

CM9760-ALM and CM9760-REL Protocol

Purpose

The purpose of this document is to completely describe the P protocol serial communication between the CM9760-ALM and the CM9760-CC1, and between the CM9760-REL and the CM9760-CC1

CM9760-ALM Operation

The CM9760-ALM has a large amount of intelligence built in. When the unit is first powered, it will request the arm alarm table from the CM9760-CC1. The CM9760-ALM only sends the receive alarm command for armed alarms upon trigger.

When an alarm is triggered, the CM9760-CC1 will send the disarm alarm command to the CM9760-ALM this prevents the alarm unit from repeating an alarm until the alarm is reset. When the alarm is reset, the CM9760-CC1 sends the arm alarm command to again enable the alarm.

Power Cycle

On power cycle the CM9760-ALM will send the command to request alarm arm table repeatedly until the send armed alarm table command is sent from the CM9760-CC1. The CM9760-ALM next acknowledges the send armed alarm table command. The CM9760-CC1 then sends the turn off auxiliary command. The CM9760-ALM responds with the acknowledge command. The purpose of the turn off auxiliary command is to ensure that the CM9760-ALM's auxiliary is off immediately after power up.

Power Cycle Command Descriptions

Hexadecimal ED Request Arm table Command

Byte	Hexadecimal Value	Description
0	A0	Start of Transmission
1	ED	Request Arm Alarm Table Command
2	00 to 03	Alarm Interface Unit Identification
3	AF	End of Transmission
4	00 to FF	Exclusive Or Check Sum

Hexadecimal EA Send Arm table Command

Byte	Value	Description
0	A0	Start of Transmission
1	EA	Send Alarm Arm Table Command
2	00 to 03	Alarm Interface Unit Identification
3 to 66	00 to 99	Arm / disarm state of one group of four alarms
67	AF	End of Transmission
68	CRC	Exclusive Or Check Sum

*Armed alarms are indicated using a bit map. Certain bits are unused and are always set to zero to disallow a start of transmission, A0 hexadecimal, or end of transmission, AF hexadecimal, armed alarm byte value.

Bit	Binary Value	Description
0	1 is armed; 0 is disarmed	Arm state of first alarm in group
1	Always zero	Unused
2	Always zero	Unused
3	1 is armed; 0 is disarmed	Arm state of second alarm in group
4	1 is armed; 0 is disarmed	Arm state of third alarm in group
5	Always zero	Unused
6	Always zero	Unused
7	1 is armed; 0 is disarmed	Arm state of fourth alarm in group

The armed alarm bytes give the armed state of 256 alarms. The first armed alarm byte (Send Arm table command byte three) indicates the armed states of alarms one to four. If alarm one and four are armed, and alarm two and three are unarmed, the value of the first armed alarm byte is hexadecimal 0x81.

The sixty-fourth armed alarm byte indicates the armed state of alarms 253 to 256 for the unit. If alarm 253 and 255 are armed and alarm 254 and 256 are unarmed the sixty-fourth armed alarm byte (Send Arm table command byte sixty-six) is hexadecimal 0x11.

Hexadecimal A2 Acknowledge

The CM9760-ALM responds to the CM9760-CC1 Send Arm Table command with the hexadecimal A2 acknowledgement.

Hexadecimal AA Negative acknowledge

The CM9760-ALM responds to the CM9760-CC1 Send Arm Table command with the hexadecimal AA negative acknowledge command if communication is incorrect.

Hexadecimal D5 Turn Off Auxiliary Command

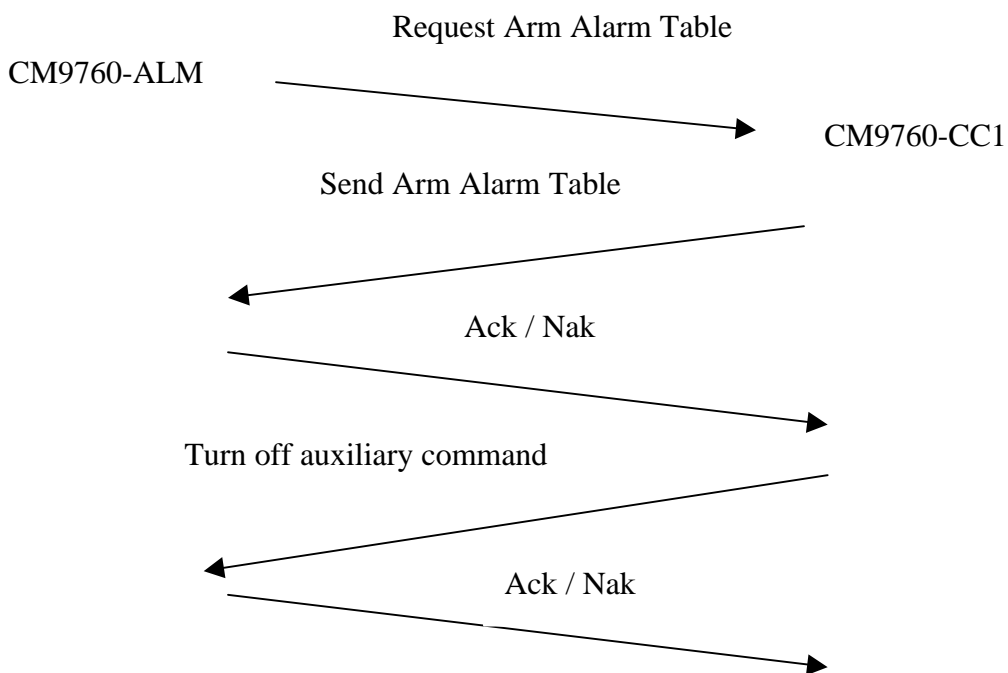
The CM9760-CC1 then sends the turn off auxiliary command. The purpose of the turn off auxiliary command is to ensure that the CM9760-ALM's auxiliary is off immediately after power up.

Byte	Value	Description
0	A0 hexadecimal	Start of Transmission
1	D5 hexadecimal	Turn off auxiliary
2	AF hexadecimal	End of Transmission
3	00 to FF hexadecimal	Exclusive Or Check Sum

Acknowledge / Negative acknowledge

The CM9760-ALM responds to the turn off auxiliary command with the hexadecimal A2 acknowledgement or hexadecimal AA negative.

Power up ladder diagram



CM9760-ALM Arm / Disarm

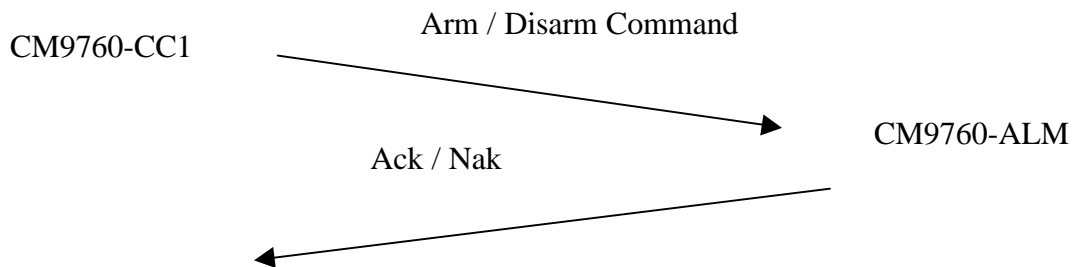
Alarms may be armed and disarmed by keyboards, or a macro. The hexadecimal EF command is sent to the alarm box when arming and disarming.

CM9760 Arm / Disarm command description

Byte	Hexadecimal Value(s)	Description
0	A0	Start of Transmission
1	EF	Arm / Disarm Alarm Command
2	00 to arm; 01 to disarm	Arm / disarm byte
3	00 to 99	Binary Coded decimal alarm high
4	00 to 99	Binary Coded decimal alarm low
5	AF	End of Transmission
6	00 to FF	Exclusive Or Check Sum

The CM9760-ALM responds to the arm / disarm command with the hexadecimal A2 acknowledge.

Arm Alarm Ladder diagram



Alarm Trigger

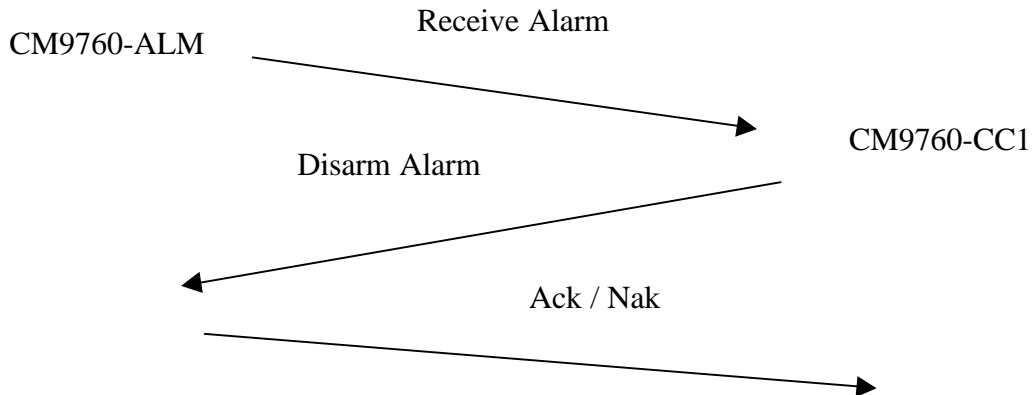
When an alarm triggers, the CM9760-ALM sends the hexadecimal F7 receive alarm command to the CM9760-CC1. The CM9760-CC1 responds with the hexadecimal EF disarm alarm command. The disarm alarm command keeps the CM9760-ALM from resending the receive alarm command until the alarm has been reset. Finally the CM9760-ALM responds with the hexadecimal A2 acknowledge.

Receive Alarm Command Description

Byte	Hexadecimal Value(s)	Description
0	A0	Start of Transmission
1	F7	Receive Alarm Command
2	00 to 99	Binary Coded decimal alarm high

3	00 to 99	Binary Coded decimal alarm low
4	AF	End of Transmission
5	00 to FF	Exclusive Or Check Sum

Alarm Trigger Ladder Diagram

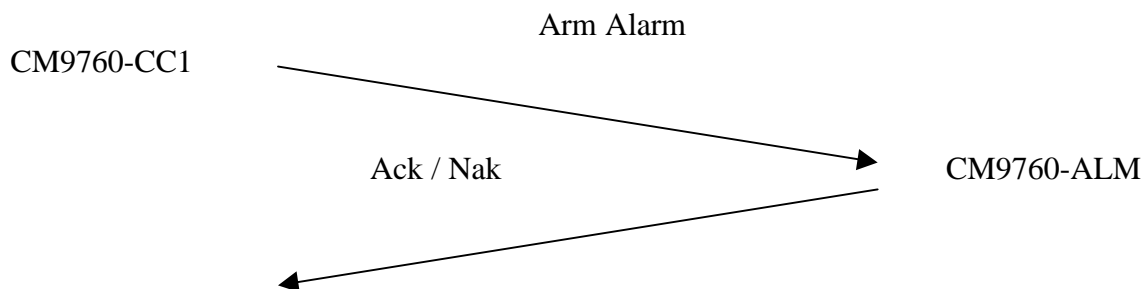


Alarm Reset

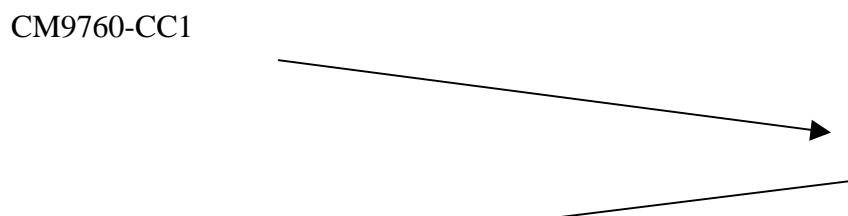
The alarms may be reset either by a macro or by an operator using the CM9760-KBD. When an alarm is reset the CM9760-CC1 sends the arm alarm command to the CM9760-ALM. If the alarm being reset is the last triggered alarm on the CM9760-ALM, the command to turn off the auxiliary is sent to ensure the auxiliary is reset. The arm / disarm command, and the turn off auxiliary commands are described above.

Alarm Reset ladder diagram

If more alarms active on CM9760-ALM



If resetting last active alarm



CM9760-ALM

Ack / Nak

Turn Off Auxiliary

Ack / Nak

Miscellaneous

Zero indexed binary coded decimal alarm numbers

The alarm numbers in the arm / disarm command and the receive alarm command are zero indexed binary coded decimal. Alarm one is represented as hexadecimal 0000 and alarm ten thousand is represented as hexadecimal 9999.

Daisy Chain operation

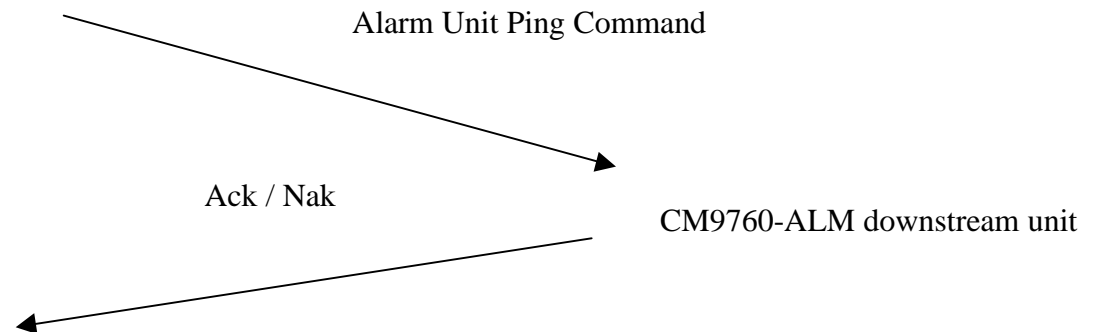
When more than one CM9760-ALM unit is daisy chained, it is possible to determine if the daisy chained units have lost communication. If this feature is enabled, the alarm unit nearest the CM9760-CC1 in the chain polls the next unit using the alarm unit ping command. The second alarm unit in the chain polls the third, and the third unit polls the fourth. If communication is lost between any of the units, the last alarm of the preceding unit is sent to the CM9760-CC1. For instance if communication is lost between the first and second alarm units, the 64th alarm is sent to the CM9760-CC1. This example assumes the first alarm unit to contain the first sixty-four alarms and the second unit the next sixty-four alarms. When using this mode, one alarm is lost for each unit in the daisy chain.

Alarm Unit Ping Command Description

Byte	Hexadecimal Value(s)	Description
0	A0	Start of Transmission
1	F6	Alarm Unit Ping Command
2	AF	End of Transmission
3	00 to FF	Exclusive Or Check Sum

Daisy Chain Ping Ladder Diagram

CM9760-ALM upstream unit



Exclusive Or Check Sum

The check sum for each P protocol command is the exclusive or function applied to every byte preceding the check sum byte.

CM9760-REL

CM9760-REL Operation

For the purpose of this document the word relay and auxiliary are used interchangeably.

A very large number of relays may be activated or deactivated using CM9760-REL units. Relays are grouped by frame, sub frame, GPI (general purpose interface) and finally individual relay. Each frame consists of four sub frames. Each sub frame consists of eight GPIs. Each GPI consists of eight relays. One frame therefore contains 256 relays (4 sub frames per frame * 8 GPIs per sub frame * 8 relays per GPI).

One relay box consists of one sub frame containing 8 GPIs and 64 relays. Each CM9760-REL unit has a six-bit frame address with two-bit sub frame address.

CM9760-REL relays can be programmed to behave in either momentary or latching modes. When in latching mode the relay is toggled when the CM9760-KBD F1 – F8 buttons are pressed. When in momentary mode, the relay follows the press of the key. When the key is pressed, the relay is turned on and when the key is released the relay is turned off.

CM9760-REL commands

There are only three commands used by the CM9760-REL. When the CM9760-KBD F1 – F8 keys are pressed, the CM9760-CC1 sends the VCR control command to the CM9760-REL. The CM9760-REL responds with either the hexadecimal A2 acknowledge or the hexadecimal AA negative acknowledge.

VCR Control Command Description

Byte	Hexadecimal Value(s)	Description
0	A0	Start of Transmission
1	F9	VCR Control Command
2	00 to 99	Binary Coded Decimal Frame High
3	00 to 99	Binary Coded Decimal Frame Low
4	00 to 19	Physical GPI number within the frame
5	00 to 17	Auxiliary Control Bit Map (see below)
6	AF	End of Transmission
7	00 to FF	Exclusive Or Check Sum

Auxiliary Control Bit Map

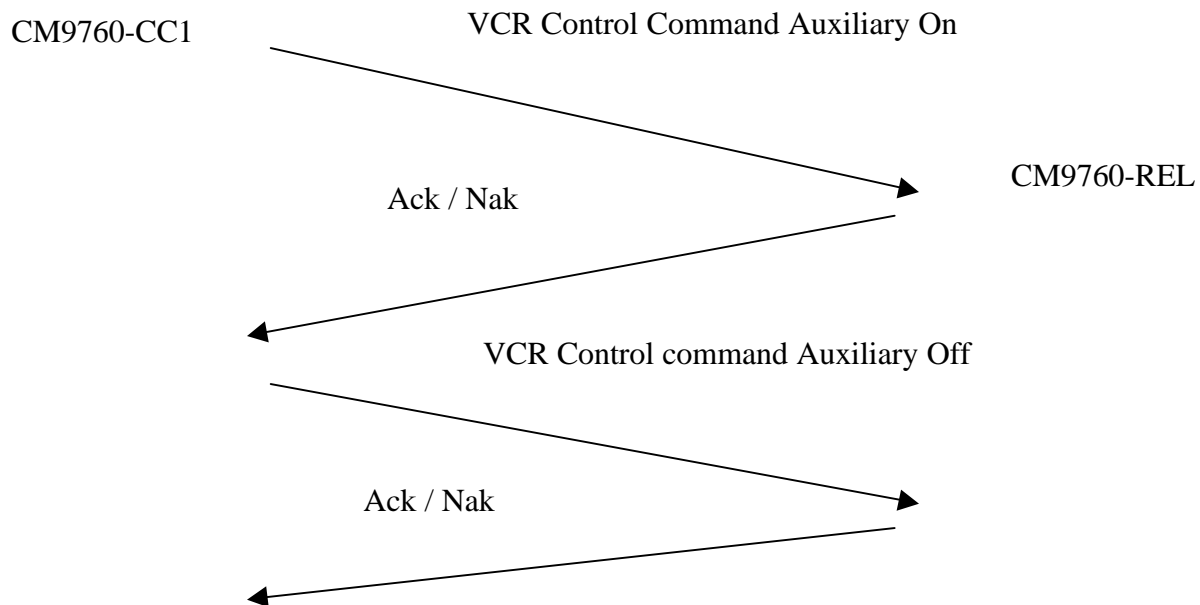
Bit	Binary Value	Description
0 to 2	000 to 111	Auxiliary number 0 to 7
3	Always zero	Unused
4	0 relay off; 1 relay on	Auxiliary control
5	Always zero	Unused
6	Always zero	Unused
7	Always zero	Unused

The VCR control command is used for both the CM9760-REL and CM9760-VCRC units. For the CM9760-VCRC different relays operate different videocassette recorder functions.

Relay number	VCR Function
0	Play
1	Stop
2	Rewind
3	Fast Forward
4	Pause
5	Record
6	Eject
7	Not Used

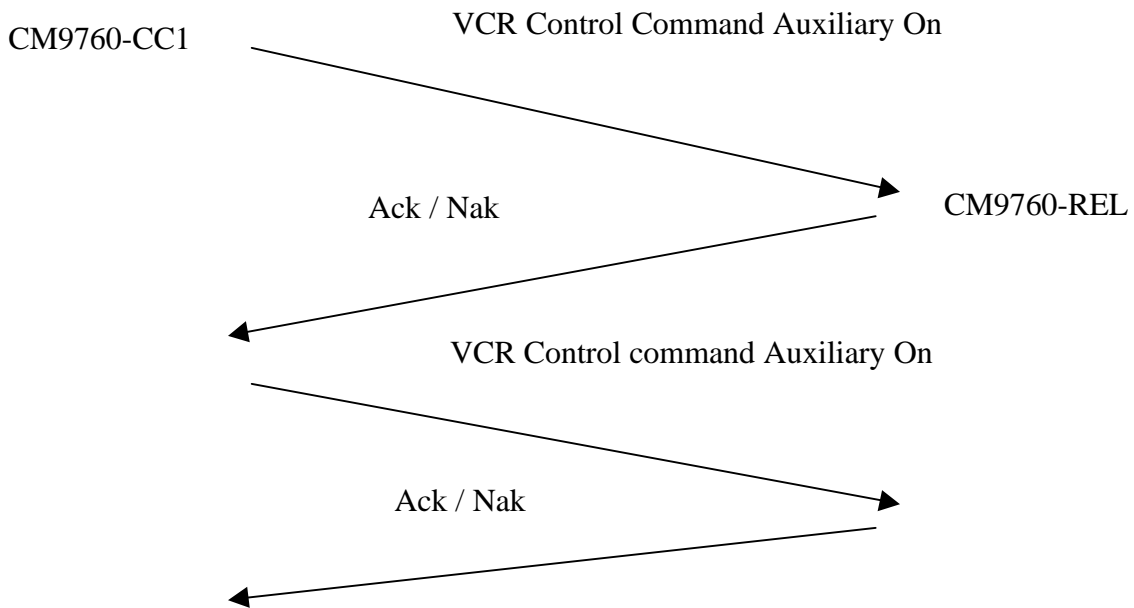
When a user presses the F1 to F8 keys on the CM9760-KBD, if the associated relay has been programmed to behave in momentary mode, the VCR control command is sent when the key is pressed turning the auxiliary on. When the key is released the VCR control command is sent a second time turning the auxiliary off.

VCR Control Command Ladder Diagram Momentary auxiliary



If an auxiliary is programmed to be a latching auxiliary, the CM9760-CC1 still sends the command two times. Once when the key is pressed and once when the key is released. If the relay is being turned on the CM9760-CC1 sends the on command twice. If the relay is being turned off, the CM9760-CC1 will send the off command twice.

VCR Control Command Ladder Diagram Latching Auxiliary On



VCR Control Command Ladder Diagram Latching Auxiliary Off

