB_CMDS] [P_DATA_CMD] [DATA1] [DATA2] [DATA3] [DATA4]

Where:

FIELD	MEANING
M_COMB_CMDS	0F
P_DATA_CMD	00
DATA1	1st byte of P Protocol data section
DATA2	2nd byte of P Protocol data section
DATA3	3rd byte of P Protocol data section
DATA4	4th byte of P Protocol data section

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command is used to combine PTZ commands into one message by sending the P Protocol data section.

19. User Interfaces [10]

19.1 Menu Commands

19.1.1 Menu Program Mode On [00]

Format:
[M_UI_CMDS] [PROGRAM MODE ON]

Where:

FIELD	MEANING
M_UI_CMDS	10
PROGRAM MODE ON	00

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
This command initiates menu mode in the target device. If this command were sent to a Spectra it would behave like it was given a Preset 95 SET command.

19.1.2 Menu Program Mode Off [01]

Format:
[M_UI_CMDS] [PROGRAM MODE OFF]

Where:

FIELD	MEANING
M_UI_CMDS	10
PROGRAM MODE OFF	01

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
Exits program menu mode on the target device.

19.1.3 Menu Next Page [02]

Format:
[M_UI_CMDS] [NEXT PAGE]

Where:

FIELD	MEANING
M_UI_CMDS	10
NEXT PAGE	02

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode, the target device would present the next page if present when this command is received.

19.1.4 Menu Previous Page [03]

Format:
[M_UI_CMDS] [PREVIOUS PAGE]

Where:

FIELD	MEANING
M_UI_CMDS	10
PREVIOUS PAGE	03

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode, the target device would present the previous page if present when this command is received.

19.1.5 Menu Select Item [04]

Format:
[M_UI_CMDS] [SELECT ITEM]

Where:

FIELD	MEANING
M_UI_CMDS	10
SELECT ITEM	04

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode, the target device would cause the current item in the menu to be selected for editing.

19.1.6 Menu Item Up [05]

Format:
[M_UI_CMDS] [ITEM UP]

Where:

FIELD	MEANING
M_UI_CMDS	10
ITEM UP	05

ACK Response Format:

There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode, the target device would move one item up in the current page.

19.1.7 Menu Item Down [06]

Format:
[M_UI_CMDS] [ITEM DOWN]

Where:

FIELD	MEANING
M_UI_CMDS	10
ITEM DOWN	06

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode, the target device would move one item down in the current page.

19.1.8 Menu Item Left [07]

Format:
[M_UI_CMDS] [ITEM LEFT]

Where:

FIELD	MEANING
M_UI_CMDS	10
ITEM LEFT	07

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode, the target device would move one item left in the current page.

19.1.9 Menu Item Right [08]

Format:
[M_UI_CMDS] [ITEM RIGHT]

Where:

FIELD	MEANING
M_UI_CMDS	10
ITEM RIGHT	08

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode, the target device would move one item right in the current page.

19.1.10 Menu Decrement Value [09]

Format:
[M_UI_CMDS] [DECREMENT VALUE] [DECREMENT AMOUNT]

Where:

FIELD	MEANING
M_UI_CMDS	10
DECREMENT VALUE	09
DECREMENT AMOUNT	Unsigned Word 0001 – FFFF Amount to decrement the number by

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode the target device would decrement a currently selected item.

19.1.11 Menu Increment Value [0A]

Format:
[M_UI_CMDS] [INCREMENT VALUE] [INCREMENT AMOUNT]

Where:

FIELD	MEANING
M_UI_CMDS	10
INCREMENT VALUE	0A
INCREMENT AMOUNT	Unsigned Word 0001 – FFFF Amount to increment the number by

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode the target device would increment a currently selected item.

19.1.12 Menu Set Value [0B]

Format:

[M_UI_CMDS] [SET VALUE] [VALUE]

Where:

FIELD	MEANING
M_UI_CMDS	10
SET VALUE	0B
VALUE	Unsigned Word 0000 – FFFF

19.1.13 Menu Set String [0C]

Format:
[M_UI_CMDS] [SET STRING] [SIZE] [STRING]

Where:

FIELD	MEANING
M_UI_CMDS	10
SET STRING	0C
SIZE	Unsigned Byte 00 – FF
STRING	String of bytes of SIZE length.

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode the target device would set the currently selected item to the indicated string value.

19.1.14 Menu Default Value [0D]

Format:
[M_UI_CMDS] [DEFAULT]

Where:

FIELD	MEANING
M_UI_CMDS	10
DEFAULT	0D

ACK Response Format:
There is no special data in the ACK to this command.

NAK Response Format:
There is no special data in the NAK to this command.

Explanation:
When in menu mode the target device would set the currently selected item to its default value.