

Spectral Products

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NSeries Ethernet TCP/IP Protocol

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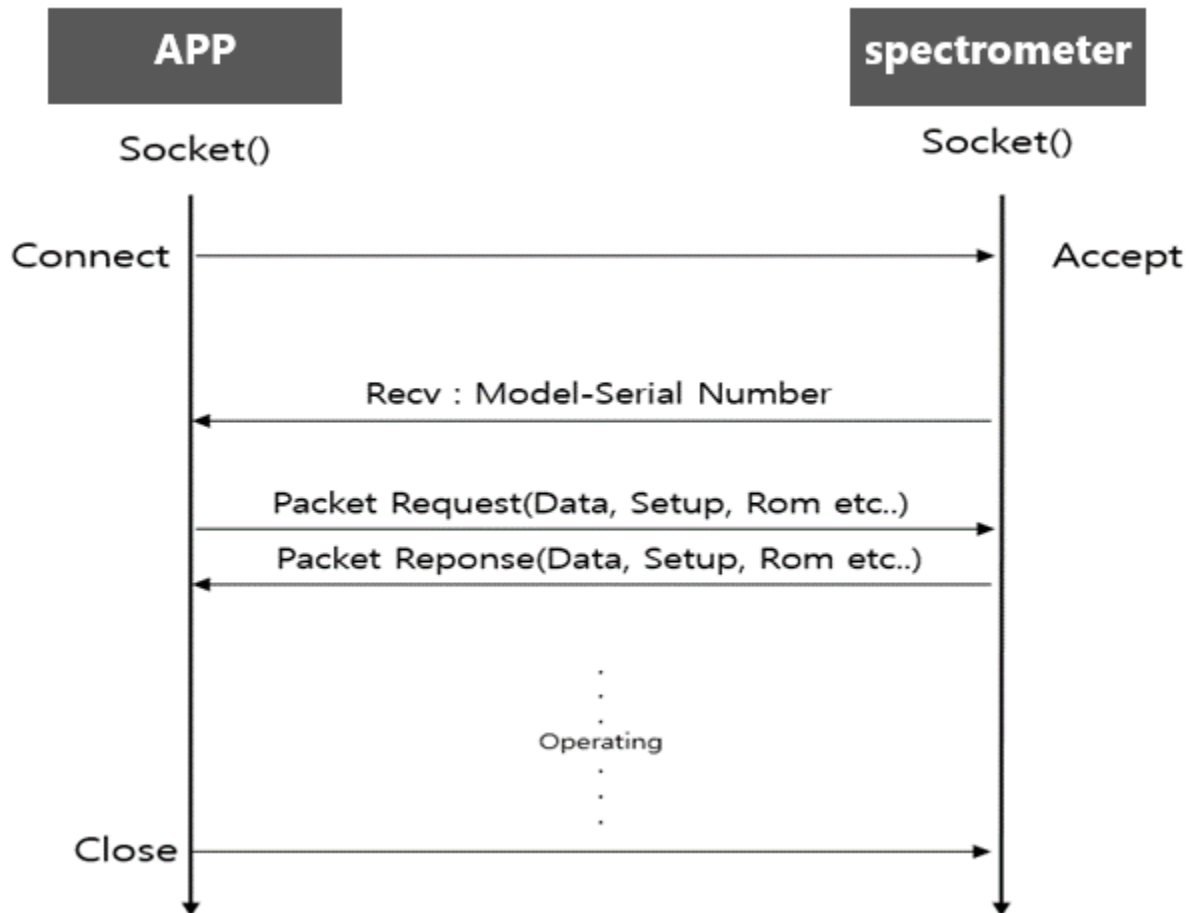
1. Overview

This document contains the Ethernet Interface TCP/IP Protocol of SM####N (SM245N, SM445N, SM642N) products. It communicates with the spectrometer through the protocol packet defined in the document by making a socket connection to the IP address assigned to the spectrometer.

Protocol Packet is composed of Header and Payload. Header is 28 bytes, and the length of Payload is different for each command. The header includes packet information such as command and payload size, and the payload includes spectrometer information required for command operation.

2. Protocol

2. 1. Communication Flow



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2.2. Header Packet

	Variable Name	DataType(Size	Description	Value
Header (28 Byte)	#1: ucCommand	unsigned char (1 byte)	APP → spectrometer	111: SetupOES_REQ
			spectrometer→ APP	112: SetupOES_RES
			APP → spectrometer	161: Get Rom Data_REQ
			spectrometer→ APP	162: Get Rom Data_RES
			APP → spectrometer	123: OES Data Transfer_REQ
			spectrometer→ APP	124: OES Data Transfer_RES
			APP → spectrometer	201: Get Gain Offset_REQ
			spectrometer→ APP	202: Get Gain Offset_RES
			APP → spectrometer	203: Set Gain Offset_REQ
			spectrometer→ APP	204: Set Gain Offset_RES
			APP → spectrometer	125: Burst Data Start_REQ
			spectrometer→ APP	126: Burst Data Start_RES
			APP → spectrometer	127: Burst Data Transfer_REQ
			spectrometer→ APP	128: Burst Data Transfer_RES
			APP → spectrometer	181: Get MemStatus_P1_REQ 191: Get MemStatus_P2_REQ
			spectrometer→ APP	182: Get MemStatus_P1_RES 192: Get MemStatus_P2_RES
			APP → spectrometer	183: Get MemData_REQ 193: Get MemData REQ
			spectrometer→ APP	184: Get MemData_RES 194: Get MemData_RES
			APP → spectrometer	185: Set MemData REQ 195: Set NenData REQ

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
			spectrometer → APP	186: Set MemData RES
			APP → spectrometer	196: Set MemData RES
			spectrometer → APP	197: Set MemDel REQ
				198: Set MemDel RES
	#2: usReserved	unsigned short (2 byte)	Not Use	
	#3: ulReserved	unsigned long (4 byte)	Not Use	
	#4: ulReserved	unsigned long (4 byte)	Not Use	
	#5: ulReserved	unsigned long (4byte)	Not Use	
	#6: ucReserved	unsigned char (1 byte)	Not Use	
	#7: usPayloadSize	unsigned short (2 byte)	Payload Length	0-65535(Size of Payload)
	#8: usReserved	unsigned short (2 byte)	Not Use	
	#9: ucReserved	unsigned char (1 byte)	Not Use	
	#10: ucReserved	unsigned char (1 byte)	Not Use	
	#11: ucReserved	unsigned char (1 byte)	Not Use	
	#12-#16: ucReserved	unsigned char (1 byte * 5)	Not Use	

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2.3. Command List

Command	Transaction			Description
	APP			
Setup OES	Req			<u>Spectrometer Settings</u>
			Res	Integration Time, Time Average, Trigger Mode
Get Rom Data	Req			Request to transmit information stored in the
			Res	EEPROM of the spectrometer
OES Data Transfer	Req			Spectroscopy data acquisition and transmission
			Res	(one measurement)
Get Gain Offset	Req			Request to transmit the gain offset value of the
			Res	spectrometer signal
Set Gain Offset	Req			Request to set Gain Offset of spectrometer signal
			Res	
Burst Data Start	Req			Start Spectrometer Data Acquisition (Burst Mode)
			Res	
Burst Data Transfer	Req			Request to transmit data measured in Burst Mode
			Res	
Get Memory Status P1, P2	Req			Memory area storage state information fairy
			Res	
Get Memory Data P1, P2	Req			Request data stored in memory
			Res	
Set Memory Data P1, P2	Req			Request to store data in memory area
			Res	
Del Memory Data	Req			Request to delete data stored in the memory area
			Res	

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2.4. Command Protocol Packet

2.4.1 Setup OES

Command	Setup OES				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Setup OES_REQ(111)			28 byte	
Payload	1. usReserved	unsigned short	0-65535	2 bytes	Not Use
	2. usReserved	unsigned short	0-65535	2 bytes	Not Use
	3. usTimeAverage	unsigned short	0-65535	2 bytes	Time Average
	4. usIntegrationTimeIn (ms)	unsigned short	1-65535	2 bytes	Integration Time(ms)
	5. usRunMode	unsigned short	1-4	2 bytes	1: Free run Next 2: Free Run Prv 3. SW Trigger 4. HW Trigger
	6. usReserved	unsigned short	0-65535	2 bytes	Not Use
	7. ulIntegrationTimeIn (ms)	unsigned long	100-65535000	4 bytes	Integration Time(us)
Notice	When communicating with SM445N, SM642N, the Integration Time is set to 7.ulIntegrationTimeInMicroSec Enter the packet in US unit and send it Total Packet: Header Packet + Payload Packet = 44 bytes				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Setup OES_RES(112)			28 bytes	
Payload	NULL				-
Notice	Total Packet: Header Packet + Payload Packet = 28 byte				

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2.4.2. Get Rom Data

Command	Get Rom Data				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Get Rom Data_REQ(161)			28 bytes	
Payload	NULL				
Notice	Total Packet: Header Packet + Payload Packet = 28 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Get Rom Data_RES(162)			28 bytes	
Payload	1. ucRomDataBuffer	unsigned char	0-255	1024 * 1 byte	1024 byte Rom Data
Notice	Returns the factory default information stored in the EEPROM of the spectrometer as 1024 bytes of text Total Packet: Header + Payload size = 1052 bytes				

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2.4.3. OES Data Transfer

Command	OES Data Transfer				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: OES Data Transfer(123)			28 bytes	
Payload	NULL				-
Notice	Total Packet: Heder Packet + Payload Packet = 28 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Setup OES_RES(124)			28 bytes	
Payload	1. usReserved	unsigned short	0-65535	2 bytes	Not Use
	2. usReserved	unsigned short	0-65535	2 bytes	Not Use
	3. usReserved	unsigned short	0-65535	2 bytes	Not Use
	4. usLength	unsigned short	0-65535	2 bytes	CCD Total Pixel Num
	5. usTCPdataArray	unsigned short	0-65535	usLength * 2byte	CCD Data Array
Notice	<p>The size of usTCPdataArray varies according to the number of CCD Pixels of the spectrometer, and the number of CCD Pixels is included in usLength.</p> <p>Payload Size by Model = usBinIndex + usTotalSectionCount + usPortNu,+ usLength + usTCPdataArray</p> <p>SM245N: 2 byte + 2 byte + 2 byte + 2 byte + (2080 * 2byte) = 4168 byte SM445N: 2 byte + 2 byte + 2 byte + 2 byte + (3680 * 2byte) = 7368 byte SM642N: 2 byte + 2 byte + 2 byte + 2 byte + (2080 * 2byte) = 4168 byte</p> <p>Total Packet: Header + Payload size</p>				

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2.4.4. Get Gain Offset

Command	Get Gain Offset				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Get Gain Offset_REQ(201)			28 byte	
Payload	NULL				
Notice	Total Packet: Header Packet + Payload Packet = 28 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Get Gain Offset_RES(202)			28 byte	
Payload	1. usGain	unsigned short	0-65535	2 byte	Gain
	2. usOffset	unsigned short	0-65535	2 byte	Offset
Notice	Total Packet: Header + Payload size = 32 byte				

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2.4.5. Set Gain Offset

Command	Set Gain Offset				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Set Gain Offset_REQ(203)			28 byte	
Payload	1. usGain	unsigned short	0 - 65535	2 byte	Gain
	2. usOffset	unsigned short	0 - 65535	2 byte	Offset
	3. usNVREGSave	unsigned short	0 - 1	2 byte	Save Mode
Notice	usNVREGSave is Gain, Offset setting mode. 0: Set the initial default value. Maintain the set value when reconnecting the spectrometer. 1: Change the current setting value. Reset to default value when reconnecting spectrometer Total Packet: Header Packet + Payload Packet = 34 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Set Gain Offset_RES(204)			28 byte	
Payload					
Notice	Total Packet: Header + Payload size = 32 byte				

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2.4.6. Burst Data Start

Command	Burst Data Start				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Burst Data Start_REQ(125)			28 byte	
Payload	1. usCount	unsigned short	0 - 65535	2 byte	Measure Count
	2. usMode	unsigned char	0 - 1	1 byte	0: Single 1: Continuous
Notice	Total Packet: Header Packet + Payload Packet = 31 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Burst Data Start_RES(126)			28 byte	
Payload	1. usBurstDataCnt	unsigned short	0-65535	2 byte	Measure Count
	2. usReserved	unsigned short	0-65535	2 byte	Not Use
	3. usReserved	unsigned short	0-65535	2 byte	Not Use
	4. usBurstDataLength	unsigned short	0-65535	2 byte	CCD Pixel Count
Notice	Total Packet: Header + Payload size = 36 byte				

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2.4.7. Burst Data Transfer

Command	Burst Data Transfer				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Burst Data Transfer_REQ(127)			28 byte	
Payload	NULL				
Notice	Normal operation must be preceded by Burst Data Start. Total Packet: Header Packet + Payload Packet = 28 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Burst Data Transfer_RES(128)			28 byte	
Payload	1. usReserved	unsigned short	0-65535	2 byte	Not Use
	2. usReserved	unsigned short	0-65535	2 byte	Not Use
	3. usReserved	unsigned short	0-65535	2 byte	Not Use
	4. usLength	unsigned short	0-65535	2 byte	CCD Total Pixel Num
	5. usBurstDataArray	unsigned short	0-65535	usLength * 2byte	CCD Data Array
Notice	The payload size for each model is the same as the payload of OES Data Transfer_RES Total Packet: Header + Payload size				

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2.4.8. Get Memory Status P1 & Get Memory Status P2

Command	Get Memory Status P1 & Get Memory Status P2				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Get MemStatus P1_REQ(181) or Get MemStatus P2 REQ(191)			28 byte	
Payload	NULL				
Notice	Total Packet: Header Packet + Payload Packet = 28 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Get MemStatus P1_RES(182) or Get MemStatus P2_RES(192)			28 byte	
Payload	1. ucMemState_0	unsigned char	0-256	1 byte	1: Saved Memory 255: Empty
	2. ucIndexName_0	unsigned char	0-255	100 * 1 byte	Memory Address Name
				
	9. ucMemState_9	unsigned char	0-256	1 byte	1: Saved Memory 255: Empty
	10. ucIndexName_9	unsigned char	0-255	100 * 1 byte	Memory Address Name
Notice	Each page contains 10 memory addresses, and returns the status of the memory addresses. usMemState: Save state = 1 byte ucIndexName: Named name of Memory Address = 100byte Total Packet: Header + Payload size = 1038 byte				

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2.4.9. Get Memory Data P1 & Get Memory Data P2

Command	Get Memory Data P1 & Get Memory Data P2				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Get MemData P1_REQ(183) or Get MemData P2_REQ(193)			28 byte	
Payload	1. ucMemIndex	unsigned char	0-9	1 byte	Memory Address
Notice	Total Packet: Heder Packet + Payload Packet = 29 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Get MemData P1_RES(184) or Get MemData P2_RES(194)			28 byte	
Payload	1. usReserved	unsigned short	0-65535	2 byte	Not Use
	2. usReserved	unsigned short	0-65535	2 byte	Not Use
	3. usReserved	unsigned short	0-65535	2 byte	Not Use
	4. usLength	unsigned short	0-65535	2 byte	CCD Total Pixel Num
	5. usTCPDataArray	unsigned short	0-65535	usLength * 2byte	CCD Data Array
Notice	The payload size for each model is the same as the payload of OES Data Transfer_RES Total Packet: Header + Payload size				

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2.4.10 Set Memory Data P1 & Set Memory Data P2

Command	Set Memory Data P1 & Set Memory Data P2				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Set MemData P1_REQ(185) or Set MemData P2 REQ(195)			28 byte	
Payload	1. ucMemIndex	unsigned char	0-9	1 byte	Memory Address
	2. ucIndexName	unsigned char	0-255	100 * 1 byte	Memory Address Name
	3. usTCPdataArray	unsigned short	0-65535	usLength * 2byte	CCD Data Array
Notice	<p>The size of usTCPdataArray varies according to the number of CCD Pixels of the spectrometer, and information on the number of CCD Pixels is included in usLength.</p> <p>Payload Size by Model = ucMemAddress + ucAddressName + usTCPdataArray</p> <p>SM245N: 1 byte + 100 byte + (2080 * 2byte) = 4261 byte SM445N: 1 byte + 100 byte + (3680 * 2byte) = 7461 byte SM642N: 1 byte + 100 byte + (2080 * 2byte) = 4260 byte</p> <p>※ WARNING: If you enter a value outside the specified range for ucMemIndex, the spectrometer system damage may occur.</p> <p>Total Packet: Header + Payload size</p>				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Set MemData P1_RES(186) or Set MemData P2_RES(196)			28 byte	
Payload	NULL				
Notice	Total Packet: Header + Payload size = 28 byte				

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2.4.11. Del Memory Data

Command	Del Memory Data				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Del MemData_REQ(197)			28 byte	
Payload	1. ucMemAddress	unsigned char	10-29	1 byte	P1: 10 -19 P2: 20 - 29
Notice	Memory area P1 address is 10-19, P2 address is 20-29 ※ WARNING: If you input a value outside the specified range for ucMemAddress, the spectrometer system damage may occur. Total Packet: Header Packet + Payload Packet = 29 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Del MemData P1_RES(198)			28 byte	
Payload	NULL				
Notice	Total Packet: Header Packet + Payload Packet = 28 byte				

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2.4.12 OES Data Transfer OutTrg

Command	OES Data Transfer OutTrg				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: OES Data Transfer OutTrg REQ(207)			28 byte	
Payload	NULL				-
Notice	Sends a command to OES Data Transfer OutTrg REQ , but the response is OES Data Transfer RES . Total Packet: Header Packet + Payload Packet = 28 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: OES Data Transfer RES(124)			28 byte	
Payload	1. usReserved	unsigned short	0-65535	2 byte	Not Use
	2. usReserved	unsigned short	0-65535	2 byte	Not Use
	3. usReserved	unsigned short	0-65535	2 byte	Not Use
	4. usLength	unsigned short	0-65535	2 byte	CCD Total Pixel Num
	5. usTCPdataArray	unsigned short	0-65535	usLength * 2byte	CCD Data Array
Notice	The size of usTCPdataArray varies according to the number of CCD Pixels of the spectrometer, and the number of CCD Pixels is included in usLength . Payload Size by Model $= \text{usBinIndex} + \text{usTotalSectionCount} + \text{usPortNu} + \text{usLength} + \text{usTCPdataArray}$ SM245N: 2 byte + 2 byte + 2 byte + 2 byte + (2080 * 2byte) = 4168 byte SM445N: 2 byte + 2 byte + 2 byte + 2 byte + (3680 * 2byte) = 7368 byte SM642N: 2 byte + 2 byte + 2 byte + 2 byte + (2080 * 2byte) = 4168 byte Total Packet: Header + Payload size				

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2.4.13 Set Pin OutTrg

Command	Set Gain Offset				
Request				Direction	APP → Spectrometer
	Item	Type	Value	Size	Description
Header	Command: Set Pin OutTrg REQ(209)			28 byte	
Payload	1. ucOutPin	unsigned char	0-7	1 byte	Output Pin Set
	2. usDelay	unsigned short	0-65535	2 byte	Init Delay
Notice	usDelay is a digital value and the valid input range is 0-65535 for SM245N and 0-996 for SM642N, and the actual delay time is calculated as follows. $\text{Actual delay (us) for SM245N} = 16\text{us} + (\text{usDelay} * 1.3\text{us})$ $\text{Actual delay (us) for SM642N} = 20\text{us} + (\text{usDelay} * 6\text{us})$				
	Total Packet: Header Packet + Payload Packet = 31 byte				
Response				Direction	Spectrometer → APP
	Item	Type	Value	Size	Description
Header	Command: Set Pin OutTrg RES(210)			28 byte	
Payload	NULL				
Notice	Total Packet: Header + Payload size = 28 byte				