EPSON
EXCEED YOUR VISION

S1S60000
Application Note

No.3 How To Use the UDP/IP Communication End Points

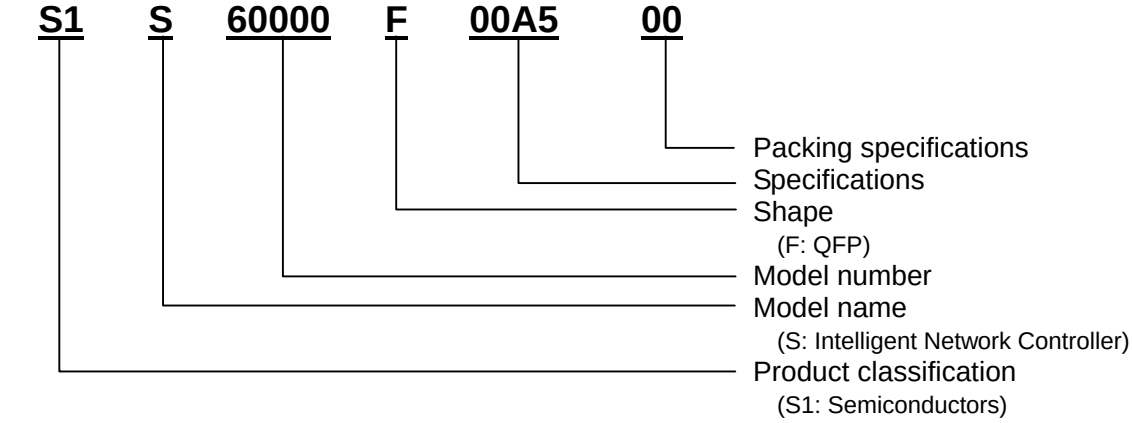
SEIKO EPSON CORPORATION

Rev.1.1

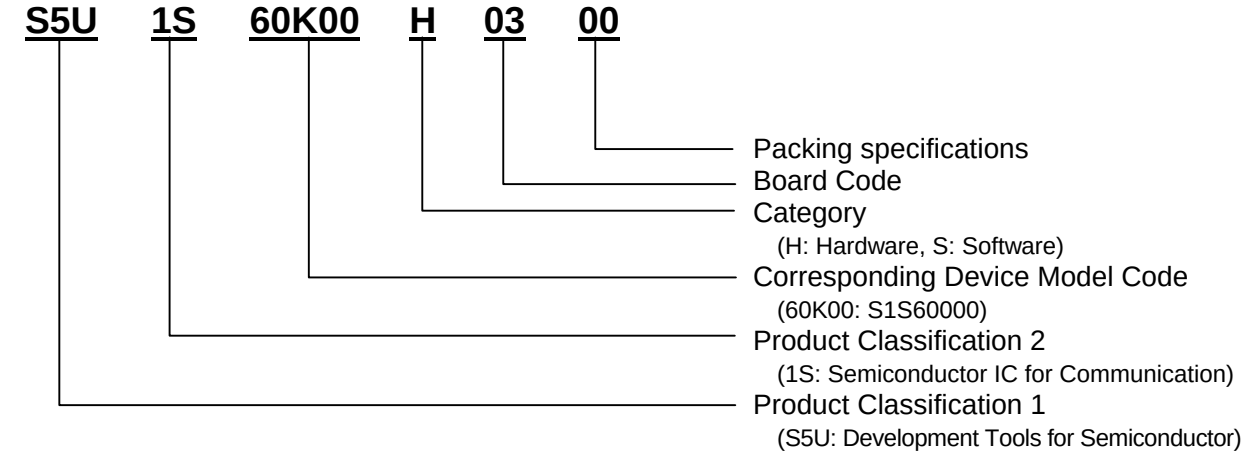
NOTICE

Configuration of product number

●DEVICES



●Evaluation Board



CONTENTS

1. DESCRIPTION

This document describes the basic procedure to open the UDP end points of S1S60000 module and to send or receive data to/from the host CPU.
When the UDP end point of the S1S60000 is opened, the UDP/IP data transmission is enabled between the S1S60000 and network devices.

2. SETUP BEFORE OPENING THE UDP END POINTS

First, open the SYSTEM communication end point of the S1S60000. For details, see the "S1S60000 Application Note: No.2 Ping Reply Method". In this example, the IP address of 192.168.0.254 is used to open the SYSTEM communication end point.

3. OPENING THE UDP END POINT

The S1S60000 has four UDP end points: UDP0 to UDP3. This example uses UDP0 (end-point number 6) for UDP connection. For detailed commands, status and data transmission between the host CPU and the S1S60000, see the "Ping Reply Method".
This section explains how to open the UDP end point from the host CPU. The procedure is as follows.

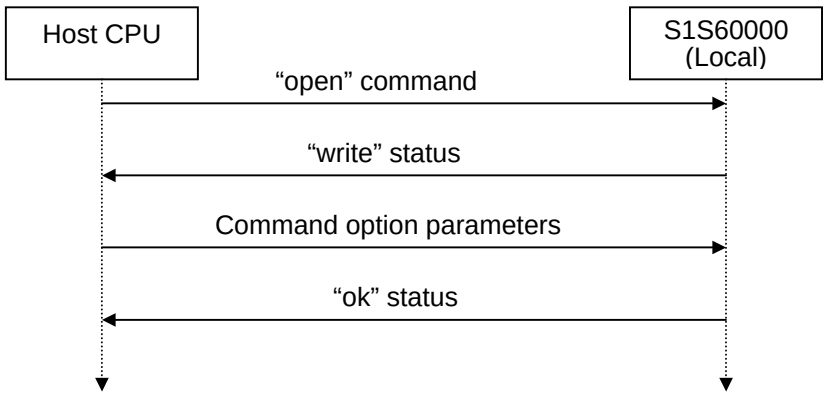


Fig.3.1 Flow to Open UDP End Points

From the host CPU, issue "open" command (0x0160: sequence number 01, end-point number 6 = UDP0, and command number 0 = open) to the command port.

3. OPENING THE UDP END POINT

The S1S60000 returns "write" status (0x0161: sequence number 01, end-point number 6 = UDP0, and status number 1 = write). Read the "write" status from the status port. In this example, open the UDP end point to allow communication without setting a specific remote host. To do so, disable the remote IP address, disable the remote port number, enable the local port number (49152), and disable the timeout value. Create the end-point open parameters in memory of the host CPU as follows, and write them into the data port.

Table 3.1 Command Option Parameter Set Values

BYTE	Write value	Contents	Comment
0	0x00	Fixed value	
1	0x00		
2	0x90	Flag	Bit 7 (Active open) = 1, Bit 6 (Remote IP address disabled) = 0, Bit 5 (Remote port number disabled) = 0, Bit 4 (Local port number enabled) = 1, Bit 3 (Reserved) = 0, Bit 2 (Timeout value disabled) = 0, Bit 1 (Reserved) = 0, Bit 0 (Reserved) = 0
3	0x00	Fixed value	
4	0x00	Remote IP address	Omit them as the remote IP address is disabled due to disabled bit 6 of byte 2.
5	0x00		
6	0x00		
7	0x00		
8	0x00	Remote port number	Omit them as the remote port number is disabled due to disabled bit 5 of byte 2.
9	0x00		
10	0xC0	Local port number	49152(0xC000)
11	0x00		
12	0x00	Timeout value	Disabled timeout value 0
13	0x00		
14	0x00	Fixed value	
15	0x00		

When the command option parameters are stored in memory, BYTE 0 of Table 3.1 is set to the low-order addresses of memory.

The write data row for each host CPU type is as follows.

Table 3.2 Data Row for Each Host CPU Type

Host CPU type	Data row
8-bit connection LittleEndian	0x00,0x00,0x90,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0xc0,0x00,0x00,0x00,0x00,0x00
8-bit connection BigEndian	0x00,0x00,0x90,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0xc0,0x00,0x00,0x00,0x00,0x00
16-bit connection LittleEndian	0x0000,0x0090,0x0000,0x0000,0x0000,0x00c0,0x0000,0x0000
16-bit connection BigEndian	0x0000,0x9000,0x0000,0x0000,0x0000,0xc000,0x0000,0x0000

* Access sequence during 8-bit connection: From low-order ports to high-order ports

When the "ok" status (0x0163: sequence number 01, end-point number 6 = UDP0, and status number 3 = ok) is returned, the "open" command processing has completed.

4. RECEIVING DATA

This section explains how to read the data on the host CPU when the S1S60000 receives data from the network. The procedure is as follows.

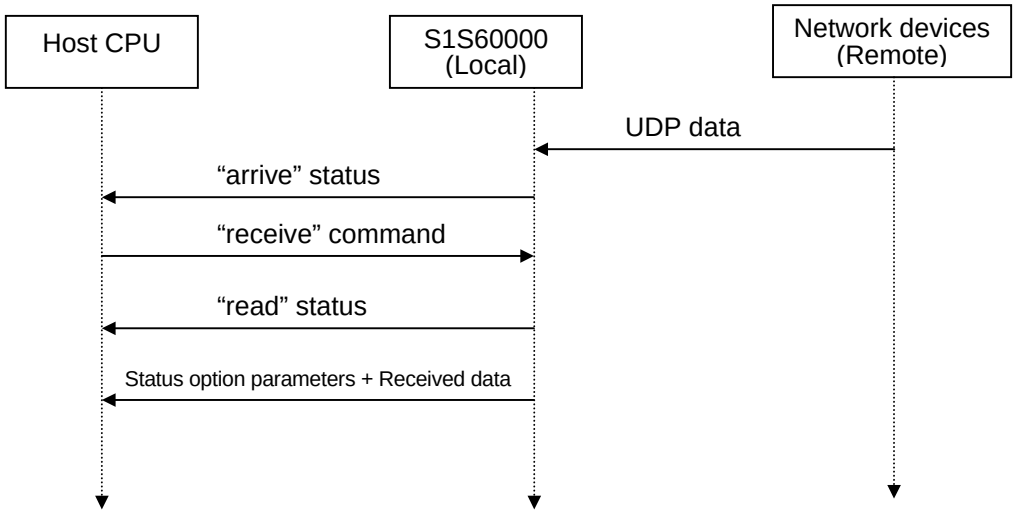


Fig.4.1 Flow of Host CPU Data Reception

When receiving data from the network, the S1S60000 outputs “arrive” status (0x006d: sequence number 00, end-point number 6 = UDP0, and status number d = arrive) to the host CPU. The host CPU issues “receive” command (0x0262: sequence number 02, end-point number 6 = UDP0, and command number 2 = receive). When “read” status (0x0262: sequence number 02, end-point number 6 = UDP0, and status number 2 = read) is responded to the “receive” command, read the received data from the data port.
The first two bytes of “read” status option are the received data length. The length is shown in bytes. If the received data length is “n” bytes, the received data is read from the data port in units of 16 bits for “n/2” times if “n” is an even number or “(n+1)/2” times if “n” is an odd number. The received data is read in units of 8 bits for “n” times if “n” is an even number or “(n+1)” times if it is an odd number. Read it from the data port for the required number of times.
If the 11-byte character code (hex.) of character string “0123456789A” is received from a device having IP address 192.168.0.2 and port number 1039, the following data row is read.

Table 4.1 “receive-read” Status Options and Readout of Received Data

BYTE	Write value	Contents	Comment
0	0x00	Received data length	11-byte data is received.
1	0x0b		
2	0x63	Flag	Bit 7 (End of data) = 0, Bit 6 (Remote IP address enabled) = 1, Bit 5 (Remote port number enabled) = 1, Bit 4 (Unicast) = 0, Bit 3 (Control flag disabled) = 0, Bit 2 (Reserved) = 0, Bit 1 (Data offset enabled) = 1, Bit 0 (Overall data length enabled) = 1
3	0x00	Fixed value	
4	0xC0	Remote IP address	192.168.0.2 (0xc0.0xa8.0x00.0x02)
5	0xA8		
6	0x00		
7	0x02		
8	0x04	Remote port number	1039 (0x040f)
9	0x0F		
10	0x00	Fixed value	
11	0x00		
12	0x00	Data offset	
13	0x00		
14	0x00	Overall data length	
15	0x0b		
16	0x30	Received data	The 11-byte character code (hex.) of character string “0123456789A” is received.
17	0x31		
18	0x32		
19	0x33		
20	0x34		
21	0x35		
22	0x36		
23	0x37		
24	0x38		
25	0x39		
26	0x41		
27	0xXX	padding	It is padded as the data is in odd-numbered bytes.

When the command option parameters are stored in memory, BYTE 0 of Table 4.1 is set to the low-order addresses of memory.

The read data row for each host CPU type is as follows.

Table 4.2 Data Row for Each Host CPU Type

Host CPU type	Data row
8-bit connection LittleEndian	0x00,0x0b,0x63,0x00,0xc0,0xa8,0x00,0x02,0x04,0x0f,0x00,0x00,0x00,0x00,0x00,0x0b 0x30,0x31,0x32,0x33,0x34,0x35,0x36,0x37,0x38,0x39,0x41,0xXX
8-bit connection BigEndian	0x00,0x0b,0x63,0x00,0xc0,0xa8,0x00,0x02,0x04,0x0f,0x00,0x00,0x00,0x00,0x00,0x0b 0x30,0x31,0x32,0x33,0x34,0x35,0x36,0x37,0x38,0x39,0x41,0xXX
16-bit connection LittleEndian	0x0b00,0x0063,0xa8c0,0x0200,0x0f04,0x0000,0x0000,0x0b00, 0x3130,0x3332,0x3534,0x3736,0x3938,0xXX41
16-bit connection BigEndian	0x000b,0x6300,0xc0a8,0x0002,0x040f,0x0000,0x0000,0x000b, 0x3031,0x3233,0x3435,0x3637,0x3839,0x41XX

* Access sequence during 8-bit connection: From low-order ports to high-order ports

5. SENDING DATA

This section explains the procedure you perform on the host CPU to transmit data from the S1S60000 to the network. The procedure is as follows.

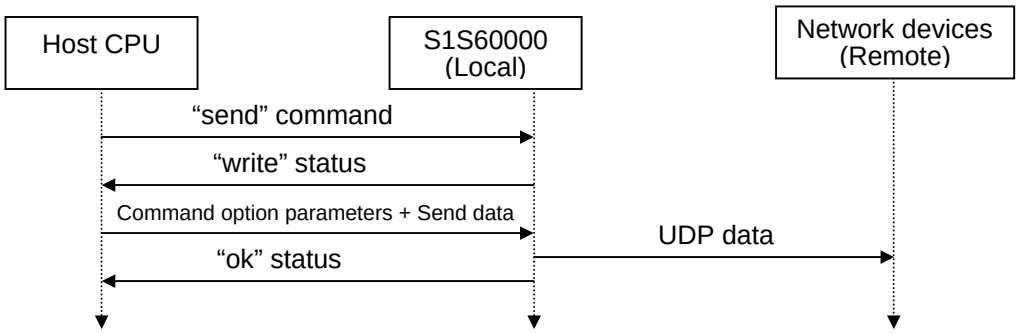


Fig.5.1 Flow of Host CPU Data Transmission

From the host CPU, issue “send” command (0x0361: sequence number 03, end-point number 6 = UDP0, and command number 1 = send). When the S1S60000 returns “write” status (0x0361: sequence number 03, end-point number 6 = UDP0, and status number 1 = write), write both the command option parameters and the send data (in this order) into the data port. In this example, the 11-byte character code (hex.) of character string “0123456789A” is sent to the device having IP address 192.168.0.2 and port number 1039.

Table 5.1 Command Option Parameters and Send Data Values

BYTE	Write value	Contents	Comment
0	0x00	Send data length	11-byte data is sent.
1	0x0b		
2	0x60	Flag	Bit 7 (End of data) = 0, Bit 6 (Remote IP address enabled) = 1, Bit 5 (Remote port number enabled) = 1, Bit 4 (Unicast) = 0, Bit 3 (Control flag disabled) = 0, Bit 2 (Reserved) = 0, Bit 1 (Data offset disabled) = 0, Bit 0 (Overall data length disabled) = 0
3	0x00	Fixed value	
4	0xc0	Remote IP address	192.168.0.2 (0xc0.0xa8.0x00.0x02)
5	0xa8		
6	0x00		
7	0x02		
8	0x04	Remote port number	1039 (0x040f)
9	0x0f		
10	0x00	Fixed value	
11	0x00		
12	0x00		
13	0x00		
14	0x00	Overall data length	If the send data is longer than the maximum length (556 bytes) of the UDP end point, set the overall data length.
15	0x00		
16	0x30	Send data	The 11-byte character code (hex.) of character string “0123456789A” is received.
17	0x31		
18	0x32		
19	0x33		
20	0x34		
21	0x35		
22	0x36		
23	0x37		
24	0x38		
25	0x39		
26	0x41		
27	0xXX	padding	It is padded as the data is in odd-numbered bytes.

When the command option parameters are stored in memory, BYTE 0 of Table 5.1 is set to the low-order addresses of memory.

The write data row for each host CPU type is as follows.

Table 5.2 Data Row for Each Host CPU Type

Host CPU type	Data row
8-bit connection LittleEndian	0x00,0x0b,0x60,0x00,0xc0,0xa8,0x00,0x02,0xc0,0x01,0x00,0x00,0x00,0x00,0x00,0x00
8-bit connection BigEndian	0x00,0x0b,0x60,0x00,0xc0,0xa8,0x00,0x02,0xc0,0x01,0x00,0x00,0x00,0x00,0x00,0x00
16-bit connection LittleEndian	0x0b00,0x0060,0xa8c0,0x0200,0x01c0,0x0000,0x0000,0x0000, 0x3130,0x3332,0x3534,0x3736,0x3938,0xXX41
16-bit connection BigEndian	0x000b,0x6000,0xc0a8,0x0002,0xc010,0x0000,0x0000,0x0000, 0x3031,0x3233,0x3435,0x3637,0x3839,0x41XX

* Access sequence during 8-bit connection: From low-order ports to high-order ports

The number of times of writing the send data in the unit of 16 bits is “n/2” times when the send data length “n” (bytes) is an even number or “(n+1)/2” times if it is an odd number.
Here as the send data length (n) is 11 bytes, the send data is written in units of 16 bits into the data port for “(n+1)/2=6” times (total 14 times together with the command option of “16 bytes/2”=8). The send data is written in units of 8 bits for “n” times if “n” is an even number or “(n+1)” times if it is an odd number. Instead of the “write” status, the “busy” status (0x0467: sequence number 04, end point number 6 = UDP0, and status number 7 = busy) may be returned. In such case, internal buffers of the S1S60000 are insufficient. The S1S60000 may have already received the “arrive” status or it has issued the “send” command too many times. Issue the “receive” command first, or wait for a while.

6. CLOSING THE UDP END POINT

From the host CPU, issue “close” command (0x0564: sequence number 05, end-point number 6 = UDP0, and command number 4 = close). The S1S60000 returns “ok” status (0x0563: sequence number 05, end-point number 6 = UDP0, and status number 3 = ok).

EPSON

International Sales Operations

AMERICA

EPSON ELECTRONICS AMERICA, INC.
HEADQUARTERS
150 River Oaks Parkway
San Jose, CA 95134, U.S.A.
Phone: +1-800-228-3964 FAX: +1-408-922-0238

SALES OFFICES

West
1960 E.Grand Avenue Flr 2
El Segundo, CA 90245, U.S.A.
Phone: +1-800-249-7730 FAX: +1-310-955-5400

Central
101 Virginia Street, Suite 290
Crystal Lake, IL 60014, U.S.A.
Phone: +1-800-853-3588 FAX: +1-815-455-7633

Northeast
301 Edgewater Place, Suite 210
Wakefield, MA 01880, U.S.A.
Phone: +1-800-922-7667 FAX: +1-781-246-5443

Southeast
3010 Royal Blvd. South, Suite 170
Alpharetta, GA 30005, U.S.A.
Phone: +1-877-332-0020 FAX: +1-770-777-2637

EUROPE

EPSON EUROPE ELECTRONICS GmbH
HEADQUARTERS
Riesstrasse 15
80992 Munich, GERMANY
Phone: +49-89-14005-0 FAX: +49-89-14005-110

DÜSSELDORF BRANCH OFFICE
Altstadtstrasse 176
51379 Leverkusen, GERMANY
Phone: +49-2171-5045-0 FAX: +49-2171-5045-10

FRENCH BRANCH OFFICE
1 Avenue de l' Atlantique, LP 915 Les Conquerants
Z.A. de Courtaboeuf 2, F-91976 Les Ulis Cedex, FRANCE
Phone: +33-1-64862350 FAX: +33-1-64862355

BARCELONA BRANCH OFFICE
Barcelona Design Center
Edificio Testa, C/Alcalde Barnils 64-68, Modulo C 2a planta
E-08190 Sant Cugat del Vallès, SPAIN
Phone: +34-93-544-2490 FAX: +34-93-544-2491

UK & IRELAND BRANCH OFFICE
8 The Square, Stockley Park, Uxbridge
Middx UB11 1FW, UNITED KINGDOM
Phone: +44-1295-750-216/+44-1342-824451
FAX: +44-89-14005 446/447

Scotland Design Center
Integration House, The Alba Campus
Livingston West Lothian, EH54 7EG, SCOTLAND
Phone: +44-1506-605040 FAX: +44-1506-605041

ASIA

EPSON (CHINA) CO., LTD.
23F, Beijing Silver Tower 2# North RD DongSanHuan
ChaoYang District, Beijing, CHINA
Phone: +86-10-6410-6655 FAX: +86-10-6410-7320

SHANGHAI BRANCH
7F, High-Tech Bldg., 900, Yishan Road,
Shanghai 200233, CHINA
Phone: +86-21-5423-5522 FAX: +86-21-5423-5512

EPSON HONG KONG LTD.
20/F., Harbour Centre, 25 Harbour Road
Wanchai, Hong Kong
Phone: +852-2585-4600 FAX: +852-2827-4346
Telex: 65542 EPSCO HX

EPSON Electronic Technology Development (Shenzhen) LTD.
12/F, Dawning Mansion, Keji South 12th Road,
Hi-Tech Park, Shenzhen
Phone: +86-755-2699-3828 FAX: +86-755-2699-3838

EPSON TAIWAN TECHNOLOGY & TRADING LTD.
14F, No. 7, Song Ren Road,
Taipei 110
Phone: +886-2-8786-6688 FAX: +886-2-8786-6677

HSINCHU OFFICE
No. 99, Jiangong Road,
Hsinchu City 300
Phone: +886-3-573-9900 FAX: +886-3-573-9169

EPSON SINGAPORE PTE., LTD.
1 HarbourFront Place,
#03-02 HarbourFront Tower One, Singapore 098633
Phone: +65-6586-5500 FAX: +65-6271-3182

SEIKO EPSON CORPORATION
KOREA OFFICE
50F, KLI 63 Bldg., 60 Yoido-dong
Youngdeungpo-Ku, Seoul, 150-763, KOREA
Phone: +82-2-784-6027 FAX: +82-2-767-3677

GUMI OFFICE
2F, Grand B/D, 457-4 Songjeong-dong,
Gumi-City, KOREA
Phone: +82-54-454-6027 FAX: +82-54-454-6093

SEIKO EPSON CORPORATION
SEMICONDUCTOR OPERATIONS DIVISION

IC Sales Dept.
IC Marketing Group
421-8, Hino, Hino-shi, Tokyo 191-8501, JAPAN
Phone: +81-42-587-5814 FAX: +81-42-587-5117

Document Code: 410503400
First Issue January 2006
Printed in JAPAN (H)