9760MGR Communication Protocol (HDR17)

HDR17 (0xC1) is used as a function header for all of the communications between 9760MGR and CM9760. The protocol structure is the same as that described in the CM9760 protocol document (9760KBD protocol). Transmitted/received messages have the following structure:
STX (0xA0), function header (0xC1), body of message, ETX (0xAF), CRC.
Each message received is checked using the CRC value, and acknowledged by a single ACK byte (0xA2).

The body of the message consists of four parts - sub-header, sender ID, receiver ID and data.

Sub-header - function described in section B.
Sender ID – two bytes as a transmitting node number (FmNode) in BCD format.
Receiver ID – two bytes as a receiving node number (ToNode) in BCD format.
Data - the length of the data field depends on the sub-header (see section B for more information).

If the receiving device needs to return or send information (other than the ACK response) to the transmitting device, it will send this message directly after the ACK.

Transmitted message

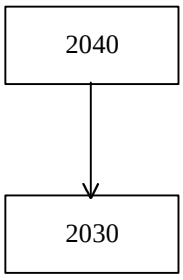
STX (0xA0)	HDR17 (1 byte)	sub-header (1 byte)	FmNode (2 bytes)	ToNode (2 bytes)	Data (n bytes)	ETX (0xAF)	CRC (1 byte)

Acknowledge returned

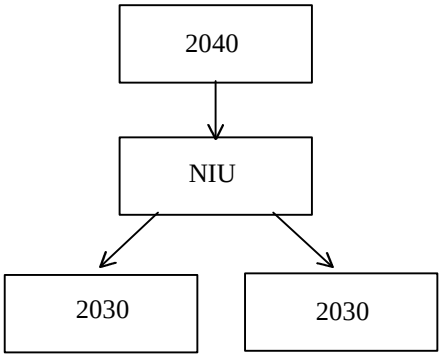
ACK (0xA2)

A. Description of Node ID

Depending on the system's configuration, 9760MGR can be connected either directly to CM9760 or through the 9760NIU unit. The equipment number defined as the communication port interfacing with 9760MGR, needs to be set as 40 (definition in 'scp' file). If the installed system operates in a networking configuration, 9760MGR need to be connected to the 9760NIU unit. The equipment number, defined in the 'niu' file, needs to be set as 40 also.



System without NIU



System with NIU

The node ID is the identification number of the sending and receiving node. The node numbers for CM9760 are assigned automatically by the NIU. The node number (node ID) is the same as the NIU's

physical port number, where CM9760 is connected. The node ID for 9760MGR is defined as 9999, and the node ID for the NIU is defined as 9998.

Node ID	Description
1-36	CM9760 ID which is assigned by the NIU
9998	9760NIU ID
9999	9760MGR ID
0 (receiver only)	Broadcast to all nodes

Examples:

1. 9760MGR broadcasts message to all nodes
   FmNode is 9999 and ToNode is 0.

2. CM9760 (node 5) sends message to 9760MGR
   FmNode is 5 and ToNode is 9999.

B. Description of Sub-Headers

The sub-header is used to help distinguish between the various communication functions and to help interpret the data attached to the message. The functions performed by these sub-headers are described in the data below:

B.1 Report System Information Message (sub-header: 0x01)

This sub-header is used to send system information from CM9760 to 9760MGR. The information includes file- name of the setup file, alarm information, macro information, GPI information, system error etc.

Message format: HDR17, 0x01, FmNode, ToNode, **type**, data

The **type** value is used when describing the meaning of the data. The type definition is described below:

B.1.1 Request for Information Filter from CM9760 to 9760MGR (0x00)

This message is sent by CM9760 to 9760MGR. It requests which information it should send to 9760MGR during the operation. CM9760 sends this message to 9760MGR after it finishes a power up sequence.

Message: HDR17, 0x01, FmNode, ToNode, 0x00
Response: HDR17, 0x01, FmNode1, ToNode1, 0x00, information filter byte1, information filter byte2
(The meaning of the response message is described in section B.1.2)

B.1.2 Send Information Filter from 9760MGR to CM9760 (0x00)

The type of this message is also 0x00, but 9760MGR sends it.

Message: HDR17, 0x01, FmNode, ToNode, 0x00, information filter byte1, information filter byte2
Response: HDR17, 0x01, FmNode, ToNode, 0x01, 20 bytes filename

(The meaning of the response message is described in section B.1.3)

There are two bytes allocated for the information filter. The information requested from 9760MGR is set in bit patterns. If a bit is set, CM9760 is requested to send the corresponding information once it is available.

information filter byte 1

7	6	5	4	3	2	1	0

bit 0 - Operator log on/log off
bit 1 - Alarm information request
bit 2 - GPI information request
bit 3 - Macro information request
bit 4 - System error information request
bit 5 - Camera switched to Monitor request
bit 6 - Video Loss information request
bit 7 - always 0

information filter byte 2

7	6	5	4	3	2	1	0

bit 0 - Macro internal information request (e.g. macro ARM)
bit 1 - Macro message request (macro step MSG information will be obtained)
bit 2 to 7 - reversed to 0

B.1.3 Send Filename of Setup File (0x01)

The type of this message is 0x01. The data information consists of 20 bytes of ASCII characters, representing a filename without an extension. The message should be padded with SPACE characters (0x20) to form a 20- byte- long string. There is no string termination byte required.

Message: HDR17, 0x01, FmNode, ToNode, 0x01, 20 bytes representing filename

e.g. if the filename of the setup files is “NODE1”, the 20 bytes filename (in hex. format) will be formatted as shown below:

4E, 4F, 44, 45, 31, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20

B.1.4 Alarm Information

The alarm information messages will be sent to 9760MGR if an alarm information request bit is set in the filter.

B.1.4.1 Alarm Trigger (0x10)

When an armed alarm is triggered, CM9760 will send the alarm trigger message to the 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x10, Date&Time, Opr, Palm, Lalm, Port

Date&Time - six bytes representing the current date and time (when a message is sent). All bytes are in BCD format.

Year (00-99)	Month (1-12)	Day (1-31)	Hour (00-23)	Minute (00-59)	Second (00-59)

Opr - two bytes representing the operator number who armed the triggered alarm in BCD format with the high byte sent first and low byte second (valid from 1 to 96).

Palm - two bytes representing the physical alarm number in BCD format (starting from 0).

Lalm - two bytes representing the logical alarm number in BCD format (valid from 1 to 9999).
Port - one byte representing the port number in BCD format, through which the alarm trigger was reported (valid from 1 to 36)

B.1.4.2 Alarm Reset (0x11)

When an alarm is reset and the alarm information filter bit is set, CM9760 will send an alarm reset message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x11, [Date&Time], Opr, Palm, Lalm, Port

The formats: Date&Time, Opr, Palm and Lalm are defined as for the alarm trigger message. The Port byte represents the port number through which the reset command was received (usually the keyboard port).

B.1.4.3 Alarm Arm (0x12)

This message informs 9760MGR which operator armed an alarm.

Message: HDR17, 0x01, FmNode, ToNode, 0x12, [Date&Time], Opr, Palm, Lalm, Port

B.1.4.4 Alarm Disarm (0x13)

This message informs 9760MGR which operator disarmed an alarm.

Message: HDR17, 0x01, FmNode, ToNode, 0x13, [Date&Time], Opr, Palm, Lalm, Port

B.1.5 Log On/Off Information

The Log on/off information message will be sent to 9760MGR if the operator log on/off filter bit is set.

B.1.5.1 Log On (0x20)

When an operator logs on to CM9760 and the Operator log on/off filter information bit is set; the system will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x20, [Date&Time], KB, Opr, Pin

KB - one byte in BCD format representing the keyboard number on which the operator logs on.
Opr - two bytes in BCD format representing the operator number.
Pin - two bytes in BCD format representing the PIN number of the operator that logged onto the system.

B.1.5.2 Log Off (0x21)

When an operator logs off from CM9760 and the Operator log on/off filter information bit is set; the system will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x21, [Date&Time], KB, Opr, Pin

The bytes format and meanings are the same as for the log on function.

B.1.5.3 Log onto the System when the PIN is Already in Use (0x22)

When an operator attempts to log onto the CM9760 system, when the PIN is already being used by another operator, CM9760 will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x20, [Date&Time], KB, Opr, Pin

KB - one byte in BCD format representing the keyboard number on which operator attempts to log on.
Opr - two bytes in BCD format representing the operator's number (always 0x00)
Pin - two bytes in BCD format representing the PIN number of the operator that is already logged in to the system.

B.1.5.4 Log On with the Wrong PIN Number (0x23)

When an operator attempts to log on to CM9760, but uses an incorrect PIN, CM9760 will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x23, [Date&Time], KB, Opr, Pin

KB - one byte in BCD format representing the keyboard number on which the operator attempted to log on.
Opr - two bytes in BCD format representing the operator's number (always 0x00)
Pin - two bytes in BCD format representing the unsuccessful PIN number.

B.1.6 Macro Information

A Macro information message will be sent to 9760MGR if the macro request filter information bit is set.

B.1.6.1 Macro Run (0x30)

When a macro is invoked by an operator, CM9760 will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x30, [Date&Time], Port, Opr, Lmac

Port - one byte in BCD format representing the port number to which the operator's keyboard is connected (valid from 1 to 36)
Opr - two bytes in BCD format representing the number of the operator who runs the macro (valid from 1 to 96).
Lmac - two bytes in BCD format representing a logical macro number (valid from 1 to 9999).

B.1.6.2 Macro Start (0x31)

When a macro is restarted by an operator after a pause, CM9760 will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x31, [Date&Time], Port, Opr, Lmac

The bytes format and meanings are the same as for the Macro Run function.

B.1.6.2 Macro Pause (0x32)

This message will be sent to 9760MGR when a macro is paused by an operator.

Message: HDR17, 0x01, FmNode, ToNode, 0x32, [Date&Time], Port, Opr, Lmac

The Bytes format and meanings are the same as for the Macro Run function.

B.1.6.3 Macro Stop (0x33)

This message will be sent to 9760MGR when a macro is stopped by an operator.

Message: HDR17, 0x01, FmNode, ToNode, 0x33, [Date&Time], Port, Opr, Lmac

Bytes format and meanings are the same as for the Macro Run function.

B.1.6.4 Macro Define (0x34)

This message will be sent to 9760MGR when an operator, through his keyboard, defines a temporary macro.

Message: HDR17, 0x01, FmNode, ToNode, 0x34, [Date&Time], Port, Opr, Lmac

Bytes format and meanings are the same as for the Macro Run function.

B.1.6.4 Macro Message (0x35)

This message will be sent to 9760MGR when a MSG step in a macro has been executed.

Message: HDR17, 0x01, FmNode, ToNode, 0x35, [Date&Time], Port, Info, Opr/Pin, MsgNo

Port - the same as for the Macro Run function.
Info - if Info is 0x00, Opr/Pin bytes will represent an operator number.
- if Info is 0x01, Opr/Pin bytes will represent operator's PIN number.
Opr/Pin - two bytes in BCD format (see Info for definition).
MsgNo - two bytes in BCD format representing message number.

B.1.7 GPI Information

The GPI information message will be sent to 9760MGR if the GPI request filter information bit is set.

B.1.7.1 GPI On/Off (0x40)

When a GPI is activated by an operator, CM9760 will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x40, [Date&Time], Opr, Pgpi, Lgpi, GpiAux

Opr - two bytes in BCD format representing the operator's number who activate a GPI.
Pgpi - two bytes in BCD format representing the physical GPI number that is activated by an operator.
Lgpi - two bytes in BCD format representing a logical GPI number.
GpiAux - one bytes of GPI status.
Bit 0 to 2 represent the AUX number (from0 to7). Bit4 (set/clear) means that this AUX function is activated/deactivated (ON/OFF).

B.1.8 Switch Camera to Monitor Information

The switch camera to monitor information message will be send to 9760MGR if the switch camera to monitor request information filter bit is set.

B.1.8.1 Switch Camera Monitor (0x50)

When a new monitor assignment occurs, CM9760 will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x50, [Date&Time], Lmon, Lcam, Opr

Lmon - two bytes in BCD format representing a logical monitor number onto which the camera is switched.
Lcam - two bytes in BCD format representing a logical camera number.
Opr - two bytes in BCD format representing the operator's number who request the switch.

B.1.9 System Error information

The system error information message will be sent to 9760MGR if the system error request information filter bit is set.

B.1.9.1 System Error (0x51)

When a system error occurs (e.g. transmit buffer full), CM9760 will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x51, [Date&Time], Port, Error, ErrMsg

Port - one bytes BCD format of port that has the error (valid from 1 to 36).
Error - one bytes BCD format of system error number (see below table for valid error number).
ErrMsg - 20 bytes of ASCII error message.

Error	ErrMsg
1	Coms Modem
2	Invalid Interrupt
3	Coms Overrun
4	Coms Parity
5	Coms Framing
6	Coms Break
7	Coms Fatal
8	Max Retry
9	Coms IIR
10	Rx overflow
11	Tx overflow
12	LPT overflow
13	Coms Tx Flag
14	Coms Rx Flag
26	TxMs Overrun
27	Tx Ptr Sync
28	Rx Ptr Sync
29	GPI Cnt < 0
30	GPI RMEM ERR
31	GPI Cnt > MAX
32	LPT Ptr Sync

B.1.10 Video Loss information

The video loss information message will be sent to 9760MGR if the video loss request information filter bit is set.

B.1.10.1 Video Loss (0x52)

When a video loss is detected, CM9760 will send this message to 9760MGR.

Message: HDR17, 0x01, FmNode, ToNode, 0x52, [Date&Time], Port, Pcam, Lcam

Port - one bytes in BCD format representing the port number where the reporting video matrix is connected (valid from 1 to 36).
Pcam - two bytes in BCD format representing a physical camera number on the reporting video matrix (valid from 0 to 255).

Lcam - two bytes in BCD format representing a logical camera number.

B.1.11 CM9760 On/Off Line Information

This message will be sent to 9760MGR whenever CM9760 gains communication with 9760MGR. In the networking system, the on/off line of the CM9760 nodes will be detected and reported by the NIU unit.

B.1.11.1 CM9760 On/Off Line (0x53)

This message informs 9760MGR of the communication link status from the CM9760 node. Whenever the CM9760 node is reported to be off line, 9760MGR will cease sending messages to this node.

Message: HDR17, 0x01, FmNode, ToNode, 0x53, [Date&Time], Node, OnOff

Node - two bytes in BCD format representing Node number.
OnOff - if OnOff byte is set to 0x00 then the node is off line, if OnOff byte is set to 0x01 then the node is on line.

B.2 Change System setup message (sub-header: 0x02)

This sub-header is used to execute a setup change on a selected CM9760 node.

The structure of the message contains **type** information used to help distinguish between requested changes in the system. The message format is similar to the Report System Information Message but its sub-header is 0x02.

Message format: HDR17, 0x02, FmNode, ToNode, **type**, data

All of the system changed messages from 9760MGR require a response message. The response message will inform 9760MGR if the last changes were accepted by the system. The valid responses are: done, not done, busy.
The structure of the response message is as below:

response message

STX (0xA0)	HDR17	sub-header (0x02)	FmNode (2 bytes)	ToNode (9999)	type (1 byte)	response (1 byte)	ETX (0xAF)	CRC (1 byte)

type - it is the same as the **type** defined in change system setup message.
response - 0x01 - DONE (e.g. the change is done)
0x02 - NOT DONE (e.g. wrong type, unknown parameters)
0x03 - BUSY (e.g. change alarm logical number while this alarm is already triggered)
0x04 - FULL (e.g. add a camera to system but it exceeds the maximum)

B.2.1 Change Monitor (0x01, 0x11)

There are two messages for changing the monitor setup.

B.2.1.1 Change Monitor (0x01)

This message is sent by 9760MGR to CM9760 requesting a change to the monitor information.

Message: HDR17, 0x02, FmNode, ToNode, 0x01, Pmon, Lmon, MonID, MonAccess

Pmon - two bytes in BCD format representing a physical monitor number.
Lmon - two bytes in BCD format representing a new logical monitor number (0-delete this monitor, 1-9999 is a valid number).
MonID - 24 bytes in ASCII format as a new monitor ident string.
MonAccess - 14 bytes of keyboard access (see a table below to find access definition).

Byte	Bit 7 6 5 4 3 2 1 0
1	x 7 6 5 4 3 2 1
2	x 15 14 13 12 11 10 9
3	x 23 22 21 20 19 18 17
4	x 31 30 29 28 27 26 25
5	x 39 38 37 36 35 34 33
6	x 47 46 45 44 43 42 41
7	x 55 54 53 52 51 50 49
8	x 63 62 61 60 59 58 57
9	x 71 70 69 68 67 66 65
10	x 79 78 77 76 75 74 73
11	x 87 86 85 84 83 82 81
12	x 95 94 93 92 91 90 89
13	x 56 48 40 32 24 16 8
14	x x x 96 89 80 72 64

The 14 bytes of monitor access for the 96 keyboards (1-96) are arranged in bit patterns. Bit 7 of each byte is always 0. When the bit is set for the corresponding keyboard, it will have access to the addressed monitor.

B.2.1.2 Change Monitor (0x11)

Message: HDR17, 0x02, FmNode, ToNode, 0x11, Pmon, Devtype, GPI, PortAddr, StartCam, Frame3170, Amp3170

Pmon - two bytes in BCD format representing a physical monitor number.
Devtype - one byte to define type of device attached to the video output.
0x00 - normal video monitor,
0x01 - VCR,
0x02 – video multiplexer (MUX).
GPI - two bytes in BCD format representing a GPI logical number (used to control the associated VCR when Devtype is set to be VCR).
PortAddr - one bytes representing the address of the device (used to control associated MUX when Devtype is set to be MUX).
StartCam - two bytes in BCD format representing a logical camera number used as a start up camera.
Frame3170 - one byte in BCD format representing a frame number of the Pacom 3170 Concealed Text Decoder (greater than or equal to 95 number means that no decoder is attached to this output).
Amp3170 - one byte in BCD format representing an amplifier address of the Pacom 3170 Concealed Text Decoder (valid range is 1-16).

B.2.2 Change Camera (0x02, 0x22, 0x32)

There are three messages for changing the camera setup. The first message is used for changing the logical number, access and ident. The second message is used for changing the decoder port address and the auxiliary status. The last is used for changing the alternate cameras.

B.2.2.1 Change Camera Access (0x02)

The message format is similar to the monitor change message.

Message: HDR17, 0x02, FmNode, ToNode, 0x02, Pcam, Lcam, CamID, CamAccess

Pcam - two bytes in BCD format representing the physical camera number.
Lcam - two bytes in BCD format representing the new logical camera number (0-delete this camera, 1-9999 is valid number).
CamID - 24 bytes representing the new camera ident in ASCII format.
CamAccess - 14 bytes representing the operator's access to cameras (1-96). This is presented in a bit patterns. With the exception that the table number represents the operator, as opposed to the keyboard, this arrangement is similar to the monitor access arrangement. When the corresponding bit is set, that operator will have access to the camera.

B.2.2.2 Change Camera Decoder (0x22)

This message can change other camera information as well as the decoder's address (see below for detail).

Message: HDR17, 0x02, FmNode, ToNode, 0x22, Pcam, Port, CAddr, Aux, GPI, Alarm, Devtype, Rev

Pcam - two bytes in BCD format representing the physical camera number.
Port - one bytes in BCD format representing the camera decoder's port number (valid from 1 to 36).
CAddr - one byte in hex format representing the camera's address (valid from 1 to 128). Port & CAddr are 0x00 for defining a fixed camera.
Aux - two bytes representing camera auxiliary status used to define operation mode for each auxiliary relay. The operation mode can be set to be momentary or toggle.

	bit 7							bit 0
first byte:	0	0	0	0	Aux 8	Aux 7	Aux 6	Aux 5

	bit 7							bit 0
second byte:	0	0	0	0	Aux 4	Aux 3	Aux 2	Aux 1

If corresponding bit is set/clear, than corresponding auxiliary relay is defined to operate in toggle/momentary mode.

GPI - two bytes in BCD format representing the logical GPI for the camera auxiliary relays directed to it.
Alarm - two bytes in BCD format representing the video loss alarm.
Devtype - one byte to define what Pcam is. 0x00 for camera, 0x01 for VCR, 0x02 for MUX.
Rev - one byte to reverse the camera control function

0	0	0	0	0	Focus	Iris	Zoom

If the corresponding bit is set, this camera control function will be reversed to the function shown on the keyboard (e.g. camera will 'zoom out' when 'zoom in' key is pressed on the keyboard when Rev is set at 0x01).

B.2.2.3 Change Alternate Camera (0x32)

The message is used to define or delete alternate cameras.

Message: HDR17, 0x02, FmNode, ToNode, 0x32, Pcam, Port, AltCam (2 bytes x 10)

Pcam - two bytes in BCD format representing the physical camera number.
AltCam - maximum of 10 alternate cameras can be defined. Each alternate camera is two bytes in BCD format with high byte first and low byte second.

B.2.3 Change Alarm (0x03, 0x13)

This message can change the alarm's logical number, ident and operator access. CM9760 will only perform this message when the selected alarm is not triggered. Otherwise, CM9760 will send back a busy response to the 9760MGR.

B.2.3.1 Change Alarm Access (0x03)

The format of this message is similar to the change camera access message format (0x02).

Message: HDR17, 0x02, FmNode, ToNode, 0x03, Palm, Lalm, AlmID, AlmAccess

Palm - two bytes in BCD format representing the physical alarm number.
Lalm - two bytes in BCD format of a new logical alarm number.
AlmID - 24 bytes of alarm ident in ASCII format.
AlmAccess - 14 bytes of alarm access for operator.

B.2.3.2 Change Alarm Camera and Preset (0x13)

This message is used to setup alarm cameras for each alarm. When an alarm is triggered, the alarm cameras will be switched to the defined alarm monitor. Each alarm has a maximum of five alarm cameras. Each alarm camera has one preset position.

Message: HDR17, 0x02, FmNode, ToNode, 0x03, Palm, ACam/Pst (3 bytes x 5), Mac, Dwell, AutoReset, MonGrp

Palm - two bytes in BCD format representing the physical alarm number.
ACam/Pst - maximum of 5 alarm cameras & presets. Each ACam/Pst consists of three bytes. The first and second bytes are the alarm camera's number in BCD format. The third byte is the preset position in BCD format.
Mac - two bytes in BCD format representing the logical alarm trigger macro number.
Dwell - two bytes in BCD format representing the dwell for alarm (unit is in second).
AutoReset - two bytes in BCD format for auto reset timer, when AutoReset is at 0, auto reset is disabled.
MonGrp - one byte in BCD format for setting up which group of monitors will be used for switching cameras for this alarm.

B.2.4 Change Macro (0x04)

This message can change the macro logical number and operator access. CM9760 will only perform the change when if the specified macro is not in use by an operator.

Message: HDR17, 0x02, FmNode, ToNode, 0x04, Pmac, Lmac, MacAccess

Pmac - two bytes in BCD format representing the physical macro number.
Lmac - two bytes in BCD format representing a new logical macro number.
MacAccess - 14 bytes of operator access to control macro.

B.2.5 Change GPI (0x05)

The message can change the GPI logical number, GPI toggle/momentary status and operator access. CM9760 can only perform the change when the specified GPI is not being used by an operator.

Message: HDR17, 0x02, FmNode, ToNode, 0x05, Pgpi, Lgpi, GStatus, GPIAccess

Pgpi - two bytes in BCD format representing the physical GPI number.
Lgpi - two bytes in BCD format representing a new logical GPI number.
GStatus - two bytes representing GPI status used to define operation mode for each auxiliary relay. The operation mode can be set to be momentary or toggle.

	bit 7							bit 0
first byte:	0	0	0	0	Aux 8	Aux 7	Aux 6	Aux 5

	bit 7							bit 0
second byte:	0	0	0	0	Aux 4	Aux 3	Aux 2	Aux 1

If corresponding bit is set/clear, than corresponding auxiliary relay is defined to operate in toggle/momentary mode.

GPIAccess - 14 bytes of GPI access for operator.

B.2.6 Change 3170 Ident (0x06)

This message changes the ident of 3170.

Message: HDR17, 0x02, FmNode, ToNode, 0x06, Dev, Frame, Amp, ID

Dev - one byte to define encoder or decoder.
Dev=0x00 for 3170/002 and 3170/022 for encoder
Dev=0x01 for 3170/022 for decoder
Frame - two bytes in BCD format representing the frame address (valid from 0 to 9999).
Amp - one byte in BCD format representing the amplifier address (valid from 1 to 15).
ID - 16 bytes ident in ASCII format.

B.2.7 Change System

There are seven messages for changing the system setup. These include: matrix attributes, print option, and alarm mode relative items.

B.2.7.1 Change Camera Attribute in Matrix (0x07)

Message: HDR17, 0x02, FmNode, ToNode, 0x07, CamX, CamY, CamAtt0, CamAtt1

CamX - one bytes in BCD format for the horizontal starting position of camera ident.
CamY - one bytes in BCD format for the vertical starting position of camera ident
CamAtt0 - first camera ident attribute.
CamAtt1 - second camera ident attribute.

(see matrix protocol for definition of CamAtt0 and CamAtt1)

B.2.7.2 Change Monitor Attribute in Matrix (0x17)

This message is used to change the monitor attribute. The message format is exactly the same as the camera attribute message.

Message: HDR17, 0x02, FmNode, ToNode, 0x17, MonX, MonY, MonAtt0, MonAtt1

B.2.7.3 Change Alarm/Special Message Attribute in Matrix (0x27)

This message is used to change the alarm/special attribute. The message format is exactly the same as the camera attribute message.

Message: HDR17, 0x02, FmNode, ToNode, 0x27, AlmX, AlmY, AlmAtt0, AlmAtt1

B.2.7.4 Change PTZ Attribute in Matrix (0x37)

This message is used to change the PTZ attribute. The message format is exactly the same as the camera attribute message.

Message: HDR17, 0x02, FmNode, ToNode, 0x37, PtzX, PtzY, PtzAtt0, PtzAtt1

B.2.7.5 Change Time&Date Attribute in Matrix (0x47)

This message is used to change the time & date attribute and the time display format. The message format is similar to the camera attribute message but an extra time format byte is added at the end.

Message: HDR17, 0x02, FmNode, ToNode, 0x47, TDX, TDY, TDAtt0, TDAtt1, TDformat

TDformat - one byte in BCD format

T&D format	Displayed format
0	01/07/98 00:00
1	07/01/98 00:00
2	01/07/98 12:00 AM
3	07/01/98 12:00 AM
4	01 Jul 98 00:00
5	01 Jul 98 12:00 AM
6	01st July 00:00
7	July 01st 00:00
8	Tue 01st Jul 98 00:00
9	Tue 01st Jul 98 12:00 AM

B.2.7.6 Change System Option (0x57)

This message can enable the system options (e.g. printer, display system error on screen), video loss parameter and the GPI definition.

Message: HDR17, 0x02, FmNode, ToNode, 0x57, Sys1, Print, GPI, VLoss, VMon

Sys1 - one byte in bit pattern to enable some options. When the corresponding bit is set, this function will be enabled.

0	HLAck	Print Opr Num	Alarm to Net	Auto Override	System error on	Diagnostic on	Printer on

Print1 - one byte in bit pattern for print options. When corresponding bit is set, selected event will be send to the printer.

0	Macro message	Video loss	Operator Log on	GPI control	System error	Alarm	Camera assign

GPI - one byte to define parallel/serial of 2013.
Vloss - one byte to define video loss mode of operation - 1=alarm, 2=video.
VMon - two bytes in BCD format representing the monitor number on which a video loss message will be displayed. This is a specified logical monitor number - from 1 to 99. The number 9998 specify an alarm monitor while number 9999 specify a current operator's monitor where video loss message will be displayed.

B.2.7.7 Change Alarm Mode (0x67)

This message is used to define alarm mode, dwell for alarm modes 3 and 4, and to end macro for resetting last system alarm.

Message: HDR17, 0x02, FmNode, ToNode, 0x67, AlmMode, M3/4Dwell, AlmMac

AlmMode - one byte in BCD representing the alarm mode.
M3/4Dwell - two bytes in BCD format representing the dwell for alarm mode 3 and 4.
AlmMac - two bytes in BCD format representing the macro for resetting the last system alarm.

B.2.8 Change Operator PIN Number (0x08)

Operator pin number for logging on can be changed by this message.

Message: HDR17, 0x02, FmNode, ToNode, 0x08, Opr, Pin, Prty, StartMac

Opr - two bytes in BCD format for operators number (1 to 96).
Pin - two bytes in BCD format for pin number (100-9999).
Prty - two bytes in BCD format for operator priority (0 - 9999)
StartMac - two bytes in BCD format for start macro number after the operator logs on.

B.2.9 Change Mimic (0x09)

This message defines mimic button information.

Message: HDR17, 0x02, FmNode, ToNode, 0x09, But, (MonCamPrst) x 5, Opr, Mac, KBUpd

But - two bytes in BCD format for button number (0 - 255).

MonCamPrst - 5 groups of MonCamPrst for mimic button assigning a camera to a monitor and directing a camera to preset position. The First two bytes in BCD format are for the monitor. The Next two bytes in BCD format are for the camera and the last byte in BCD is for the preset position.
Opr - two bytes in BCD format to assign operator number for this button.
Mac - two bytes in BCD format to trigger macro when this button is activated.
KBUpd - one bytes keyboard update flag.

B.2.10 Change Message (0x0A)

This message defines the print message for the macro step MSG.

Message: HDR17, 0x02, FmNode, ToNode, 0x0A, MsgNum, PrintPin, Msg

MsgNum - two bytes in BCD format for message number (start from 0).
PrintPin - one byte to enable the print PIN number onto printer (0x00 disable, 0x01 enable.
Msg - 24 bytes of message in ASCII.

B.3 Send Message to Operator (sub-header: 0x03)

Sub-header 0x03 allows the 9760MGR to send a display message to the operator or P2035 keyboard.

These messages do not have responses coming back from CM9760. Once CM9760 receives the display message, it will display the current monitor and keyboard to the operator.

There are only two different types of messages (one to the operator and one to the keyboard)

Message format: HDR17, 0x03, FmNode, ToNode, **type**, data

B.3.1 Send to Operator (0x01)

CM9760 will display messages to a specified operator on their P2035 keyboard and current monitor.

Message: HDR17, 0x03, FmNode, ToNode, 0x01, Opr, Msg

Opr - two bytes in BCD format to specify the operator number (1 - 96). If Opr is 0x00, it means all operators in ToNode can read message.
Msg - 24 bytes of displayed information in ASCII.

B.3.2 Send to Keyboard (0x02)

CM9760 will display messages to a specified keyboard and its current monitor.

Message: HDR17, 0x03, FmNode, ToNode, 0x02, KB, Msg

KB - two bytes in BCD format to specify keyboard number (1 - 96). If KB is 0x00, it means all keyboards in ToNode can read message.
Msg - 24 bytes of displayed information in ASCII.

B.4 Save CM9760 Setup Information from Memory to Hard disk (sub-header: 0x04)

Sub-header 0x02 allows 9760MGR to change the CM9760 parameter dynamically.

This is temporary and will not be updated to hard disk –all changes are lost once CM9760 is rebooted. Although, CM9760 may be forced, by 9760MGR to update its setup file on the hard drive from memory - this message receives a response from CM9760.

B.4.1 Update Hard-disk

When CM9760 receives this message, it will create a backup before writing new setup files – only the latest 3 backup files will be stored with name extension changed to xx1, xx2 and xx3. Once CM9760 starts to write to hard disk, a status message will be displayed on all operator keyboards and monitors. After CM9760 has finished, it will remove the message and send a response to the 9760MGR.

Message format: HDR17, 0x04, FmNode, ToNode, filetype1, filetype2

filetype1 - one byte in bit pattern to specify which file it wants to update.

0	sym	scp	gpi	mac	alm	cam	mon

filetype2 - one byte in bit pattern to specify which file it wants to update.

0	0	0	0	0	msg	mim	pin

B.4.2 Response from Updated Hard-disk

A response message will be sent back to the 9760MGR after the CM9760 receives the updated hard-disk message.

Message format : HDR17, 0x04, FmNode, ToNode, FileNum, response

FileNum - one byte in BCD to describe to which file the response is related.

FileNum	File	FileNum	File
1	monitor (*filename*.mon)	6	equipment (*filename*.scp)
2	camera (*filename*.cam)	7	system (*filename*.sym)
3	alarm (*filename*.alm)	8	pin (*filename*.pin)
4	macro (*filename*.mac)	9	mimic (*filename*.mim)
5	gpi (*filename*.gpi)	10	message (*filename*.msg)

response - 0x00 DONE (e.g. update finished)
0x01 WAIT (e.g. waiting to update, because another file is in progress)
0x02 IN PROGRESS (e.g. already started and in progress now)
0x03 ERROR (e.g. disk full, wrong file type)

B.5 9760MGR Receives System Setup Files from CM9760 (sub-header: 0x05)

This sub-header is used to receive setup files from CM9760.

Setup files include: monitor, camera, Vamp, alarm, macro, gpi, comms, system, operator, message, link camera. The information comes to 9760MGR in a message format. One message per monitor configuration (more per camera) is needed.

9760MGR requests the setup file from CM9760 first. After the CM9760 sends setup file information (usually 16 configurations), 9760MGR request next group of information. 9760MGR and CM9760 will keep this procedure until all information is sent to 9760MGR. If 9760MGR detects a message to be missing it will request the message to be re-sent (error checking). The 9760MGR unit can abort the communication at any time - CM9760 will cease sending set up file information.

Three message formats are included in this protocol: request, abort and receiving message.

*Request message

STX (0xA0)	HDR17	Sub-header (0x05)	FmNode (9999)	ToNode (2 byte)	Type (1 byte)	Data	ETX (0xAF)	CRC (1 byte)

This message is sent by 9760MGR unit to request the setup information from CM9760. It tells CM9760 the physical number(s) of the configuration(s) that CM9760 should send. After CM9760 receives this message, it will start sending setup information to 9760MGR.
9760MGR sends this request message (set up information) to CM9760, providing the physical number(s) of the configuration(s) that are to be forwarded. The information is sent once CM9760 receives the request.
Type - different type means different setup information.
Data - ****
2 bytes, physical number. Request one configuration whose phy num is ****.
(e.g. 0015, request camera 0015 configuration)
- FFFF ****
4 bytes. **** is the starting physical number of a group. Request one group of configurations whose phy num starts from ****. (e.g. FFFF 0000, request 16 camera configurations whose physical numbers start from 0000 to 0015).

*Abort message

STX (0xA0)	HDR17	Sub-header (0x05)	FmNode (9999)	ToNode (2 bytes)	Type (1 byte)	F0 (1 byte)	ETX (0xAF)	CRC (1 byte)

Type - different type means different setup information. 00 means abort all setup information communications.

*Receiving message

STX (0xA0)	HDR17	Sub-header (0x05)	FmNode (2 bytes)	ToNode (9999)	Type (1 byte)	Subtype (1 byte)	Data	ETX (0xAF)	CRC (1 byte)

This is the message sent from CM9760 to 9760MGR.

There are two formats: - carrying communication control information
- sending corresponding setup configuration

Type - different type means different setup configuration.
Subtype - One type consists of different subtypes. (e.g. There are 2 subtypes in camera type)
Data - Communication control messages (SubType 01)
(01) FFFF, TotalNum (2 bytes), ThisGroupNum (1 byte), 01, StartPhyNum (2 bytes)
- This message tells 9760MGR the total number of configurations to send (e.g. 23 cameras), how many configurations are in this group (e.g. 16 cameras) and the starting physical number of the group (e.g. 0000).

(01) FFFF, TotalNum (2 bytes), ThisGroupNum (1 byte), 00, EndPhyNum (2 bytes)

- This message tells 9760MGR that sending is complete –the last physical number sent is used to guide CM9760 in sending the next group of requested configurations.

- Setup configuration messages (SubType 01 & SubType 02)
  See below information for details

B.5.1 Monitor Setup Message (Type 0x01)

To receive a monitor setup configuration, subtype 0x01 is required.

Message: HDR17, 0x05, FmNode, ToNode, 0x01, 0x01, Pmon, Lmon, MonID, MonAccess, Devtype, GPI, PortAddr, StartCam, Frame3170, Amp3170, TieNode, TieNum.

Pmon - two bytes in BCD format representing the physical monitor number.
Lmon - two bytes in BCD format representing a new logical monitor number.
MonID - 24 bytes for new monitor ident in ASCII format.
MonAccess - 14 bytes of keyboard access (see below table to define the access).

Byte	Bit 7 6 5 4 3 2 1 0
1	x 7 6 5 4 3 2 1
2	x 15 14 13 12 11 10 9
3	x 23 22 21 20 19 18 17
4	x 31 30 29 28 27 26 25
5	x 39 38 37 36 35 34 33
6	x 47 46 45 44 43 42 41
7	x 55 54 53 52 51 50 49
8	x 63 62 61 60 59 58 57
9	x 71 70 69 68 67 66 65
10	x 79 78 77 76 75 74 73
11	x 87 86 85 84 83 82 81
12	x 95 94 93 92 91 90 89
13	x 56 48 40 32 24 16 8
14	x x x 96 89 80 72 64

The 14 bytes of monitor access for the 96 keyboards (1-96) are arranged as bit patterns. Bit 7 of each byte is always 0. When a bit corresponds with a keyboard number, that keyboard has direct access to the Pmon monitor. The arrangement (14 bytes of monitor access) is the same as described above.

Devtype - one byte to define equipment attached to Pmon is. 0x00 for monitor, 0x01 for VCR., 0x02 for MUX
GPI - two bytes in BCD format representing the GPI logical number that is use for associating to the VCR when Devtype is set to be VCR
PortAddr - one byte representing the address is used for associating with MUX when Devtype is set to be MUX.
StartCam - two bytes in BCD format representing the start-up camera for each monitor.
Frame3170 - one byte in BCD format representing the frame number of the 3170 concealed text decoder (if number is greater than or equal to 95, the 3170 decoder is not attached to the monitor).
Amp3170 - one byte in BCD format representing the amplifier address of the 3170 concealed text decoder (valid range is 1-16).

TieNode - two bytes in BCD format representing the node number where the tie line is connected.
TieNum - two bytes in BCD format representing the input number to which the tie line is connected.

B.5.2 Camera Setup Messages (Type 0x02)

To receive one camera setup configuration, there need two messages of subtype 0x01 and 0x02. Subtypes 0x01 and 0x02 are needed for receiving the camera setup configuration.

B.5.2.1 Camera Message1 (SubType 0x01)

Message : HDR17, 0x05, FmNode, ToNode, 0x02, 0x01, Pcam, Lcam, CamID, CamAccess

Pcam - two bytes in BCD format representing the physical camera number.
Lcam - two bytes in BCD format representing a new logical camera number.
CamID - 24 bytes of new camera ident in ASCII format.
CamAccess - 14 bytes representing the operator access.

The 14 bytes of camera access for the 96 operators (1-96) are presented in bit patterns. The arrangement is similar to that of monitor access but the number inside the table is used to represent the operator number (rather than keyboard number). When the corresponding bit is set, that operator will be allowed to control camera (Pcam).

B.5.2.2 Camera Message2 (SubType 0x02)

Message : HDR17, 0x05, FmNode, ToNode, 0x02, 0x02, Pcam, Port, CAddr, Aux, GPI, Alarm, Devtype, Rev, AltCam (2 bytes x 10).

Pcam - two bytes in BCD format representing the physical camera number.
Port - one bytes in BCD format representing the camera decoder port number (valid from 1 to 36).
CAddr - one byte in hex. format representing the camera address (valid from 1 to 128). Port & CAddr are 0x00 for defining a fixed camera.
Aux - two bytes representing camera auxiliary status used to define operation mode for each auxiliary relay. The operation mode can be set to be momentary or toggle.

	bit 7							bit 0
first byte:	0	0	0	0	Aux 8	Aux 7	Aux 6	Aux 5

	bit 7							bit 0
second byte:	0	0	0	0	Aux 4	Aux 3	Aux 2	Aux 1

If corresponding bit is set/clear, than corresponding auxiliary relay is defined to operate in toggle/momentary mode.

GPI - two bytes in BCD format representing the logical GPI that the camera auxiliary relays are directed to.
Alarm - two bytes in BCD format representing the video loss alarm.
Devtype - one byte to define equipment connected to Pcam. 0x00 for camera, 0x01 for VCR, 0x02 for MUX.
Rev - one byte to reverse camera control function

0	0	0	0	0	Focus	Iris	Zoom

If corresponding bit is set, this camera control function will be reversed (e.g. camera will zoom out when the zoom in key is pressed).

AltCam - maximum of 10 alternate cameras can be defined. Each alternate camera occupy two bytes in BCD format (high byte first and low byte second).

B.5.3 Alarm Setup Messages (Type 0x03)

To receive one alarm setup configuration, there need two messages of subtype 0x01 and 0x02. Subtypes 0x01 and 0x02 are required for the reception of an alarm setup configuration

B.5.3.1 Alarm Message1 (Subtype 0x01)

Message: HDR17, 0x05, FmNode, ToNode, 0x03, 0x01, Palm, Lalm, AlmID, AlmAccess

Palm - two bytes in BCD format representing the physical alarm number.
Lalm - two bytes in BCD format representing a new logical alarm number.
AlmID - 24 bytes representing the alarm ident in ASCII format.
AlmAccess - 14 bytes representing the operator access to control an alarm.

B.5.3.2 Alarm Message 2 (Subtype 0x02)

Message: HDR17, 0x05, FmNode, ToNode, 0x03, 0x02, Palm, ACam/Pst (3 bytes x 5), Mac, Dwell, AutoReset, MonGrp

Palm - two bytes in BCD format representing the physical alarm number.
ACam/Pst - maximum of 5 alarm cameras & presets. Each ACam/Pst consists of three bytes. The first and second bytes are the alarm camera number in BCD format. The third byte is the preset position in BCD format.
Mac - two bytes in BCD format representing the logical alarm trigger macro number.
Dwell - two bytes in BCD format representing the dwell for alarm (unit is in second).
AutoReset - two bytes in BCD format representing the value for auto reset timer, if AutoReset is 0, auto reset is disabled.
MonGrp - one byte in BCD format for setting up the group of monitors to be used by the camera for this alarm.

B.5.4 Macro Setup Messages (Type 0x04)

Macro setup messages are different from other messages, as unlike with group receiving, Data is received one macro at a time. So the request message only contains one physical number (not the starting physical number of a group). The message number for a macro setup configuration depends on the number of macro steps (e.g. If there are 37 macro steps in the macro, 7 messages -subtype 0x01 and 0x02 are needed to receive this macro). They are:

1) control message (subtype 01), carrying macro steps number, this physical number…
2) data message (subtype 01), carrying PhyNum, LogNum…
3) data message (subtype 02), carrying macro step1 to 10
4) data message (subtype 02), carrying macro step11 to 20
5) data message (subtype 02), carrying macro step21 to 30
6) data message (subtype 02), carrying macro step31 to 37
7) control message (subtype 01), carrying macro steps number, next physical number…

B.5.4.1 Macro Message 1 (Subtype 0x01)

Communication control messages:

(01) FFFF, TotalMacroNum (2 bytes), ThisMacroStepsNum (2 byte), 01, ThisPhyNum (2 bytes)

- This message is sent before sending data messages. It tells 9760MGR the total number of macros to be received (e.g. 76 macros), the number of macro steps in this macro (e.g. 41 steps), and the macro physical number (e.g. macro 5).

(01) FFFF, TotalMacroNum (2 bytes), ThisMacroStepsNum (2 byte), 00, NextPhyNum(2 bytes)

- This message is sent after the data messages. It tells 9760MGR the total number of macros to receive (e.g. 76), how many macro steps in this macro (e.g. 41), and the next macro physical number (e.g. macro 6). If this is the last macro CM9760 has sent, NextPhtNum is set to 9999.

Data messages:

HDR17, 0x05, FmNode, ToNode, 0x04, 0x01, Pmac, Lmac, MacAccess

Pmac - two bytes in BCD format representing the physical macro number.
Lmac - two bytes in BCD format representing a new logical macro number.
MacAccess - 14 bytes representing the operator access to the macro.

B.5.4.2 Macro Message 2 (Subtype 0x02)

HDR17, 0x05, FmNode, ToNode, 0x04, 0x02, Pmac, StepNum, ComParam[50]

Each message2 can carry a maximum of 10 macro steps. As there are a maximum of 130 steps in a macro, up to 13 message2s are required to receive a macro.

Pmac - two bytes in BCD format representing the physical macro number.
StepNum - one byte in BCD format, 0x00 means steps 1 to 10 are carried in ComParam, 0x01 means steps 11 to 20, 0x03 means step 21 to 30 etc. (For e.g. if 0 is selected, step 1 is the first five bytes of ComParam, step 2 is the second five bytes of ComParam etc.)
ComParam - fifty bytes in BCD format, there needs to be 5 bytes of data for each macro step, so a maximum of 10 macro steps can be carried in a message.

B.5.4.3 How a Macro Step is Packed into Five Bytes of Data

A macro step stores the command and its parameters in four bytes of data (b0, b1, b2, b3).

A macro command is stored in byte b0 as shown in the lookup table below.

SWT 0;	AUX 1;	PRS 2;	MUP 3;	MDW 4;	ARM 5;
DAR 6;	GPI 7;	TIM 8;	DWL 9;	RDW 10;	SMC 11;
CMC 12;	RPR 13;	MVL 14;	MVR 15;	STP 16;	LOP 17;
END 18;	SPM 19;	GTO 20;	CSN 21;	COM 22;	DAT 23;
DOW 24;	COC 25;	MSG 26;	?SW 27;	?GP 28;	CCO 29;
SNT 30;	RCG 31;	DAK 32;	AAK 33;	ARR 34;	DRR 35;
SPS 36;	TOR 37;	TPR 38;	RAK 39;	GPM 40;	KOF 41;
PMS 42;	CLG 43;	DGO 44;	AAG 45;	DAG 46;	RAM 47;
?AT 48;	CSM 49;	MPT 50;	SPT 51;	?AX 52;	MID 53;
ROP 54;	SLM 55;	DSM 56;			

Command parameters are stored in bytes b1, b2 and b3.

Byte conversion:

Store first seven bits (0-6) of b0 into ByteA.
Store first seven bits (0-6) of b1 into ByteB.
Store first seven bits (0-6) of b2 into ByteC.

Store first seven bits (0-6) of b3 into ByteD.
Store bit 7 of b0 as bit 0 of ByteE.
Store bit 7 of b1 as bit 1 of ByteE.
Store bit 7 of b2 as bit 2 of ByteE.
Store bit 7 of b3 as bit 3 of ByteE.

ByteE	ByteD	ByteC	ByteB	ByteA
bit0..3	Bit0..6	bit0..6	bit0..6	bit0..6

The above are five bytes of data sent from the 9760MGR unit. The CM9760 system will decode them to the corresponding macro step command and its parameters.

e.g. step SWT mon5 cam400 - switch camera 400 to monitor 5

Values stored in:	b3	b2	b1	b0
	01	90	05	00

b0:	00 = 0000 0000	SWT
b1:	05 = 0000 0101	monitor 05
b3 b2:	0190 = 0000 0001 1001 0000	camera 400

After conversion as described in above:

ByteE	ByteD	ByteC	ByteB	ByteA
04	01	10	05	00

B.5.5 GPI Setup Message (Type 0x05)

To receive a gpi setup configuration, there is only one message needed with subtype 0x01.
Only one message, with the subtype 0x01, is needed to receive a gpi setup configuration.

Message : HDR17, 0x05, FmNode, ToNode, 0x05, 0x01, Pgpi, Lgpi, GStatus, GPIAccess

Pgpi - two bytes in BCD format of physical gpi number.
Lgpi - two bytes in BCD format of new logical gpi number.
GStatus - two bytes representing GPI status used to define operation mode for each auxiliary relay. The operation mode can be set to be momentary or toggle.

	bit 7							bit 0
first byte:	0	0	0	0	Aux 8	Aux 7	Aux 6	Aux 5

	bit 7							bit 0
second byte:	0	0	0	0	Aux 4	Aux 3	Aux 2	Aux 1

If corresponding bit is set/clear, than corresponding auxiliary relay is defined to operate in toggle/momentary mode.
GPIAccess - 14 bytes of GPI access for operator.

B.5.6 Comms Setup Message (Type 0x06)

To receive a comms setup configuration, there need two messages of subtype 0x01 and 0x02.
For a comms message to be received, two messages (subtype 0x01 and 0x02) are needed.

The comms set-up configuration message (SubType 01) can be altered to the form described bellow if port expander is defined in CM9760 system.
The modified message will be:
HDR17, 0x06, FmNode, ToNode, 0x06, 0x01, FFFF, TotalNum(2 bytes), ThisGroupNum(1 byte), 01, StartPhyNum(2 bytes), PortExpander(1 byte)

B.5.6.1 Comms Message 1 (subtype 0x01)

Message : HDR17, 0x05, FmNode, ToNode, 0x06, 0x01, Port, Equip, Baud, Type, KeyBoard, Priority, StartMac, EndMac, Am10, Amod1, Am20, Amod2.

Port - two bytes in BCD format of physical port number.
Equip - two bytes in BCD format of equipment number.
Baud - three bytes in BCD format of Baud rate and Parity.
Type - one byte in BCD format of Type.
KeyBoard - two byte in BCD format of keyboard number.
Priority - one byte in BCD format of priority number.
StartMac - two bytes in BCD format of starting macro number.
EndMac - two bytes in BCD format of end macro number.
Am 10 - 10 bytes in BCD format of alarm monitor for alarm monitor1 to alarm monitor 10.
Amod1 - one byte in BCD format of alarm mode for alarm monitor 1 to 10.
Am 20 - 10 bytes in BCD format of alarm monitor for alarm monitor2 to alarm monitor 20.
Amod2 - one byte in BCD format of alarm mode for alarm monitor 11 to 20.

B.5.6.2 Comms Message 2 (subtype 0x02)

Message : HDR17, 0x05, FmNode, ToNode, 0x06, 0x02, Port, Am30, Amod3, Am40, Amod4, Am50, Amod5.
Port - two bytes in BCD format of physical port number.
Am 30 - 10 bytes in BCD format of alarm monitor for alarm monitor 21 to alarm monitor 30.
Amod3 - one byte in BCD format of alarm mode for alarm monitor 21 to 30.
Am 40 - 10 bytes in BCD format of alarm monitor for alarm monitor 31 to alarm monitor 40.
Amod4 - one byte in BCD format of alarm mode for alarm monitor 31 to 40.
Am 50 - 10 bytes in BCD format of alarm monitor for alarm monitor 41 to alarm monitor 50.
Amod5 - one byte in BCD format of alarm mode for alarm monitor 41 to 50.

B.5.7 System Setup Message (Type 0x07)

To receive one system setup configuration, there need seven messages of subtype 0x01, 0x02, 0x03, 0x04, 0x05, 0x06 and 0x07.

Seven messages (subtypes 0x01–0x04 and 0x05-0x07) are needed to receive a system setup configuration.

B.5.7.1 System Message 1(subtype 0x01)

Message : HDR17, 0x05, FmNode, ToNode, 0x07, 0x01, CamX, CamY, CamAtt0, CamAtt1

CamX - one byte in BCD format for horizontal starting position of camera ident.
CamY - one byte in BCD format for vertical starting position of camera ident.
CamAtt0 - first camera ident attribute.
CamAtt1 - second camera ident attribute.

(see matrix protocol for definition of CamAtt0 and CamAtt1)

B.5.7.2 Change Monitor Attribute in Matrix (subtype 0x02)

This message is used to change the monitor attribute. The message format is exactly the same as that of the camera attribute message.

Message : HDR17, 0x05, FmNode, ToNode, 0x07, 0x02, MonX, MonY, MonAtt0, MonAtt1

B.5.7.3 Change Alarm/Special Attribute in Matrix (subtype 0x03)

This message is used to change the alarm/special attribute. The message format is exactly the same as for the camera attribute message.

Message : HDR17, 0x05, FmNode, ToNode, 0x07, 0x03, AlmX, AlmY, AlmAtt0, AlmAtt1

B.5.7.4 Change PTZ Attribute in Matrix (subtype 04ex)

This message is used to change the PTZ attribute. The message format is exactly the same as for the camera attribute message.

Message : HDR17, 0x05, FmNode, ToNode, 0x07, 0x04, PtzX, PtzY, PtzAtt0, PtzAtt1

B.5.7.5 Change Time & Date Attribute in Matrix (subtype 0x05)

This message is used to change the time & date attribute and the time display format. The message format is similar to that of the camera attribute message, but an extra time format byte is added to the end of the message.

Message : HDR17, 0x05, FmNode, ToNode, 0x07, 0x05, TDX, TDY, TDAtt0, TDAtt1, TDformat

TDformat - one byte in BCD format

T&D format	Format
0	01/07/98 00:00
1	07/01/98 00:00
2	01/07/98 12:00 AM
3	07/01/98 12:00 AM
4	01 Jul 98 00:00
5	01 Jul 98 12:00 AM
6	01st July 00:00
7	July 01st 00:00
8	Tue 01st Jul 98 00:00
9	Tue 01st Jul 98 12:00 AM

B.5.7.6 Change System Option (subtype 0x06)

This message can enable the system options (e.g. printer, display system error on screen), setting video loss parameter and GPI definition.

Message: HDR17, 0x05, FmNode, ToNode, 0x07, 0x06, MiscOpt, PrintOpt, P2013, VLoss, Vmon, CamRel

MiscOpt - one byte in bit pattern to enable some options. When corresponding bit is set, this function will be enabled.

0	HLAck	Print Opr Num	Alarm to Net	Auto Override	System error on	Diagnostic on	Printer on

PrintOpt - one byte in bit pattern to print options. When corresponding bit is set, this event will be printed.

0	Macro message	Video loss	Operator Log on	GPI Control	System error	Alarm	Camera assign

P2013 - one byte to define parallel/serial of 2013.
Vloss - one byte for video loss mode define 1=alarm, 2=video.
VMon - two bytes in BCD format representing the monitor number on which a video loss message will be displayed. This is a specified logical monitor number - from 1 to 99. The number 9998 specify an alarm monitor while number 9999 specify a current operator's monitor where video loss message will be displayed.
CamRel - two bytes in BCD format of camera release.

B.5.7.7 Change Alarm Mode (subtype 0x07)

This message is used to define the alarm mode, dwell for the alarm mode 3/4 and the end macro for resetting the last system alarm.

Message : HDR17, 0x05, FmNode, ToNode, 0x07, 0x07, AlmMode, M3/4Dwell, AlmMac

AlmMode - one byte in BCD format to define alarm mode.
M3/4Dwell - two bytes in BCD format to define dwell for alarm mode 3 and 4.
AlmMac - two bytes in BCD format to define macro for resetting last system alarm.

B.5.8 Operator Setup Message (Type 0x08)

To receive one operator setup configuration, there is only one message needed with subtype 0x01. For an operator setup configuration to be received a message with the subtype 0x01 is needed.

Message : HDR17, 0x05, FmNode, ToNode, 0x08, 0x01, Idx, Opr, Pin, Prty, StartMac

Idx - two bytes in BCD format for index number (physical number). Used for communication. E.g. System has operator 1, 2, 4, 18, 94 so their index numbers are 1, 2, 3, 4, 5.
Opr - two bytes in BCD format for operators number (1 to 96).
Pin - two bytes in BCD format pin number (100-9999).
Prty - two bytes in BCD format for operator priority (0 - 9999)
StartMac - two bytes in BCD format for starting macro number after the operator logs on.

B.5.9 Mimic Setup Message(Type 0x09)

Not implemented in CM9760.

B.5.10 Message Setup (Type 0x0A)

To receive one message setup configuration, there needs only one message of subtype 0x01. One message (subtype 0x01) is needed to receive the message setup configuration.

Message : HDR17, 0x05, FmNode, ToNode, 0x0A, 0x01, MsgNum, PrintPin, Msg

MsgNum - two bytes in BCD format for message number (start from 0).
PrintPin - one byte to enable print pin number to printer (0x00 disable, 0x01 enable).
Msg - 24 bytes of message in ASCII.

B.5.11 Link Camera Setup Message (Type 0x0B)

To receive one link camera setup configuration, there need two messages of subtype 0x01 and 0x02. Two messages (subtypes 0x01 and 0x02) are required to receive a link camera configuration.

B.5.11.1 Link Camera Message 1 (subtype 0x01)

Message : HDR17, 0x05, FmNode, ToNode, 0x0B, 0x01, Pcam, Lcam, CamID, CamAccess, Port, CAddr, Aux

Pcam - two bytes in BCD format of physical camera number.
Lcam - two bytes in BCD format of new logical camera number.
CamID - 24 bytes of new camera ident in ASCII format.
CamAccess - 14 bytes of operator access -for 96 operators (1-96) presented in a bit pattern. (The arrangement is similar to that of monitor access but the number inside the table is used to present the operator number rather than keyboard number. When the corresponding bit is set, that operator will have access directly to the camera Pcam.)
Port - one byte in BCD format of the camera decoder port number (valid from 1 to 36).
CAddr - one byte in hex. format of camera address (valid from 1 to 128). Port & CAddr are 0x00 for defining a fixed camera.
Aux - two bytes representing camera auxiliary status used to define operation mode for each auxiliary relay. The operation mode can be set to be momentary or toggle.

	bit 7							bit 0
first byte:	0	0	0	0	Aux 8	Aux 7	Aux 6	Aux 5

	bit 7							bit 0
second byte:	0	0	0	0	Aux 4	Aux 3	Aux 2	Aux 1

If corresponding bit is set/clear, than corresponding auxiliary relay is defined to operate in toggle/momentary mode.

B.5.11.2 Link Camera Message 2 (sub type 0x02)

Message : HDR17, 0x05, FmNode, ToNode, 0x0B, 0x02, Pcam, GPI, Alarm, Devtype, Rev, AltCam (2 bytes x 10), UniqueID (20 bytes).

Pcam - two bytes in BCD format of physical camera number.
GPI - two bytes in BCD format of logical GPI (for the) to which the camera auxiliary relays are redirected.
Alarm - two bytes in BCD format of video loss alarm.
Devtype - one byte to define what Pcam is. 0x00 for camera, 0x01 for VCR, 0x02 for MUX.
Rev - one byte to reverse camera control function

0	0	0	0	0	Focus	Iris	Zoom

If the corresponding bit is set, the camera control function will be reversed (e.g. camera will zoom out when the zoom in key is pressed on the keyboard).
AltCam - maximum of 10 alternate cameras can be defined. Each alternate camera is two bytes

in BCD format with high byte first and low byte second.
UniqueID - 20 bytes of unique ident in ASCII format

B.5.12 3170 Ident Setup Message (Type 0x0C)

To receive one 3170 ident setup configuration, there needs one message of subtype 0x01. For a 3170 ident setup configuration to be received, a message with the subtype 0x01 is needed.

Message : HDR17, 0x05, FmNode, ToNode, 0x0C, 0x01, PhyNum, Frame, Amp, ID

PhyNum - two bytes in BCD format of physical number starting from 0.
Frame - two bytes in BCD format of frame address (valid from 0 to 9999).
Amp - one byte in BCD format of amplifier address (valid from 1 to 16).
ID - 16 bytes ident in ASCII format.

B.6 9760MGR Sends System Setup Files to CM9760 (sub-header: 0x06)

This sub-header is used to send setup files to CM9760.
Setup files include: monitor, camera, alarm, macro, gpi, comms, system, operator, message, link camera, vamp. The information is sent to CM9760 in forms of messages.

Once 9760MGR receives an 'Acknowledgment and Request information', in response to its notification of intended transmission, it will start sending the setup file information (usually 16 configurations) to CM9760. CM9760 will continue to request the setup configurations until the entire file has been sent. CM9760 will continuously check the information and request any information which is missing to be re-sent (error checking). Once all of the information has been transmitted, 9760MGR will receive a "received all" message, to which it will reply with a "restart" message. If the operator chooses to abort the operation, 9760MGR will send an 'abort' message and cease transmission.

Six message formats are included in this protocol: notice, acknowledgement and request, sending, abort, receive all and restart.

*Notice message

STX (0xA0)	HDR17	Sub-header (0x06)	FmNode (9999)	ToNode (2 bytes)	Type (1 byte)	FF	ETX (0xAF)	CRC (1 byte)

This is the message that 9760MGR sends to inform CM9760 that it intends to start sending the setup information.

Type - descriptor for message and its function.

*Acknowledgment & Request message

STX (0xA0)	HDR17	Sub-header (0x06)	FmNode (2 bytes)	ToNode (9999)	Type (1 byte)	Data	ETX (0xAF)	CRC (1 byte)

This is the message that CM9760 sends to 9760MGR when it is ready to begin receiving the information. Included in this message are the physical number(s) and configuration(s) that 9760MGR should send. After 9760MGR receives this message, it will start sending the setup information.

Data - two bytes format – represents requested physical number (e.g. 0015, request camera 0015 configuration)

- four bytes format (FFFF xxxx) – represents starting physical number for requested group (e.g. FFFF 0000, ready to receive 16 camera configurations with physical numbers starting from 0000 to 0015).

*Sending message

STX (0xA0)	HDR17	Sub-header (0x06)	FmNode (9999)	ToNode (2 bytes)	Type (1 byte)	Subtype (1 byte)	Data	ETX (0xAF)	CRC (1 byte)

This is the message 9760MGR sends CM9760. There are two formats, carrying communication control information, and sending corresponding setup configuration.
Type - different type means different setup information.
Subtype - One type consists of different subtypes. (e.g., There are 2 subtypes in camera type)
Data - Communication control messages (SubType 01)
(01) FFFF, TotalNum (2 bytes), ThisGroupNum (1 byte), 01, StartPhyNum (2 bytes)
- This message is sent before the groups of configurations are sent. It tells CM9760 the total number of configurations to be sent (e.g. 23 cameras), how many configurations in this group (e.g. 16 cameras), and the starting physical number of the group(e.g. 0000).

(01) FFFF, TotalNum (2 bytes), ThisGroupNum (1 byte), 00, EndPhyNum (2 bytes)
- This message is sent after the groups of configurations are sent. It tells CM9760 that the sending of this group has finished. EndPhyNum tells CM9760 the last physical number that was sent, which CM9760 uses to send an Acknowledgment & Request message and to ask 9760MGR for the next group of configurations.

- Setup information messages (SubType 01 & SubType 02)
See below information for details

*Abort message

STX (0xA0)	HDR17	Sub-header (0x06)	FmNode (9999)	ToNode (2 bytes)	Type (1 byte)	F0	ETX (0xAF)	CRC (1 byte)

This is the message 9760MGR sends CM9760 to indicate that sending is aborted.
Type - different type means different setup information. 00 means sending of all selected setup information is aborted.

*Receive all message

STX (0xA0)	HDR17	Sub-header (0x06)	FmNode (2 bytes)	ToNode (9999)	Type (1 byte)	FFFF	9999	ETX (0xAF)	CRC (1 byte)

This is the message CM9760 sends to inform 9760MGR that all setup information of type “Type” has been received.
Type - different type means different setup information.

*Restart message

STX (0xA0)	HDR17	Sub-header (0x06)	FmNode (9999)	ToNode (2 bytes)	F5 (1 byte)	FA	ETX (0xAF)	CRC (1 byte)

This is the message 9760MGR sends to inform CM9760 that it can restart now. If the message is “Hdr17 06 9999 ToNode 0C FA”, this means CM9760 has received video amplifier information.

B.6.1 Monitor Setup Message (Type 0x01)

To send a monitor setup configuration a message of subtype 0x01 needs to be received.

Message: HDR17, 0x06, FmNode, ToNode, 0x01, 0x01, Pmon, Lmon, MonID, MonAccess, Devtype, GPI, PortAddr, StartCam, Frame3170, Amp3170, TieNode, TieNum.

Pmon - two bytes in BCD format of physical monitor number.
Lmon - two bytes in BCD format of new logical monitor number.
MonID - 24 bytes of new monitor ident in ASCII format.
MonAccess - 14 bytes of keyboard access (see below table to define the access).

Byte	Bit 7 6 5 4 3 2 1 0
1	x 7 6 5 4 3 2 1
2	x 15 14 13 12 11 10 9
3	x 23 22 21 20 19 18 17
4	x 31 30 29 28 27 26 25
5	x 39 38 37 36 35 34 33
6	x 47 46 45 44 43 42 41
7	x 55 54 53 52 51 50 49
8	x 63 62 61 60 59 58 57
9	x 71 70 69 68 67 66 65
10	x 79 78 77 76 75 74 73
11	x 87 86 85 84 83 82 81
12	x 95 94 93 92 91 90 89
13	x 56 48 40 32 24 16 8
14	x x x 96 89 80 72 64

The 14 bytes of monitor access for the 96 keyboards (1-96) are represented by a bit pattern. The bit 7 of each byte is always 0. When the corresponding bit is set, that keyboard will have access directly to the monitor Pmon. The arrangement of 14 bytes of monitor access is exactly the same as the previous message from CM9760 to NIU.

Devtype - one byte to define what Pmon is. 0x00 for monitor, 0x01 for VCR., 0x02 for MUX
GPI - two bytes BCD format of GPI logical number is used for associating to VCR when Devtype is set to be VCR
PortAddr - one byte of address is used for associating to MUX when Devtype is set to be MUX.
StartCam - two bytes in BCD format to setup the starting camera of each monitor after CM9760 has been booted up.
Frame3170 - one byte in BCD format to setup the frame number of 3170 concealed text decoder (if number is greater than or equal to 95, there is no 3170 decoder attached to the monitor).
Amp3170 - one byte in BCD format to setup the amplifier address of 3170 concealed text decoder (valid range is 1-16).
TieNode - two bytes in BCD format for setup tie to node.
TieNum - two bytes in BCD format for setup tie input.

B.6.2 Camera Setup Messages (Type 0x02)

To send one camera setup configuration, there are two messages needed of subtype 0x01 and 0x02.two messages (subtypes 0x01 and 0x02) are required to send a camera setup configuration.

B.6.2.1 Camera Message1 (SubType 0x01)

Message : HDR17, 0x06, FmNode, ToNode, 0x02, 0x01, Pcam, Lcam, CamID, CamAccess

Pcam - two bytes in BCD format of physical camera number.
Lcam - two bytes in BCD format of new logical camera number.
CamID - 24 bytes of new camera ident in ASCII format.
CamAccess - 14 bytes of operator access. The 14 bytes of camera access for the 96 operators (1-96) are represented by a bit pattern. The arrangement is similar to the monitor access but the number inside table is used to represent the operator number rather than keyboard number. When the corresponding bit is set, that operator will have direct access to the camera Pcam.

B.6.2.2 Camera Message2 (SubType 0x02)

Message : HDR17, 0x06, FmNode, ToNode, 0x02, 0x02, Pcam, Port, CAddr, Aux, GPI, Alarm, Devtype, Rev, AltCam (2 bytes x 10).

Pcam - two bytes in BCD format of physical camera number.
Port - one bytes in BCD format of the camera decoder port number (valid from 1 to 36).
CAddr - one byte in hex. format of camera address (valid from 1 to 128). Port & CAddr are 0x00 for defining a fixed camera.
Aux - two bytes representing camera auxiliary status used to define operation mode for each auxiliary relay. The operation mode can be set to be momentary or toggle.

	bit 7							bit 0
first byte:	0	0	0	0	Aux 8	Aux 7	Aux 6	Aux 5

	bit 7							bit 0
second byte:	0	0	0	0	Aux 4	Aux 3	Aux 2	Aux 1

If corresponding bit is set/clear, than corresponding auxiliary relay is defined to operate in toggle/momentary mode.

GPI - two bytes in BCD format representing logical GPI number to where the camera auxiliary control is redirected.
Alarm - two bytes in BCD format of video loss alarm.
Devtype - one byte to define what Pcam is. 0x00 for camera, 0x01 for VCR, 0x02 for MUX.
Rev - one byte to reverse the camera control function

0	0	0	0	0	Focus	Iris	Zoom

If corresponding bit is set, this camera control function will be reversed (e.g. camera will zoom out when the zoom in key is pressed on keyboard [Rev is 0x01]).

AltCam - maximum of 10 alternate cameras can be defined. Each alternate camera is two bytes in BCD format with the high byte first and the low byte second.

B.6.3 Alarm Setup Messages (Type 0x03)

To send one alarm setup information, there need two messages of subtype 0x01 and 0x02. To send alarm setup information two messages (subtype 0x01 and 0x02) are required.

B.6.3.1 Alarm Message1 (Subtype 0x01)

Message : HDR17, 0x06, FmNode, ToNode, 0x03, 0x01, Palm, Lalm, AlmID, AlmAccess

Palm - two bytes in BCD format of physical alarm number.

Lalm - two bytes in BCD format of new logical alarm number.
AlmID - 24 bytes of alarm ident in ASCII format.
AlmAccess - 14 bytes of alarm access for operator.

B.6.3.2 Alarm Message 2 (Subtype 0x02)

Message : HDR17, 0x06, FmNode, ToNode, 0x03, 0x02, Palm, ACam/Pst (3 bytes x 5), Mac, Dwell, AutoReset, MonGrp

Palm - two bytes in BCD format of physical alarm number.
ACam/Pst - maximum of 5 alarm cameras & presets. Each ACam/Pst consists of three bytes. The first and second bytes are the alarm camera numbers in BCD format. The third byte is the preset position in BCD format.
Mac - two bytes in BCD format of logical alarm trigger macro number.
Dwell - two bytes in BCD format of dwell for alarm (unit is in second).
AutoReset - two bytes in BCD format for auto reset timer, if AutoReset = 0, auto reset is disabled.
MonGrp - one byte in BCD format for setting up the group of monitors to be used for switching the camera for this alarm.????????????

B.6.4 Macro Setup Messages (Type 0x04)

Macro setup messages are different from other messages. Unlike with group sending, Data is sent one macro at a time. So the acknowledgment & request message only contains one physical number, not the starting physical number of a group. The message number for the macro setup configuration depends on the number of macro steps. E.g. If there are 37 macro steps in the macro, there needs to be 7 messages with subtype 0x01 and 0x02 to send this macro. These messages are:

1) control message (subtype 01), carrying macro step number, this physical number…
2) data message (subtype 01), carrying PhyNum, LogNum…
3) data message (subtype 02), carrying macro step 1 to 10
4) data message (subtype 02), carrying macro step 11 to 20
5) data message (subtype 02), carrying macro step 21 to 30
6) data message (subtype 02), carrying macro step 31 to 37
7) control message (subtype 01), carrying macro steps number, next physical number…

B.6.4.1 Macro Message 1 (Subtype 0x01)

Communication control messages:

(01) FFFF, TotalMacroNum (2 bytes), ThisMacroStepsNum (2 byte), 01, ThisPhyNum (2 bytes)

- This message is sent prior to the data. It tells CM9760 the total number of macros to send (e.g. 76 macros), how many macro steps (e.g. 41 steps), and the macro physical number (e.g. macro 5).

(01) FFFF, TotalMacroNum (2 bytes), ThisMacroStepsNum (2 byte), 00, NextPhyNum (2 bytes)

- This message is sent after the data message. It tells CM9760 the total number of macros to send (e.g. 76 macros), number of macro steps (e.g. 41 steps), and the next physical number(e.g. macro 6). If this is the last macro 9760MGR has sent, NextPhtNum is set to 9999.

Data messages:

HDR17, 0x06, FmNode, ToNode, 0x04, 0x01, Pmac, Lmac, MacAccess
Pmac - two bytes in BCD format representing physical macro number.
Lmac - two bytes in BCD format representing new logical macro number.

MacAccess - 14 bytes representing operator access for this macro.

B.6.4.2 Macro Message 2 (Subtype 0x02)

HDR17, 0x06, FmNode, ToNode, 0x04, 0x02, Pmac, StepNum, ComParam[50]

Each message 2 can carry maximum of 10 macro steps –as there are up to 130 steps in a macro, we need to send up to 13 messages.

Pmac - two bytes in BCD format representing the physical macro number.
StepNum - one byte in BCD format, 0 means steps 1 to 10 are carried in ComParam, 1 means steps 11 to 20, 3 means steps 21 to 30 and etc. E.g. If StepNum = 0 then the first macro step occupies the first five bytes of ComParam, second macro step occupies next five bytes (6 to 10) of ComParam etc.
ComParam - fifty bytes in BCD format. this parameters can hold information for up to 10 steps (five bytes per step).

B.6.4.3 How a Macro Step is Packed into Five Bytes of Data

A macro step stores the command and its parameters in four bytes of data (b0, b1, b2, b3).

A macro command is stored in byte b0 as shown in the lookup table below.

SWT 0;	AUX 1;	PRS 2;	MUP 3;	MDW 4;	ARM 5;
DAR 6;	GPI 7;	TIM 8;	DWL 9;	RDW 10;	SMC 11;
CMC 12;	RPR 13;	MVL 14;	MVR 15;	STP 16;	LOP 17;
END 18;	SPM 19;	GTO 20;	CSN 21;	COM 22;	DAT 23;
DOW 24;	COC 25;	MSG 26;	?SW 27;	?GP 28;	CCO 29;
SNT 30;	RCG 31;	DAK 32;	AAK 33;	ARR 34;	DRR 35;
SPS 36;	TOR 37;	TPR 38;	RAK 39;	GPM 40;	KOF 41;
PMS 42;	CLG 43;	DGO 44;	AAG 45;	DAG 46;	RAM 47;
?AT 48;	CSM 49;	MPT 50;	SPT 51;	?AX 52;	MID 53;
ROP 54;	SLM 55;	DSM 56;			

Command parameters are stored in bytes b1, b2 and b3.

Byte conversion:

Store first seven bits (0-6) of b0 into ByteA.
Store first seven bits (0-6) of b1 into ByteB.
Store first seven bits (0-6) of b2 into ByteC.
Store first seven bits (0-6) of b3 into ByteD.
Store bit 7 of b0 as bit 0 of ByteE.
Store bit 7 of b1 as bit 1 of ByteE.
Store bit 7 of b2 as bit 2 of ByteE.
Store bit 7 of b3 as bit 3 of ByteE.

ByteE	ByteD	ByteC	ByteB	ByteA
bit0..3	Bit0..6	bit0..6	bit0..6	bit0..6

The above are five bytes of data sent from the 9760MGR unit. The CM9760 system will decode them to the corresponding macro step command and its parameters.

e.g. step SWT mon5 cam400 - switch camera 400 to monitor 5
Values stored in: b3 b2 b1 b0

01 90 05 00

b0:	00 = 0000 0000	SWT
b1:	05 = 0000 0101	monitor 05
b3 b2:	0190 = 0000 0001 1001 0000	camera 400

After conversion as described in above:

ByteE	ByteD	ByteC	ByteB	ByteA
04	01	10	05	00

B.6.5 GPI Setup Message (Type 0x05)

To send the GPI setup information, only one message with subtype 0x01 is required for each GPI.

Message : HDR17, 0x06, FmNode, ToNode, 0x05, 0x01, Pgpi, Lgpi, GStatus, GPIAccess

Pgpi - two bytes in BCD format representing the physical GPI number.
Lgpi - two bytes in BCD format representing the new logical GPI number.
GStatus - two bytes representing the GPI status used to define the operation mode for each auxiliary relay. The operation mode can be set to either momentary or toggle.

	bit 7							bit 0
first byte:	0	0	0	0	Aux 8	Aux 7	Aux 6	Aux 5

	bit 7							bit 0
second byte:	0	0	0	0	Aux 4	Aux 3	Aux 2	Aux 1

If the corresponding bit is set/clear, then the corresponding auxiliary relay is defined to operate in toggle/momentary mode.

GPIAccess - 14 bytes representing operator access to GPI control.

B.6.6 Comms Setup Message (Type 0x06)

Two messages are required to send a comms set-up configuration for each port defined in the CM9760 system (messages with subtype function 0x01 and 0x02).

B.6.6.1 Comms Message 1 (subtype 0x01)

Message : HDR17, 0x06, FmNode, ToNode, 0x06, 0x01, Port, Equip, Baud, Type, KeyBoard, Priority, StartMac, EndMac, Am10, Amod1, Am20, Amod2.

Port - two bytes in BCD format representing the physical port number.
Equip - two bytes in BCD format representing the equipment number.
Baud - three bytes in BCD format representing Baud rate and Parity.
Type - one byte in BCD format representing Type.
KeyBoard - two byte in BCD format representing the keyboard number.
Priority - one byte in BCD format representing the priority number.
StartMac - two bytes in BCD format representing the start-up macro number.
EndMac - two bytes in BCD format representing the end macro number.
Am 10 - 10 bytes in BCD format representing the first ten alarm monitor numbers (group 1).
Amod1 - one byte in BCD format representing alarm mode for alarm monitors 1 to 10 (group 1).
Am 20 - 10 bytes in BCD format representing the second ten alarm monitor numbers (group 2).

Amod2 - one byte in BCD format representing alarm mode for alarm monitors 11 to 20 (group 2).

The comms set-up configuration message (SubType 01) can be altered to the form described below if the port expander is defined in the CM9760 system.
The modified message will be:
HDR17, 0x06, FmNode, ToNode, 0x06, 0x01, FFFF, TotalNum(2 bytes), ThisGroupNum(1 byte), 01, StartPhyNum(2 bytes), PortExpander(1 byte)

B.6.6.2 Comms Message 2 (subtype 0x02)

Message : HDR17, 0x06, FmNode, ToNode, 0x06, 0x02, Port, Am30, Amod3, Am40, Amod4, Am50, Amod5.

Port - two bytes in BCD format representing the physical port number.
Am 30 - 10 bytes in BCD format representing the third ten alarm monitor numbers (group 3).
Amod3 - one byte in BCD format representing alarm mode for alarm monitors 21 to 30 (group 3).
Am 40 - 10 bytes in BCD format representing the fourth ten alarm monitor numbers (group 4).
Amod4 - one byte in BCD format representing alarm mode for alarm monitors 31 to 40 (group 4).
Am 50 - 10 bytes in BCD format representing the fifth ten alarm monitor numbers (group 5).
Amod5 - one byte in BCD format representing alarm mode for alarm monitors 41 to 50 (group 5).

B.6.7 System Setup Message (Type 0x07)

To send system setup information, seven messages (subtypes 0x01, 0x02…0x07) are needed. there need seven messages of subtype 0x01, 0x02, 0x03, 0x04, 0x05, 0x06 and 0x07.

B.6.7.1 System Message 1 (subtype 0x01)

Message : HDR17, 0x06, FmNode, ToNode, 0x07, 0x01, CamX, CamY, CamAtt0, CamAtt1

CamX - one byte in BCD format representing the horizontal starting position of camera ident.
CamY - one bytes BCD format for vertical starting position of camera ident.
CamAtt0 - first camera ident attribute.
CamAtt1 - second camera ident attribute.

(see matrix protocol for a definition of CamAtt0 and CamAtt1)

B.6.7.2 Change Monitor Attribute in the Matrix (subtype 0x02)

This message is used to change the monitor attribute. The message format is exactly same as the camera attribute message.

Message : HDR17, 0x06, FmNode, ToNode, 0x07, 0x02, MonX, MonY, MonAtt0, MonAtt1

B.6.7.3 Change Alarm/Special Attribute in the Matrix (subtype 0x03)

This message is used to change the alarm/special attribute. The message format is exactly same as the camera attribute message.

Message : HDR17, 0x06, FmNode, ToNode, 0x07, 0x03, AlmX, AlmY, AlmAtt0, AlmAtt1

B.6.7.4 Change the PTZ Attribute in the Matrix (subtype 04ex)

This message is used to change the PTZ attribute. The message format is exactly same as the camera attribute message.

Message : HDR17, 0x06, FmNode, ToNode, 0x07, 0x04, PtzX, PtzY, PtzAtt0, PtzAtt1

B.6.7.5 Change Time & Date Attribute in the Matrix (subtype 05ex)

This message is used to change the time & date attribute and the time display format. The message format is the same as the camera attribute message but an extra byte, representing the time format, has been added.
Message : HDR17, 0x06, FmNode, ToNode, 0x07, 0x05, TDX, TDY, TDAtt0, TDAtt1, TDformat

TDformat - one byte in BCD format

TDformat	Format
0	01/07/98 00:00
1	07/01/98 00:00
2	01/07/98 12:00 AM
3	07/01/98 12:00 AM
4	01 Jul 98 00:00
5	01 Jul 98 12:00 AM
6	01st July 00:00
7	July 01st 00:00
8	Tue 01st Jul 98 00:00
9	Tue 01st Jul 98 12:00 AM

B.6.7.6 Change System Option (subtype 0x06)

This message activates the system's options (printer, screen error display etc.).
Message: HDR17, 0x06, FmNode, ToNode, 0x07, 0x06, MiscOpt, PrintOpt, P2013, VLoss, Vmon, CamRel

MiscOpt - one byte arranged in a bit pattern to enable the options. When the corresponding bit is set, this function will be enabled.

0	HLAck	Print Opr Num	Alarm to Net	Auto Override	System error on	Diagnostic on	Printer on

PrintOpt - one byte arranged in a bit pattern representing the print option. When the corresponding bit is set, selected event will be printed.

0	Macro message	Video loss	Operator Log on	GPI Control	System error	Alarm	Camera assign

P2013 - one byte to define the parallel/serial(series) what? of program 2013.
Vloss - one byte for the video loss mode. These are defined as 1=alarm, 2=video.
VMon - two bytes in BCD format representing the monitor number on which a video loss message will be displayed. This is a specified logical monitor number - from 1 to 99. The number 9998 specify an alarm monitor while number 9999 specify a current operator's monitor where video loss message will be displayed.
CamRel - two bytes in BCD format representing the camera release.

B.6.7.7 Change Alarm Mode (subtype 0x07)

This message is used to define the alarm mode, the dwell time for the alarm modes 3 and 4 and to define an alarm end macro.

Message : HDR17, 0x06, FmNode, ToNode, 0x07, 0x07 AlmMode, M3/4Dwell, AlmMac

AlmMode - one byte in BCD format to define the alarm mode.
M3/4Dwell - two bytes in BCD format representing the dwell time for alarm modes 3 and 4.
AlmMac - two bytes in BCD format representing the alarm end macro.

B.6.8 Operator Setup Message(Type 0x08)

To send the operator setup configuration, a message (subtype 0x01) is required.
Message : HDR17, 0x06, FmNode, ToNode, 0x08, 0x01, Idx, Opr, Pin, Prty, StartMac

Idx - two bytes in BCD format representing the physical index number that is to be used in the communications (i.e. system operators 1,2,4,18,94 are assigned the index numbers 1,2,3,4,5 respectively).
Opr - two bytes in BCD format representing the operator numbers (1 to 96).
Pin - two bytes in BCD format representing the PIN number (100-9999).
Prty - two bytes in BCD format representing the operator priority (0 - 9999)
StartMac - two bytes in BCD format to represent the start macro number, activated by the operator when logging on.

B.6.9 Mimic Setup Message (Type 0x09)

Not implemented in CM9760.

B.6.10 Message Setup (Type 0x0A)

For the setup configuration message to be sent, a message (subtype 0x01) is needed.

Message : HDR17, 0x06, FmNode, ToNode, 0x0A, 0x01, MsgNum, PrintPin, Msg

MsgNum - two bytes in BCD format representing the message number (starting from 0).
PrintPin - one byte to enable the PIN number to be printed (0x00 to disable; 0x01 to enable).
Msg - 24 bytes of message in ASCII format.

B.6.11 Link Camera Setup Message (Type 0x0B)

For a link camera configuration to be sent, two messages (subtypes 0x01 and 0x02) are needed.

B.6.11.1 Link Camera Message 1 (SubType 0x01)

Message : HDR17, 0x06, FmNode, ToNode, 0x0B, 0x01, Pcam, Lcam, CamID, CamAccess, Port, CAddr, Aux

Pcam - two bytes in BCD format representing the physical camera number.
Lcam - two bytes in BCD format representing the new logical camera number.
CamID - 24 bytes representing the new camera's ident in ASCII format.
CamAccess - 14 bytes representing operator access. This is presented in a bit pattern, and with the exception of the number presented in the table corresponding with the operator rather than the keyboard, the arrangement is the same as that used for monitor access. When the

corresponding bit is set, that operator will have access to the camera. Port - one byte in BCD format representing the camera decoder port number (valid from 1 to 36).

CAddr - one byte in hex. format representing the camera's address (valid from 1 to 128). Port & CAddr are 0x00 for defining a fixed camera. To define a fixed camera -port and CAddr are used.

Aux - two bytes, representing the camera's auxiliary status, are used to define the operational modes for each of the auxiliary relays. The operation mode can be set to either a momentary or a toggle mode.

	bit 7							bit 0
first byte:	0	0	0	0	Aux 8	Aux 7	Aux 6	Aux 5

	bit 7							bit 0
second byte:	0	0	0	0	Aux 4	Aux 3	Aux 2	Aux 1

If the corresponding bit is set/clear, then the corresponding auxiliary relay is defined to operate in toggle/momentary mode.

B.6.12.2 Link camera message2 (SubType 0x02)

Message : HDR17, 0x06, FmNode, ToNode, 0x0B, 0x02, Pcam, , GPI, Alarm, Devtype, Rev, AltCam (2 bytes x 10), UniqueID(20 bytes).

Pcam - two bytes in BCD format representing the physical camera number.

GPI - two bytes in BCD format representing the logical GPI number where camera auxiliary control is redirected.

Alarm - two bytes in BCD format representing the video loss alarm.

Devtype - one byte used to define what the Pcam is (0x00 for camera, 0x01 for VCR, 0x02 for MUX).

Rev - one byte to reverse the camera's control functions

0	0	0	0	0	Focus	Iris	Zoom

The camera control function will perform the reverse functions to those shown on the keyboard (e.g. zoom-out, when zoom-in key is pressed) when the corresponding bit is set.

AltCam - allows for a maximum of 10 alternate cameras to be defined. Each alternate camera's number occupy two bytes (in order – high, low) represented in BCD format.

UniqueID - 20 bytes of unique ident in ASCII format

B.6.12 3170 Ident Setup Message (Type 0x0C)

To send a 3170 ident setup configuration, a message (subtype 0x01) is needed.

Message : HDR17, 0x06, FmNode, ToNode, 0x0C, 0x01, PhyNum, Frame, Amp, ID

PhyNum - two bytes in BCD format representing the physical number (starting from 0).

Frame - two bytes in BCD format representing the frame address (valid from 0 to 9999).

Amp - one byte in BCD format representing the amplifier address (valid from 1 to 16).

ID - 16 bytes of ident in ASCII format.