APPLICATION NOTE

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ESP TECHNICAL SUMMARY

ESP the communication solution for today's intelligent fire detection ..... and tomorrow's fully integrated systems.

Communication Protocol Format

The Enhanced System Protocol is based on RS232 the serial communication standard used in today's PC's, which allows the Fire Alarm Panel to be designed using standard techniques and components. The major difference between the Hochiki ESP communication format and RS232 is the voltage and current levels used to transmit and receive the data.

The Hochiki ESP communication format has been designed specifically for fire alarm voltages i.e. 24V, where as RS232 uses different voltages and can transmit and receive data at the same time. ESP communication format can transmit or receive at any point in time due to the transmission being over two wire fire alarm cable, this is commonly known as half duplex serial asynchronous digital communication. The fire alarm system is expected to transmit over long distances using fire alarm cables, the transmission rate must not be fast due to the characteristics of the cable.

Communication Protocol Data Rates

The characteristics of the cable limits the speed that data can be transmitted over its maximum permitted length, to guarantee the data integrity the data rate is kept to 1200 bits per second.
At this data rate, it takes approximately 7.5 seconds to communicate to all 127 devices on the loop, hence it was necessary to build in a method where a device can force a much swifter response from the control panel. This method is termed interrupt processing and is used extensively in the ESP communication protocol, should an interrupt occur on more than one device at the same time the highest priority interrupt will be serviced first and the ESP protocol supports up to three levels of interrupt.

System Communication

The system can communicate with the devices on the loop in one of four modes;

- POLLING
  The polling command is used to determine the status of a device on the loop, each device is accessed on power up and then each device is addressed and its present status returned. This enables the control panel to give the appropriate response according to device type.

- CONTROL
  The control command is used to control a device on the loop, this provides a secure method of proving any output actions are valid. No output action can take place without the control panel sanctioning the action.

- GROUP ACTION
  The group action command is used to communicate with all the devices on the loop within the defined group, this allows specific actions to be carried out with one command rather than individually addressing each device.

- INTERRUPT
  The interrupt command is used to quickly determine a response to a device on the loop i.e. Fire Condition.

Each of the above communication modes allows the system to completely control each device on the loop.

Interrupt

The interrupting sequence starts when an input has been operated i.e. a call point. The interrupting device recognises the polling command from the control panel, when the device being polled responds with its data

the interrupting device responds at the same time with a pre-defined value. The interrupting device will continue to respond to the polling command until the control panel starts the interrupt search routine.

The control panel recognises that another device has responded by the data received, and the control panel will then enter into an interrupt search routine to find the device that has caused the interrupt.
The interrupt search routine starts by determining the interrupt level (3 levels) once the interrupt level has been established then the interrupt search will start according to the highest priority interrupt. The search for the interrupting device is started by determining in which of the 16 groups the interrupt originated, once the group has been established the eight addresses within each group are searched to find the interrupting device.
It is possible for more than one device to interrupt at the same time and these devices may have a different interrupt level. The response has been designed in such a way that it is possible to distinguish more than one interrupt level at the same time, furthermore as there may be more than one interrupting device with the same interrupt level the protocol has been designed such that the system still operates correctly

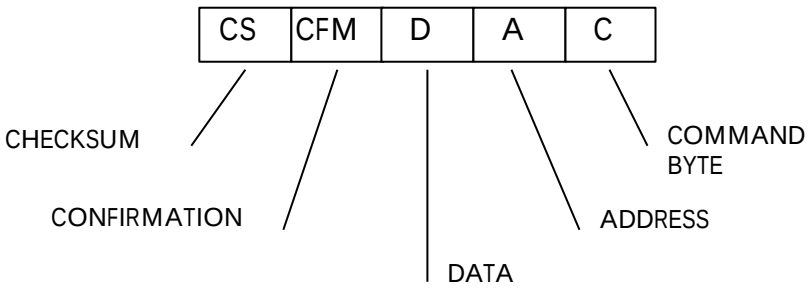
Group Actions

The functions that the group command supports are;

- On/off synchronisation
- Sleep Mode
- A/D conversion
- Enable/Disable all levels of interrupt for every device
- Reset all devices within a group to the initial power on conditions.

Definition Of Terms

When data is sent to the field devices the first byte of data always specifies the type of action and the last byte of data is always the checksum.



COMMAND BYTE

The command byte is always the first byte sent from the control panel, it defines the type of operation that is to be actioned by the device. The following data provides the following functions;

- Analogue channel threshold settings
- Device fire test - allows a field device to be put into the fire condition from the control panel, and activates the analogue device's test functions
- Device type - the device type is normally read during power up, this command allows the device type to be read at any time.
- Output drive - allow control of devices that can have their outputs operated either continuous or pulsed. This also controls the base fire LED's.
- Inhibit functions - allows the interrupt level or specified input to be enabled/disabled.

ADDRESS

This is the specific address the control panel will communicate to or the address the field device responds back to the controller.

CONFIRMATION

When the system is in CONTROL mode the output of a field device cannot change until the control panel sends an ACK (acknowledgement) command to the field device confirming that it is the correct unit and the data sent is correct

CHECKSUM

The checksum is used to verify that the data received by either a field device or the control panel is the same as the data transmitted. If the checksum is found to be incorrect on the devices then the data is ignored and if it is found to be incorrect or no response at the control panel then the control panel will re-transmit the data, if this occurs more than three times on the same data transmission the control panel will indicate a communication failure.

DATA

Data can be sent both from the field devices and the control panel, the data from the field devices provides the following actions;

- Analogue data - this can return up to three channels of data
- Input status - verification of the status of an input on a field device.
- Input/Output terminal fault - this returns which input/output is in fault and which type of fault has occurred.
- Terminal power fault - this returns that a power fault has occurred on a device which requires a power supply.
- Output status condition - this verifies that the output status is in the correct state.
- Device type - this returns the device type.

Expansion Capabilities

The ESP system has been designed to be multi-purpose such that the same basic components could be used to control any type of system. Whereas the transmission system components may be subjected to technological changes, the overall transmission protocol has been designed such that it will not. The transmission protocol anticipates future requirements and can feature address and message expansion.
Each address has the capability of returning up to three analogue channels, this allows the connection of devices that have multiple sensing elements i.e. a combined heat and optical detector.

Compatible ESP Approved Product

The **ASX Range** of fire detection products is fully compatible with ESP and provides the system designer with a very comprehensive range for most intelligent fire detection applications. Field Device addressing is achieved via simple and reliable 7 bit DIL switch and the Sensors are addressed via a hand held programmer this will allow up to 127 devices to be addressed on each loop. The range consists of:-

• Multi Sensor (ACA-E)	EN54 parts 5 and 7
• Photoelectric Smoke Sensor (ALG-E and ALG-E(NP))	EN54 part 7
• Ionisation Smoke Sensor (AIE-E and AIE-E(NP))	EN54 part 7
• Heat Sensor (ATG-E and ATG-E(NP))	EN54 part 7
• Sensor Base (YBN-R/3)	LPC approved
• Short Circuit Isolator (YBO-R/SCI)	LPC approved
• Relay Output Module (CHQ-R)	EFSG
• Mini-Zone Monitor (CHQ-MZ)	EFSG
• Zone Monitor (CHQ-Z)	EFSG
• Dual Switch Monitor (CHQ -S)	EFSG
• Manual Call Point (MCP-E)	BS5839 part 2
• Weatherproof Manual Call Point (MCP-W)	LPC approved

- Dual Circuit Sounder Controller (CHQ-B) EFSG

Product currently submitted for approval

- Single Input/Output Module (CHQ-SIO)

Specification

Enhanced Systems Protocol (ESP):

Transmission Type	Half duplex, serial asynchronous digital
	2 wire, Voltage transmit, Current receive
Data format	8 data bits, 1 start and 1 stop bit
Data rate	1200 bits/second
Operating voltage	Digital 0 - 24Vdc
	Digital 1 - 32Vdc
Operating current	Digital 0 - Loop current + 22mA
	Digital 1 - Loop current + 0mA
Error checking	Byte - Even parity
	Message - 8 bit checksum
Command Types	Polling, Control, Interrupt and Group
Polling rate	7.5 seconds per loop
Interrupt response time	1.5 seconds max., 1.0 seconds typ.

HOCHIKI
World Class Leaders in Fire Detection since 1918

Hochiki Europe (UK) Ltd
Grosvenor Road, Gillingham Business Park,
Gillingham, Kent, ME8 0SA, England
Telephone: +44(0)1634 260133 Facsimile: +44(0)1634 260132
Email: sales@hochikieurope.com
Web: www.hochikieurope.com