

## KSM Communication Protocol v3.0

This document provides technical data to facilitate communication with Koolance devices that support it.

Koolance maintains and provides the Koolance System Monitor (KSM) program which already has this protocol built-in, and is sufficient for most users. If however, the KSM software does not meet your requirements, custom integration with your software can be achieved by understanding and implementing the protocol described in this document.

The original KSM software can be found at <https://koolance.com/software>

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## USB-Serial Drivers

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The communication between the KSM software and devices is performed via system COM ports. These ports make use of the RS232 serial protocol. To support serial communication over USB, your system may require USB-UART drivers. You can find the required drivers from FTDI here: <https://www.ftdichip.com/Drivers/D2XX.htm>

A setup executable for these drivers is available for Windows, while source files are available to compile on Linux.

## Protocol Overview

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The protocol operates on a request-response paradigm (**Polling**). Request messages are sent by the **client** (your software) to the Koolance **device**. The device then sends a response back. The KSM software defaults to 3 seconds, but the polling frequency is left for you to determine.

## Example Commands

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The following example commands are using the f.DF variant. Other variants will have different byte orders and lengths. Please make sure you are following the variant your Koolance device supports.

**WARNING:** Requests will vary depending on the current settings of the applicable Koolance device. Using these examples verbatim may cause unintended changes to settings. Use a Data Request (CF 01 08) to poll existing settings specific to your device.

Spaces between bytes are included here for readability. Commands should be transmitted in raw binary.

### Making a Data Request

**Request:** CF 01 08

**Response:** DF 02 08 AA 0F AC 0F AC 00 00 00 00 00 00 00 00 34 00 07 06 AE AA AA AA AA  
AA 00 02 00 01 00 01 00

### Changing the Set-Point to 40°C LIQ temp

(Also note the **unit change to °C**)

$(0x01 * 44) + 40 = 84 = 0x54$

**Request:** CF 04 00 00 00 00 00 00 00 00 00 00 00 00 00 01 54 00 07 06 AE AA AA AA AA AA  
AA 00 01 00 00 00 01 41

**Response:** None

Protocol Variant	<b>f.DF</b>
Supported Devices	CTR-KSM100, RPM-ALX400, ALX-750-P400, ALX-1450-P400, ALX-2000-P400, ALR-4500A, ALR-4500C, ALH-2000 (Rev 1.0 /1.1)

	Byte	Device	Explanation
<b>STX</b>	0	STX	* [0xCF]: Client to Device * [0xDF]: Device to Client
<b>CMD</b>	1	Command	* [0x01]: Data request (Client to Device) * [0x02]: Data send (Device to Client) * [0x03]: Disconnect (Device to Client) * [0x04]: Set request (Client to Device)
<b>Monitoring Data</b>	2,3	LIQ Temp (°C)	* (°C * 10) + 2000 * [0x0FAC]: Out of Range * [0x0FA3]: Sensor Open * [0x0FA4]: Sensor Short
	4,5	CH1 Temp	* (°C * 10) + 2000
	6,7	CH2 Temp	* [0x0FAC]: Out of Range
	8,9	Fan RPM	* [0x0000] - [0x2710]: 0 - 10,000 RPM
	10,11	Pump RPM	
	12,13	Flow Meter	* [0x0000] - [0x2710]: (LPM or GPM) * 10
<b>User Mode Settings</b>	14	Fan Mode	* [0x00]: Fixed Mode * [0x01]: Auto Mode, based on LIQ Temp * [0x02]: Auto Mode, based on CH1 Temp * [0x03]: Auto Mode, based on CH2 Temp
	15	Fan Power / Set Point	* Fixed Mode: 0 - 100 (%) * Auto Mode: (Fan Mode * 44) + Temp Set Point (°C or °F)
	16,17	Pump Power	* [0x01] - [0x0A]: (Levels 1 - 10)
	18,19	Flow Meter	See Chart FM1
<b>Alarm Setup</b>	20,21	LIQ Temp	* [0xAAAA]: Disable * Send: (°C * 10) + 2000 * Receive: (°C / 10) - 2000
	22,23	CH1 Temp	
	24,25	CH2 Temp	
	26,27	Flow Meter	* [0xAAAA]: Disable * Send: (LPM or GPM) * 10 * Receive: (LPM or GPM) / 10
	28,29	Fan RPM	* [0xAAAA]: Disable * [0x0064] - [0x2710]: 100 - 10000 RPM (Increments of 100)
30,31	Pump RPM		
<b>Relay Setup</b>	32,33	LIQ Temp	* [0xAAAA] : Disable * Send: (°C * 10) + 2000 * Receive: (°C / 10) - 2000
	34,35	CH1 Temp	
	36,37	CH2 Temp	
	38,39	Flow Meter	* [0xAAAA]: Disable * Send: (LPM or GPM) * 10 * Receive: (LPM or GPM) / 10
	40,41	Fan RPM	* [0xAAAA]: Disable * [0x0064] - [0x2710]: 100 - 10000 RPM (Increments of 100)
42,43	Pump RPM		
<b>Units</b>	44,45	Unit	* [0x0001]: °C / LPM * [0x0002]: °F / GPM
<b>Level Sensor</b>	46,47	Level Sensor	* [0x0001]: Normal * [0x0002]: Problem
	48,49	Level Sensor Setup	See Chart LS1
<b>CRC</b>	50	Check Sum	* Sum(Byte 0, ... Byte 49) % 0x64

Protocol Variant	<b>f.DF (43 Bytes)</b>
Supported Devices	LLX-7000

	Byte	Device	Explanation
<b>STX</b>	0	STX	* [0xCF]: Client to Device * [0xDF]: Device to Client
<b>CMD</b>	1	Command	* [0x01]: Data request (Client to Device) * [0x02]: Data send (Device to Client) * [0x03]: Disconnect (Device to Client) * [0x04]: Set request (Client to Device)
<b>Monitoring Data</b>	2,3	LIQ Temp (°C)	* (°C * 10) + 2000 * [0x0FAC]: Out of Range
	4,5	CH1 Temp	* [0x0FA3]: Sensor Open
	6,7	CH2 Temp	* [0x0FA4]: Sensor Short
	8,9	Fan RPM	* [0x0000] - [0x2710]: 0 - 10,000 RPM
	10,11	Pump RPM	
	12,13	Flow Meter	* [0x0000] - [0x2710]: (LPM or GPM) * 10
<b>User Mode Settings</b>	14	Fan Mode	* [0x00]: Fixed Mode * [0x01]: Auto Mode, based on LIQ Temp * [0x02]: Auto Mode, based on CH1 Temp * [0x03]: Auto Mode, based on CH2 Temp
	15	Fan Power / Set Point	* Fixed Mode: 0 - 100 (%) * Auto Mode: 0 - 100 (°C or °F)
	16,17	Pump Power	* [0x01] - [0x0A]: (Levels 1 - 10)
	18,19	Flow Meter	See Chart FM1
<b>Alarm Setup</b>	20,21	LIQ Temp	* [0x0BB8]: Disable * Send: (°C * 10) + 2000
	22,23	CH1 Temp	* Receive: (°C / 10) - 2000
	24,25	CH2 Temp	Range: 0 - 99°C
	26,27	Flow Meter	* [0x0BB8]: Disable * Send: (LPM or GPM) * 10 * Receive: (LPM or GPM) / 10
<b>Relay Setup</b>	28,29	LIQ Temp	* [0xAAAA]: Disable * Send: (°C * 10) + 2000
	30,31	CH1 Temp	* Receive: (°C / 10) - 2000
	32,33	CH2 Temp	Range: 0 - 99°C
	34,35	Flow Meter	* [0xAAAA]: Disable * Send: (LPM or GPM) * 10 * Receive: (LPM or GPM) / 10
<b>Units</b>	36,37	Unit	* [0x0001]: °C / LPM * [0x0002]: °F / GPM
<b>Level Sensor</b>	38,39	Level Sensor	* [0x0001]: Normal * [0x0002]: Problem
	40,41	Level Sensor Setup	See Chart LS1
<b>CRC</b>	42	Check Sum	* Sum(Byte 0, ... Byte 41) % 0x64

**NOTE:** Devices using the 43 byte length f.DF variant can only be polled for data. Adjusting device settings via protocol is unsupported.

Protocol Variant	f.3C		
Supported Devices	EXC-900		

	Bytes	Name	Value
<b>STX</b>	0	STX	* [0xCF]: Client to Device * [0x3C]: Device to Client
<b>CMD</b>	1	Command	* [0x01]: Data request (Client to Device) * [0x02]: Data send (Device to Client) * [0x03]: Disconnect (Device to Client) * [0x04]: Set request (Client to Device)
<b>Monitoring Data</b>	2,3	LIQ Temp	* °C / °F * [0x0FAC]: Out of Range
	4,5	EXT Temp	* [0x0FA3]: Sensor Open
	6,7	AMB Temp	* [0x0FA4]: Sensor Short
	8,9	Fan RPM	* [0x0000] - [0x2710]: 0 - 10,000 RPM
	10,11	Pump RPM	
	12,13	Flow Meter	* [0x0000] - [0x2710]: (LPM or GPM) * 10
<b>User Mode Settings</b>	14,15	Temp Set Point	Fixed Set Points: * LIQ: (°C or °F) + 500 * EXT: (°C or °F) + 1000 (Range: -20°C to 120°C / -4°F to 248°F)  Delta Set Points: * LIQ-AMB: (°C or °F) + 1500 * EXT-AMB: (°C or °F) + 2000 (Range: -50°C to 50°C / -58°F to 122°F)
	16,17	Pump Power	* [0x00]: Pump Off * [0x01] - [0x0A]: (Levels 1 - 10)
	18,19	Flow Meter	* [0x06AE]: (Always INS-FM17/10mm. See Chart FM1)
<b>Alarm Setup</b>	20,21	(±) Set-Point	* °C / °F (Range: 1°C - 50°C / 1°F - 50°F)
	22,23		* [0x0000] Unused
	24,25		
	26,27	Flow Meter	* [0xAAAA]: Disable * Send: (LPM or GPM) * 10 * Receive: (LPM or GPM) / 10
	28,29	Fan RPM	* [0xAAAA]: Disable
	30,31	Pump RPM	* [0x0064] - [0x2710]: 100 - 10000 RPM (Increments of 100)
<b>Relay Setup</b>	32,33	(±) Set-Point	* °C / °F (Range: 1°C - 50°C / 1°F - 50°F)
	34,35		* [0x0000] Unused
	36,37		
	38,39	Flow Meter	* [0xAAAA]: Disable * Send: (LPM or GPM) * 10 * Receive: (LPM or GPM) / 10
	40,41	Fan RPM	* [0xAAAA]: Disable
	42,43	Pump RPM	* [0x0064] - [0x2710]: 100 - 10000 RPM (Increments of 100)
<b>Units</b>	44,45	Unit	* [0x0001]: °C / LPM * [0x0002]: °F / GPM
<b>Level Sensor</b>	46,47	Level Sensor	* [0x0001]: Normal * [0x0002]: Low
	48,49	Level Sensor Setup	See Chart LS1
<b>CRC</b>	50	Check Sum	* Sum(Byte 0, ... Byte 49) % 0x64

Protocol Variant	f.32
Supported Devices	ALH-2000 (Rev 1.2)

	Byte	Device	Explanation
<b>STX</b>	0	STX	* [0xCF]: Client to Device * [0x32]: Device to Client
<b>CMD</b>	1	Command	* [0x01]: Data request (Client to Device) * [0x02]: Data send (Device to Client) * [0x03]: Disconnect (Device to Client) * [0x04]: Set request (Client to Device)
<b>Monitoring Data</b>	2,3	LIQ Temp (°C)	* (°C * 10) + 2000 * [0x0FAC]: Out of Range * [0x0FA3]: Sensor Open * [0x0FA4]: Sensor Short
	4,5	CH1 Temp	* (°C * 10) + 2000
	6,7	CH2 Temp	* [0x0FAC]: Out of Range
	8,9	Fan RPM	
	10,11	Pump RPM	* [0x0000] - [0x2710]: 0 - 10,000 RPM
	12,13	Flow Meter	* [0x0000] - [0x2710]: (LPM or GPM) * 10
<b>User Mode Settings</b>	14	Fan Mode	* [0x00]: Fixed Mode * [0x01]: Auto Mode, based on LIQ Temp * [0x02]: Auto Mode, based on CH1 Temp * [0x03]: Auto Mode, based on CH2 Temp
	15	Fan Power / Set Point	* Fixed Mode: 0 - 100 (%) * Auto Mode: (Fan Mode * 44) + Temp Set Point (°C or °F)
	16	Heater	* [0x00]: Disable * [0x10]: Enable
	17	Pump Power	* [0x00]: Pump Off * [0x01] - [0x0A]: (Levels 1 - 10)
	18,19	Flow Meter	* [0x06AE]: (Always INS-FM17/10mm. See Chart FM1)
<b>Alarm Setup</b>	20,21	LIQ Temp	* [0xAAAA]: Disable
	22,23	CH1 Temp	* Send: (°C * 10) + 2000
	24,25	CH2 Temp	* Receive: (°C / 10) - 2000
	26,27	Flow Meter	* [0xAAAA]: Disable * Send: (LPM or GPM) * 10 * Receive: (LPM or GPM) / 10
	28,29	Fan RPM	* [0xAAAA]: Disable
30,31	Pump RPM	* [0x0064] - [0x2710]: 100 - 10000 RPM (Increments of 100)	
<b>Relay Setup</b>	32,33	LIQ Temp	* [0xAAAA]: Disable
	34,35	CH1 Temp	* Send: (°C * 10) + 2000
	36,37	CH2 Temp	* Receive: (°C / 10) - 2000
	38,39	Flow Meter	* [0xAAAA]: Disable * Send: (LPM or GPM) * 10 * Receive: (LPM or GPM) / 10
	40,41	Fan RPM	* [0xAAAA]: Disable
42,43	Pump RPM	* [0x0064] - [0x2710]: 100 - 10000 RPM (Increments of 100)	
<b>Units</b>	44,45	Unit	* [0x0001]: °C / LPM * [0x0002]: °F / GPM
<b>Level Sensor</b>	46,47	Level Sensor	* [0x0001]: Normal * [0x0002]: Low
	48,49	Level Sensor Setup	See Chart LS1
<b>CRC</b>	50	Check Sum	* Sum(Byte 0, ... Byte 49) % 0x64

## Reference Charts

### All Variants

Chart CP1

Connection Parameters			
Serial Port	COM1, COM2, etc.	Flow Control (Handshake)	None
Bits/Second (Baud Rate)	9600 bps	Discard Null	False
Parity	None	DTR (Data Terminal Ready)	False
Data Bits	8	RTS (Request To Send)	False
Stop Bits	1	Received Bytes Threshold	1

Chart FM1

Flow Meter Setting Values			
Flow Meter	Tubing Inner Diameter		
	6 mm	10 mm	13 mm
INS-FM14	0x057E	0x0582	0x0586
INS-FM16	0x0646	0x064A	0x064E
INS-FM17	0x06AA	0x06AE	0x06B2
INS-FM18	0x070E	0x0712	0x0716
INS-FM19	0x0772	0x0776	0x077A

Chart LS1

Level Sensor Values			
State	Hex	Alarm	Relay
All Off	0x0001	OFF	OFF
Alarm	0x0002	ON	OFF
Relay	0x0003	OFF	ON
All On	0x0004	ON	ON

### Variants f.DF, f.DF43, f.32

Chart FA1

Fan Auto Mode Set-Point Range					
Sensor	°C		°F		Increments
	Min	Max	Min	Max	
LIQ	-30	90	-22	194	1
CH1	-20	120	-4	248	1
CH2	-20	120	-4	248	1

Chart AR1

Alarm / Relay Setting Range					
Sensor	°C / LPM		°F / GPM		Increments
	Min	Max	Min	Max	
LIQ	0	99	32	211	1
CH1	0	119	32	247	1
CH2	0	119	32	247	1
FAN	100	10000	100	10000	100
PUMP	100	10000	100	10000	100
FLOW	0.1	20	0.1	2.7	0.1

### Variant f.3C

Chart SP1

Temp Set-Point Range					
Sensor	°C		°F		Increments
	Min	Max	Min	Max	
LIQ	-20	120	-4	248	1
EXT	-20	120	-4	248	1
LIQ-AMB	-50	50	-58	122	1
EXT-AMB	-50	50	-58	122	1

Chart AR2

Alarm / Relay Setting Range					
Sensor	°C / LPM		°F / GPM		Increments
	Min	Max	Min	Max	
LIQ	0	99	32	211	1
EXT	0	119	32	247	1
LIQ-AMB	0	119	32	247	1
EXT-AMB	0	119	32	247	1
FLOW	0.1	20	0.1	2.7	0.1
FAN	100	10000	100	10000	100
PUMP	100	10000	100	10000	100