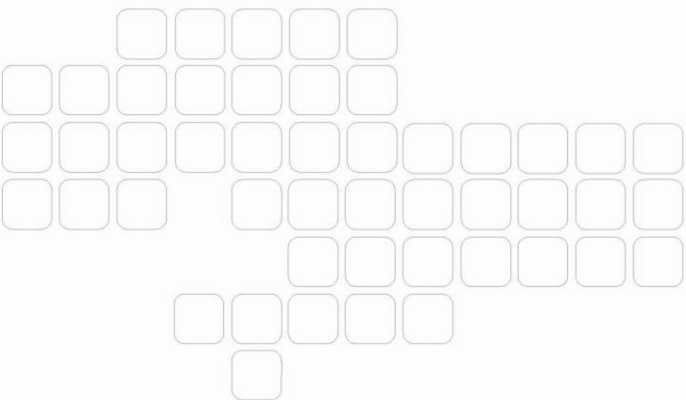


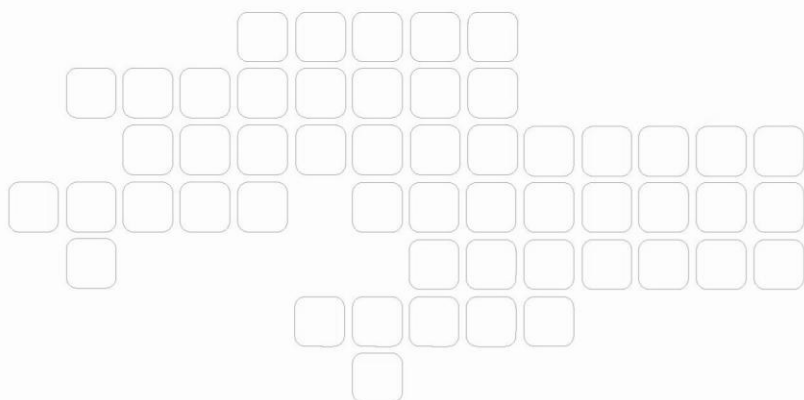


USER'S MANUAL

FireSync Host Protocol

Platform Version 5.4.3.22

Protocol Version 2.0



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This product is designated for use solely as a component and as such it does not comply with the standards relating to laser products specified in U.S. FDA CFR Title 21 Part 1040.

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Introduction

This document describes the FireSync Host Protocol (FHP). The FireSync Host Protocol defines a set of messages, communicated via TCP and UDP, that enable network communication between user applications and a system of FireSync devices. A standalone sensor is considered a special case of a FireSync system that contains only one device.

A typical setup consists of the following hardware components:

Component	Description
FireSync Sensors	Provide cameras, lights, and data processing capacity.
FireSync Stations	Provide expanded data processing capacity.
FireSync Master	Provides network time/encoder/event synchronization.
Application Computers	Connect, control and/or receive data from FireSync devices.

and the following software agents:

Agent	Description
FHP Server	Accepts commands from an FHP Client to control FireSync devices.
FHP Client	Connects to the FHP server and issues commands.
FHP Receivers	Receive data, health, and/or event messages from FireSync devices.

A FireSync Sensor or Station is designated to act as the FHP Server when its *server module* is enabled. In a given system, one FireSync device acts as the FHP Server and exercises control over other FireSync devices. A device with its *server module* enabled retains its original functionality (e.g. a Station can be used for data processing while its *server module* is enabled).

The FHP Server accepts commands from an FHP Client, which typically runs on an Application Computer outside of the FireSync network. The FHP Server accepts discovery, upgrade, management, and control commands. The FHP Server orchestrates outgoing data connections from devices within the FireSync network to FHP Receivers, which are passive listeners that can receive data, health, and event messages.

The following examples illustrate common FireSync network arrangements:

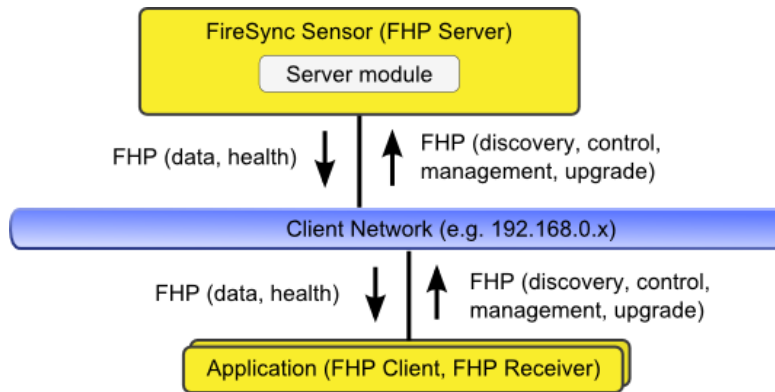


Figure 1. Single Sensor Network (Standalone Sensor)

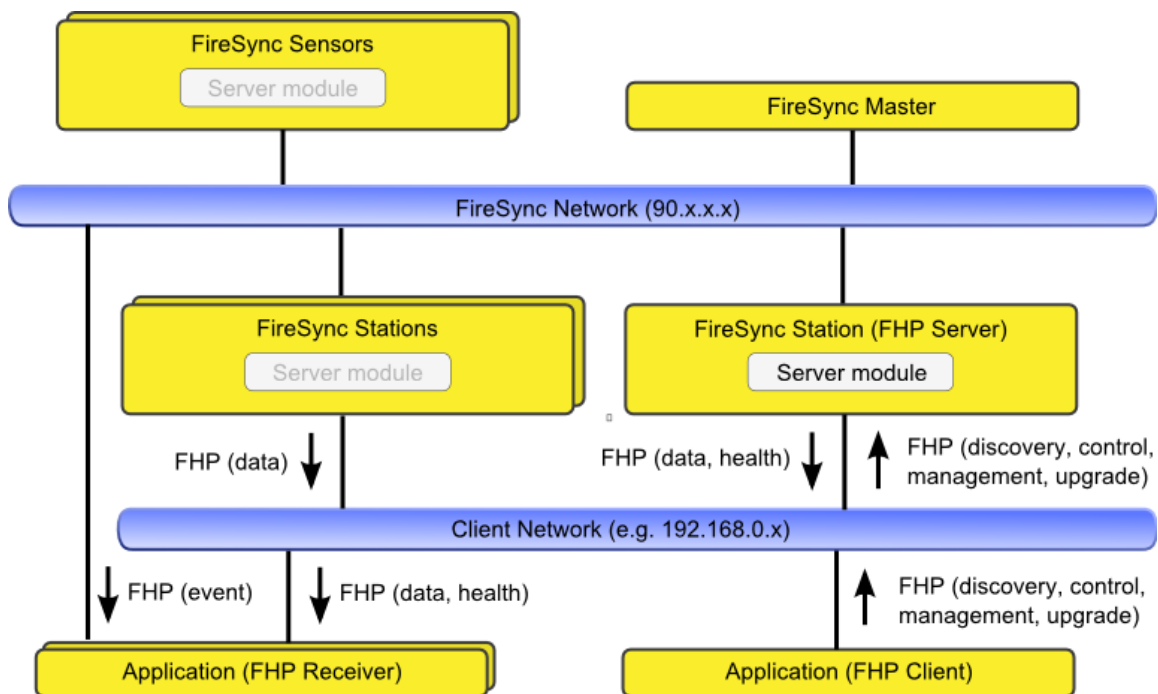


Figure 2. Large Sensor Network

FireSync Host Protocol

Protocol Basics

Communication Channels

A client application communicates with a FireSync server through various communication channels. Over these channels, the application can send commands, configure the network address of a server, and listen for data. The table below summarizes the available communication channels.

Channel	Protocol	Port	Description
Discovery	UDP/Command	3220	System accepts broadcast commands for IP configuration.
Upgrade	TCP/Command	3192	System accepts commands for firmware upgrades.
Management	TCP/Command	3191	System accepts commands for monitoring and management.
Control	TCP/Command	3190	System accepts commands for common control operations.
Health	TCP/Result	-	System sends health indicators to a user-defined port.
Event	TCP/Result	-	System sends event indicators to a user-defined port.
Data	TCP/Result	-	System sends output data to one or more user-defined ports.

The Discovery Channel is a UDP broadcast port used for network address discovery and configuration. The port is configured in such a way that communication can occur across subnets, enabling servers with unknown addresses to be configured. Note that the Discovery Channel is supported only on devices supplied directly by LMI. It is not supported on third-party machines running Station software.

The Upgrade, Management, and Control Channels are TCP-based *command* channels, over which commands and replies are exchanged between the application and the server.

The Health, Event, and Data channels are TCP-based *result* channels, over which result messages are transmitted from FireSync devices to receivers. Receivers open a port and listen for incoming connections from FireSync devices; these connections are established in response to Management and/or Control commands.

System States

A FireSync sever is always in one of several states. The server state changes in response to control commands or events such as channel disconnections. Some commands have restrictions on the states in which they can be used.

Label	Value	Description
Conflict	1	System has detected errors that prevent it from running.
Ready	2	System is ready to run.
Running	3	System is running.
Standby	4	System is paused; data channels are suspended until system is resumed.

Device Types

The following table defines the type identifiers for FireSync devices.

Label	Value	Description
Sensor	1	FireSync sensor.
Master	2	FireSync master.
Station	3	FireSync station.

Data Types

The table below defines the data types and associated type identifiers used throughout this document. All values are transmitted in little-endian format (least significant byte first) unless stated otherwise.

Data Type	Value	Description
8u	1	8-bit unsigned integer.
8s	2	8-bit signed integer.
16u	3	16-bit unsigned integer.
16s	4	16-bit signed integer.
32u	5	32-bit unsigned integer.
32s	6	32-bit signed integer.
64u	7	64-bit unsigned integer.
64s	8	64-bit signed integer.
byte	9	byte
char	10	8-bit ASCII-encoded character.
64f	11	64-bit floating point value.
32f	12	32-bit floating point value.

IP addresses are defined as byte arrays (byte[4]), in big-endian format (most significant byte first). For example, an address of “a.b.c.d” would be stored as address[0] = a, address[1] = b, address[2] = c and address[3] = d.

Status Codes

Each command reply contains a status field indicating whether or not the command succeeded. The following table lists the status codes and their meanings.

Label	Value	Description
OK	1	Command succeeded.
Failed	0	Command failed.
Invalid State	-1000	Command is not valid in the current state.
Item Not Found	-999	A required item was not found.
Invalid Command	-998	Command Id is not recognized.
Invalid Parameter	-997	One or more command parameters are incorrect.
Not Supported	-996	The operation is not supported.
Busy	-995	The command cannot be processed because the system is busy.

Command Format

Commands and replies each begin with a common header.

Command Header

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier.

Reply Header

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier.
status	64s	Reply status.

Note that the length fields prepended to the beginning of each message refer to the size of the entire message, including the length field itself. For a command that consists of only the header (no additional fields), the length field would contain a value of 16.

Discovery Channel

The discovery channel is used to retrieve and/or configure the network address of a server. To send a discovery command to a server, a UDP packet should be sent to the discovery port on the broadcast address ("255.255.255.255").

Each command identifies its target with a serial number. After the command is processed, the server broadcasts a UDP response packet to the sender's port.

Get Address

Purpose	Discover devices.
Channel	Discovery
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x0001)
signature	64s	Magic number (0x0000504455494D4C).
serialNumber	64s	Device serial number.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1001)
status	64s	Reply status.
signature	64s	Magic number (0x0000504455494D4C).
serialNumber	64s	Device serial number.
useDhcp	64s	1 if network interface uses DHCP, 0 otherwise.
reserved[4]	byte	Reserved.
address[4]	byte	IP address.
reserved[4]	byte	Reserved.
mask[4]	byte	Subnet mask.
reserved[4]	byte	Reserved.
gateway[4]	byte	Gateway.
reserved[4]	byte	Reserved.
reserved[4]	byte	Reserved.

Send this command to retrieve the current network settings of a server. The addresses returned are in big-endian format.

Custom station hardware does not support this command.

Set Address

Purpose	Modifies the network configuration of a device, using the serial number to locate the device.
Channel	Discovery
States	Any

Command

Field	Type	Description
-------	------	-------------

length	64s	Command size, in bytes.
id	64s	Command identifier (0x0002).
signature	64s	Magic number (0x0000504455494D4C).
serialNumber	64s	Device serial number.
useDhcp	64s	1 if network interface uses DHCP, 0 otherwise.
reserved[4]	byte	Reserved. Set to 0.
address[4]	byte	IP address.
reserved[4]	byte	Reserved. Set to 0.
mask[4]	byte	Subnet mask.
reserved[4]	byte	Reserved. Set to 0.
gateway[4]	byte	Gateway.
reserved[4]	byte	Reserved. Set to 0.
reserved[4]	byte	Reserved. Set to 0.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1002).
status	64s	Reply status.
signature	64s	Magic number (0x0000504455494D4C).
serialNumber	64s	Device serial number.

This command is used to set the network settings of the server. The addresses must be transmitted in big-endian format.

The device reboots when network settings are applied successfully. Custom station hardware does not support this command.

Upgrade Channel

The upgrade channel is used to upgrade a FireSync system. Typical usage is to transmit an upgrade package file with the Start Upgrade command, and then monitor the progress with the Get Upgrade Status command until the process is finished. The Get Upgrade Log command can be used to retrieve the upgrade log if a problem occurs.

Get Protocol Version

Purpose	Retrieves the protocol version.
Channel	Upgrade
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x0100).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x0100).
status	64s	Reply status.
majorVersion	64s	Major version.
minorVersion	64s	Minor version.

Use this command to retrieve the protocol version. The protocol version described by this document can be found on the title page.

Start Upgrade

Purpose	Starts a firmware upgrade.
Channel	Upgrade
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x0000).
fileSize	64s	Upgrade file size, in bytes.
file[fileSize]	byte	Upgrade file.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x0000).
status	64s	Reply status.

This command begins the upgrade process by transmitting an upgrade package file to the server. Firmware upgrade packages are available for most sensor products through

the LMI Technologies website. Refer to FireSync Support for instructions on obtaining and applying upgrade packages.

All server operations (data, health and event) should be stopped before transmitting this command.

A standalone sensor reboots upon successful upgrade.

Get Upgrade Status

Purpose	Determines the progress of a firmware upgrade.
Channel	Upgrade
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x0001).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x0001).
status	64s	Reply status.
stage	64s	Current upgrade stage: -1 – Upgrade Failed 0 – Upgrade Completed 1 – Upgrade in Progress
progress	64s	Percentage completed, valid when stage is Upgrade in Progress.

This command queries the current status of the upgrade progress.

Get Upgrade Log

Purpose	Retrieves the upgrade log file.
Channel	Upgrade
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x0002).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x0002).
status	64s	Reply status.
fileSize	64s	Log file size, in bytes.
file[fileSize]	byte	Log file.

In case of upgrade programs, the Get Log command can be used to retrieve the upgrade log and aid in troubleshooting.

Management Channel

The management channel is used for system monitoring and management.

Get Protocol Version

Purpose	Retrieves the protocol version.
Channel	Management
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x2100).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x2100).
status	64s	Reply status.
majorVersion	64s	Major version.
minorVersion	64s	Minor version.

Use this command to retrieve the protocol version. The protocol version described by this document can be found on the title page.

Start Health Channel

Purpose	Creates a health channel connection.
Channel	Management
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x2000).
reserved[4]	byte	Reserved. Set to 0.
address[4]	byte	Health listener IP address.
port	64s	Health listener port.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x2000).
status	64s	Reply status.

This command starts the transmission of system health information to a TCP server socket (specified by the *address* and *port* field). Similar to the System Start command, the FireSync server initiates the TCP connection. The health data channel is described in a later section.

The address must be transmitted in big-endian format.

Stop Health Channel

Purpose	Disconnects the health channel.
Channel	Management
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x2001).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x2001).
status	64s	Reply status.

This command stops health data streaming and disconnects the health data connection.

Ping

Purpose	Determines the liveliness of the management channel.
Channel	Management
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x2003).
timeout	64s	Ping timeout period (microseconds).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x2003).
status	64s	Reply status.

This command allows the client to ping the server to detect if the connection to the server is still alive.

The timeout field sets the ping timeout timer for the management channel.

If the timeout period is set to non-zero, then the client must send the next ping command to the server no later than the specified timeout period. The server will disconnect the management channel if it does not receive the next ping command within the specified period.

If the timeout period is set to zero, then the ping monitoring mechanism is disabled, and the client has no obligation to send another ping command. This is the default behavior on system startup.

Get Health Log

Purpose	Retrieves health indicators logged by the server.
Channel	Management
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x2006).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x2006).
status	64s	Reply status.
logSize	64s	Log size, in bytes.
log[logSize]	byte	Log data.

This command retrieves health information logged by the server. The server keeps an internal record of the most recent health indicators for diagnostics purposes. When an error occurs, the log should be saved as soon as possible and sent to LMI to aid in the troubleshooting process.

Get Process Logs

Purpose	Retrieves logs from process failures.
Channel	Management
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x2007).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x2007).
status	64s	Reply status.
logSize	64s	Log size, in bytes.
log[logSize]	byte	Log data.

This command retrieves the logs from node process failures. If failures occur, this command should be used to retrieve a single archive containing the logs that may aid in troubleshooting.

Standalone sensors do not support this function and always return an empty log.

Control Channel

The control channel is used to send most of the commands that pertain to configuring and running a FireSync system.

If changes such as device reconnection take place while the system is online, the server will process these changes. When these changes are being processed (which normally takes a few seconds), control channel commands can return the “busy” status. If a client receives the “busy” status for a command, it should retry the command at a later time.

Get Protocol Version

Purpose	Retrieves the protocol version.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1100).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1100).
status	64s	Reply status.
majorVersion	64s	Major version.
minorVersion	64s	Minor version.

Use this command to retrieve the protocol version. The protocol version described by this document can be found on the title page.

Start

Purpose	Commands the system to enter the Running State.
Channel	Control
States	Ready

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x100D).
reserved	64s	Reserved field. Set to 0.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x100D).
status	64s	Reply status.

This command begins execution of the FireSync system. Upon receiving this command, the server attempts to connect all data channels that have been enabled via the Enable Data Channel command. If any of these connection attempts fail, then the command will

return an error code. Upon success, cameras and lights will begin triggering and camera data will be processed by FireSync devices to generate data result messages.

Stop

Purpose	Commands the system to enter the Ready State.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1001).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1001).
status	64s	Reply status.

This command stops the system. Data channels will be disconnected by the FireSync server upon receiving this command.

Pause

Purpose	Commands the system to enter the Standby State.
Channel	Control
States	Running

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1002).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1002).
status	64s	Reply status.

This command directs the FireSync system to enter the Standby state. Cameras and lights are disabled until a Resume command is received.

Pause/Resume commands are typically faster to execute than Start/Stop, but the tradeoff is that the system may not permit reconfiguration while paused. Refer to the User's Guide for your FireSync sensor system to determine appropriate guidelines for using Pause/Resume.

Resume

Purpose	Commands the system to resume the Running State.
Channel	Control
States	Standby

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1003).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1003).
status	64s	Reply status.

This command resumes the FireSync system from the Standby state. Cameras and lights are re-enabled.

Set Mode

Purpose	Sets the current mode of the system.
Channel	Control
States	Ready

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1004).
mode[16]	char	Mode name (null-terminated).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1004).
status	64s	Reply status.

This command sets the current mode of the FireSync system by name. Refer to the User's Guide for your FireSync sensor system to determine the available modes and guidelines for configuration.

Get Mode

Purpose	Gets the name of the current system mode.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1005).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1005).
status	64s	Reply status.
mode[16]	char	Mode name (null-terminated).

This command retrieves the name of the current system mode.

Set Parameter

Purpose	Sets a parameter value.
Channel	Control
States	Ready

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1018).
mode[16]	char	Mode name (null-terminated).
parameter[16]	char	Parameter name (null-terminated).
value	64s	Parameter value.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1018).
status	64s	Reply status.

This command sets the value of a parameter by its name and the system mode it belongs to. Refer to the User's Guide for your FireSync sensor system to determine the available parameters.

If the mode name is an empty string, then the current system mode is used.

Get Parameter

Purpose	Gets a parameter value.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1019).
mode[16]	char	Mode name (null-terminated).
parameter[16]	char	Parameter name (null-terminated).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1019).
status	64s	Reply status.
value	64s	Parameter value.

This command retrieves the value of a parameter by its name and the system mode it belongs to. Refer to the User's Guide for your FireSync sensor system to determine the available parameters.

If the mode name is an empty string, then the currently mode is used.

Write File

Purpose	Writes a file to non-volatile server storage.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1006).
fileName[64]	char	File name (null-terminated).
fileSize	64s	File size, in bytes.
file[fileSize]	byte	File content.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1006).
status	64s	Reply status.

The Write File command is used to create a new file or update an existing file to the non-volatile storage area of the server. If a file with the given name already exists, it is overwritten; otherwise a new file is created.

Write Volatile File

Purpose	Writes a volatile file to server storage.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1017).
fileName[64]	char	File name (null-terminated).
fileSize	64s	File size, in bytes.
file[fileSize]	byte	File content.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1017).
status	64s	Reply status.

The Write Volatile File command is similar to the Write File command, except that the file written is temporary and thus not preserved when the server is restarted. The Read File and Delete File commands can be used on temporary files.

If this command is used on a file that already exists in non-volatile storage, then a new temporary file is created and the original file is left untouched. The Read File command reads the new temporary file, and the Delete File command deletes both copies.

If the Write File command is used on an existing temporary file, then the temporary file converts into a non-temporary file.

Read File

Purpose	Reads a file from server storage.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1007).
fileName[64]	char	File name (null-terminated).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1007).
status	64s	Reply status.
fileSize	64s	File size, in bytes.
file[fileSize]	byte	File content.

This command is used to read the contents of a file from the server.

Delete File

Purpose	Deletes a file from server storage.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1008).
fileName[64]	char	File name (null-terminated).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1008).
status	64s	Reply status.

Send this command to delete a file with the given name from the server.

Enable Data Channel

Purpose	Configures and enables a data channel.
Channel	Control
States	Ready

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x100B).
reserved[4]	byte	Reserved. Set to 0.
address[4]	byte	Data listener IP address.
port	64s	Data listener port.

channel	64s	Data channel id.
---------	-----	------------------

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x100B).
status	64s	Reply status.

Enables an output data channel by providing a channel identifier and a TCP end-point (*address* and *port* fields). The FireSync server will initiate connections to all enabled data channels when the Start System command is received. The address must be transmitted in big-endian format.

Most FireSync systems support the use of a single data channel (channel 0). Systems that employ multiple FireSync Stations or support output data partitioning may require more than one channel to transmit results. Refer to the User's Guide for your FireSync sensor system to determine how output channels should be configured.

Disable Data Channel

Purpose	Disables a data channel.
Channel	Control
States	Ready

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x100C).
channel	64s	Data channel id.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x100C).
status	64s	Reply status.

Start Event Channel

Purpose	Creates an event channel connection.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1010).
reserved[4]	byte	Reserved. Set to 0.
address[4]	byte	Event listener IP address.
port	64s	Event listener port.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1010).

status	64s	Reply status.
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This command starts the transmission of events to a TCP end-point (*address* and *port* fields). Similar to the System Start command, the FireSync server initiates the TCP connection. The event channel result format is described in a later section. The address must be transmitted in big-endian format.

The TCP server must be located at a subnet that could be connected by the Master, which is located in the 90.x.x.x subnet.

Stop Event Channel

Purpose	Disconnects the event channel.	
Channel	Control	
States	Any	

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1011).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1011).
status	64s	Reply status.

Enumerate Devices

Purpose	Enumerates the devices present in the system (sensors, masters, stations).	
Channel	Control	
States	Any	

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1009).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1009).
status	64s	Reply status.
count	64s	Count of devices.
devices[N]	64s	List of device identifiers (typically serial numbers).

Get Device Info

Purpose	Gets descriptive information for a specific device (sensor, master, station).	
Channel	Control	
States	Any	

Command

Field	Type	Description
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length	64s	Command size, in bytes.
id	64s	Command identifier (0x1016).
deviceId	64s	Device identifier (typically serial number).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1016).
status	64s	Reply status.
deviceId	64s	Device identifier (typically serial number).
modelName[32]	char	Model name.
deviceType	64s	Device type.
isServer	64s	FHP Server module is enabled in this device.
reserved[240]		Reserved.

Backup

Purpose	Creates a backup of server files (e.g. configuration, calibration).
Channel	Control
States	Ready

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1013).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1013).
status	64s	Reply status.
fileSize	64s	Size of backup file, in bytes.
file[fileSize]	byte	Backup file content.

Restore

Purpose	Restores server files files (e.g. configuration, calibration) from a backup.
Channel	Control
States	Ready

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x1014).
fileSize	64s	Size of backup file, in bytes.
file[fileSize]	byte	Backup file content.

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x1014).
status	64s	Reply status.

Ping

Purpose	Determines the liveness of the control channel.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x100E).
timeout	64s	Ping timeout period (microseconds).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x100E).
status	64s	Reply status.

This command allows the client to ping the server to detect if the connection to the server is still alive.

The timeout field sets the ping timeout timer for the system operation channel.

If the timeout period is set to non-zero, the client must send the next ping command to the server no later than the specified timeout period. The server will disconnect the command channel if it does not receive the next ping command within the specified period.

If the timeout period is set to zero, the ping monitoring mechanism is disabled, and the client has no obligation to send another ping command. This is the default behavior on system startup.

Get Time

Purpose	Gets the current system clock, in microseconds.
Channel	Control
States	Any

Command

Field	Type	Description
length	64s	Command size, in bytes.
id	64s	Command identifier (0x100A).

Reply

Field	Type	Description
length	64s	Reply size, in bytes.
id	64s	Reply identifier (0x100A).
status	64s	Reply status.
time	64u	Current time, in microseconds.

This command retrieves the system clock, in microseconds. All devices in a system are synchronized with the system clock; this value can be used for diagnostic purposes.

Result Channels and Formats

While the *command* channels are used to operate the system, *result* channels are used to transmit health, event, and data messages from FireSync devices to FHP Receivers. Result channels and the Result message format are described in this chapter.

Result Format

The FireSync Result format has the following general structure.

Result Format

Field	Type	Description
size	64s	Message length, in bytes.
id	64s	Message identifier.
attributeCount	64s	Count of attributes in this message.
dataCount	64s	Count of data blocks in this message.
attributes[N]	64s	List of attributes.
descriptors[M]	Descriptor	List of data block descriptors (one per data block).
data[M]	-	List of data blocks; data type for each block given by corresponding descriptor.

Result Descriptor Format

Field	Type	Description
length0	64s	First array dimension length of data block.
length1	64s	Second array dimension length of data block.
length2	64s	Third array dimension length of data block.
type	Type	Data type code for elements in data block (refer to Data Types section).

A result message contains a list of attributes and a list of data blocks. Each data block is an array of primitive types with 1, 2 or 3 dimensions, characterized by an accompanying descriptor. The *data* field of the Result message concatenates the data blocks in the same order as the descriptors.

The first length field that contains a zero determines the dimensionality of the array (e.g. the length2 field will contain zero for a 2-dimensional array). Items in the highest valid dimension are arranged contiguously (e.g. for a three dimensional array, the item at (i, j, k) is located at byte offset $(i \cdot \text{length1} \cdot \text{length2} + j \cdot \text{length2} + k) \cdot \text{sizeof}(\text{type})$).

Data Channels

When a Start System command is issued by the client to the server, data connections are initiated by FireSync devices to FHP Receivers. When connections are established and the system is started, data results are transmitted to FHP Receivers at a pace determined by the FireSync system.

The attributes and data blocks that are transmitted in each data result message are application- and mode-specific. Refer to the User's Guide for your FireSync system for a complete description of these fields.

Health Channel

When the Start Health Channel command is received by the server, a health connection is initiated to an FHP Receiver. Health results are then transmitted to the FHP Receiver at a regular interval. Individual health results are transmitted for each device in the system (sensors, stations, master).

The tables below define the health result format. Message fields not applicable to health information are marked as reserved, but contain values that are consistent with the general rules for FireSync result messages.

Health Result Format

Field	Type	Description
size	64s	Message length, in bytes.
id	64s	Message id (1000)
reserved[2]	64s	-
serialNumber	64s	Device Id (typically serial number of sensor, master, or station).
indicatorCount	64s	Count of indicators.
reserved[3]	64s	-
indicators[N]	Indicator	List of indicators.

Health Indicator Format

Field	Type	Description
id	64s	Indicator identifier
instance	64s	Indicator instance
value	64s	Indicator value

Event Channel

When the Start Event Channel command is received by the server, an event connection is initiated to an FHP Receiver. Event results are then transmitted to the FHP Receiver at a regular interval.

The tables below define the event result format. Message fields not applicable to event information are marked as reserved, but contain values that are consistent with the general rules for FireSync result messages. Note that the event message format differs from the health message format only by the message and indicator id values.

Event Result Format

Field	Type	Description
size	64s	Message length, in bytes.
id	64s	Message id (1001)
reserved[3]	64s	-
indicatorCount	64s	Count of indicators.
reserved[3]	64s	-
indicators[N]	Indicator	List of indicators.

Event Indicator Format

Field	Type	Description
id	64s	Indicator identifier
instance	64s	Indicator instance
value	64s	Indicator value

Event Indicators

Field	ID	Instance ID	Description
Encoder Value	3003	-	Encoder count value.
Encoder Index	3004	-	Encoder index value.
Input States	3005	-	Digital input states (bit array).

Health Indicators

The following standard health indicators are defined. Individual sensor products may transmit additional indicators; refer to the User's Guide for your FireSync sensor system to determine if additional indicators are available.

Sensor Indicators

Field	ID	Instance ID	Description
App Version	2000	-	Firmware application version.
FireSync Version	2001	-	Firmware FireSync version.
Temperature	2002	-	Internal temperature (degrees Celsius).
Memory Usage	2003	-	Amount of memory currently used (bytes).
Memory Capacity	2004	-	Total amount of memory available (bytes).
Storage Usage	2005	-	Amount of non-volatile storage used (bytes).
Storage Capacity	2006	-	Total amount of non-volatile storage available (bytes).
CPU Usage	2007	-	CPU usage (percentage of maximum).
Net Out Usage	2008	-	Current outbound network throughput (bytes/s).
Net Out Capacity	2009	-	Total available outbound network throughput (bytes/s).
State	2010	-	Current Node State (1: Error, 2: Ready, 3: Running, 4: Paused)
Camera Errors	2011	Camera Index	Number of camera frame errors encountered.
Camera Drops	2012	Camera Index	Number of camera frames dropped. Does not include Camera Errors.
Camera Rate	2018	Camera Index	Camera sampling rate in Hertz.
Sync Source	2013	-	Synchronization source (1: None, 2: Master, 3: Sensor).
Sync Errors	2014	-	Number of synchronization errors.
Message In Drops	2015	-	Number of messages received from acquisition sources, but dropped before data processing.
Message Out Drops	2016	-	Number of messages generated but failed to be sent.
Uptime	2017	-	Time elapsed since node boot-up or reset (microseconds).

Station Indicators

Field	ID	Instance ID	Description
App Version	3000	-	Firmware application version.
FireSync Version	3001	-	Firmware FireSync version.
Memory Usage	3002	-	Amount of memory currently used (bytes).
Memory Capacity	3003	-	Total amount of memory available (bytes).
Storage Usage	3004	-	Amount of non-volatile storage used (bytes).
Storage Capacity	3005	-	Total amount of non-volatile storage available (bytes).
CPU Usage	3006	-	CPU usage (percentage of maximum).
Net Out Usage	3007	-	Current outbound network throughput (bytes/s).
Net Out Capacity	3008	-	Total available outbound network throughput (bytes/s).
Net In Usage	3009	-	Current inbound network throughput (bytes).
Net In Capacity	3010	-	Total available inbound network throughput (bytes/s).
State	3011	-	Current Node State (1: Error, 2: Ready, 3: Running, 4: Paused)
Message In Drops	3012	-	Number of messages received but dropped before processing.
Message Out Drop	3013	-	Number of messages generated but failed to be sent.
Uptime	3014	-	Time elapsed since node boot-up or reset (microseconds).

Master Indicators

Field	ID	Instance ID	Description
App Version	4000	-	Firmware application version.
FireSync Version	4001	-	Firmware FireSync version.
Temperature	4002	-	Internal temperature (degrees Celsius).

Server Indicators (Available when server module is enabled)

Field	ID	Instance ID	Description
System State	1000	-	Overall system state (see definition in Chapter 1).
Node Comm Status	1001	Node ID	Communication status for each node (1: Ok, 2: Missing, 3: Error, 4: Requires upgrade)
Node Comm Errors	1002	Node ID	Communication error count for each node.
Encoder Value	1003	-	Current system encoder tick.
Encoder Index	1004	-	Current system encoder index.
Encoder Frequency	1005	-	Current system encoder frequency (ticks/s).
Change Pending	1006	-	System change pending (devices have been removed, added or rebooted, but the changes cannot be processed because the system is running).
Change Count	1007	-	Number of detected and processed system changes.