HIOKI

Remote Operation Manual

SS7012

DC SIGNAL SOURCE

Contents

ii

Contents

Introduction

This manual details the methods to operate the SS7012 DC Signal Source using communication functions, as well as all the commands used by the SS7012.
When the communication function is used, the SS7012 can be manually operated using communication terminal software. Furthermore, application software to automatically control the SS7012 can be run.

Safety Information

The following symbols in this manual indicate the relative importance of cautions and warnings.

⚠ CAUTION	Indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument.
NOTE	Indicates advisory items related to performance or correct operation of the instrument.

SS7012 Remote Interface Overview

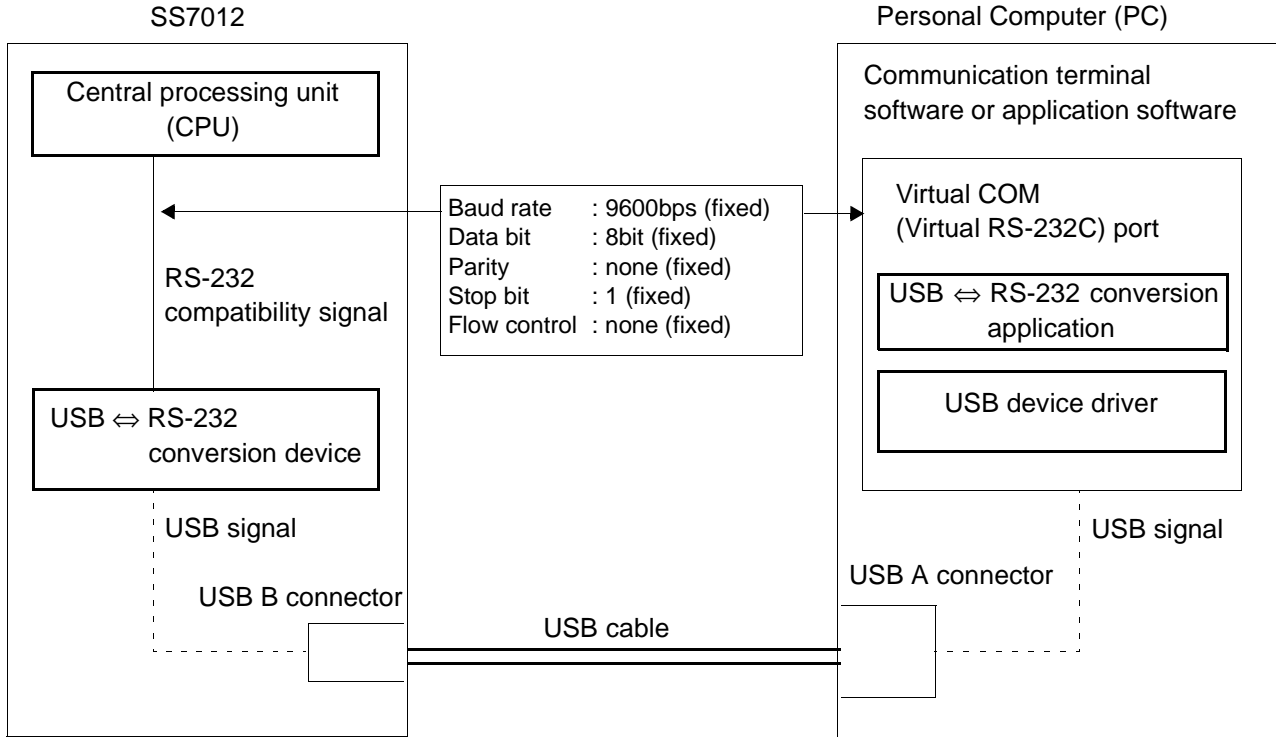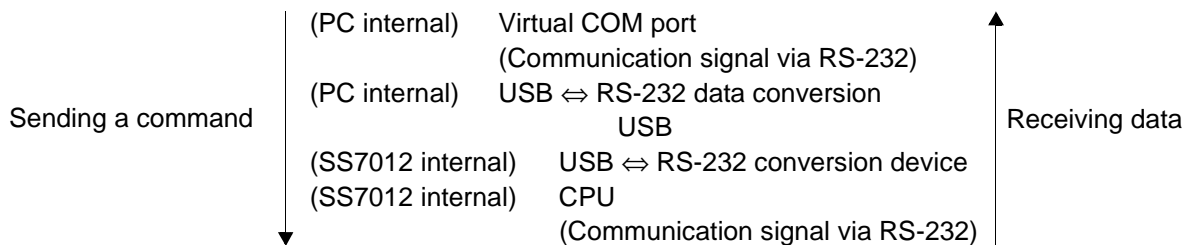Figure 1 shows a block diagram of the SS7012 remote interface.

SS7012   Personal Computer (PC)

Central processing unit (CPU)

Communication terminal software or application software

Virtual COM (Virtual RS-232C) port

Baud rate	: 9600bps (fixed)
Data bit	: 8bit (fixed)
Parity	: none (fixed)
Stop bit	: 1 (fixed)
Flow control	: none (fixed)

RS-232 compatibility signal

USB ⇔ RS-232 conversion application

USB device driver

USB ⇔ RS-232 conversion device

USB signal   USB signal

USB B connector   USB A connector

USB cable

Figure 1: Overview block diagram of the SS7012 remote interface

Operating principle

Communication between a personal computer and the SS7012 is virtual RS-232 serial communication. While the USB interface is installed as the transmission route, actual communication uses RS-232.

It is necessary to issue RS-232 commands via the virtual COM port.
When RS-232 commands are issued to the virtual COM port, commands are sent to the SS7012 in the following order. (For the receipt of data, the order is reversed.)

Sending a command

(PC internal)	Virtual COM port (Communication signal via RS-232)
(PC internal)	USB ⇔ RS-232 data conversion USB
(SS7012 internal)	USB ⇔ RS-232 conversion device
(SS7012 internal)	CPU (Communication signal via RS-232)

Receiving data

Connect a USB cable

Before connecting the USB cable, install the USB driver on the personal computer. The USB driver is located on the CD that accompanied the SS9000 Communication Package.

For installation instructions, please refer to the instruction manual of the SS9000 Communication Package.

After installing the USB driver, connect the personal computer and SS7012 as shown in Figure 2. The virtual RS-232 COM port will be automatically assigned to the USB port.
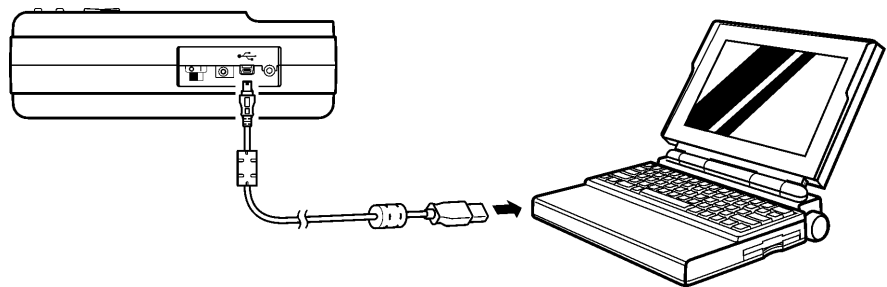

Figure 2: Cable connection for Communication

Setting Remote Interface Parameters

In order to send communications, the serial interface parameters of the SS7012 and personal computer must match.

Table 1 shows the settings required for communication. These parameters are fixed. If any other settings are used, communication is not possible.

Table 1: Remote Interface Parameters (All fixed values)

Item	Parameter	Fixed settings
1	Baud rate	9600
2	Data bit	8
3	Parity	None
4	Stop bit	1
5	Flow control	None

Enabling key operation

While the SS7012 is communicating, key operation of the SS7012 cannot be used. (On the LCD of the SS7012, RMT is on.)

To enable key operation of the SS7012, push the **LOCAL** key of the SS7012. RMT goes out.

Commands Summary

Overview of Command Type and Format

All commands can be entered in upper and lowercase.

Command Format and Query Format

The commands control instrument functions.
The following example shows a command and its associated query:

Example 1:
(Transmission command)   `CVV 1.0000<CR><LF>`   (Set the source voltage value to 1 V.)
(Response 1)   `OK<CR><LF>`   (When the transmission command was sent normally)
(Response 2)   `CMD ERR<CR><LF>`   (When there is an error in the transmission command)

Example 2:
(Transmission command)   `RMV?<CR><LF>`   (Query the voltage monitor value)
(Response 1)   `1.0000<CR><LF>`
(Response 2)   `CMD ERR<CR><LF>`   (When there is an error in the transmission command)

Query Command

The query command ends with a question mark "**?**".

Terminator (delimiter)

A terminator is a character, which identifies the end of a command string. A valid terminator consists of two-byte data:

`<CR>`   (Carriage Return, ASC(&H0D))
`<LF>`   (Line Feed, ASC(&H0A))

Response Messages

Return Result

After the instrument executes a query command the return of the result will be in the following format:
<Result><CR><LF>

The format of measurement data will be shown as following:
<Measurement Data><CR><LF>

The format of monitor data will be shown as following:
<Monitor Data><CR><LF>

The format of setting command will be shown as following:
(Response 1) **OK<CR><LF>**   (When the setting command was processed normally)
(Response 2) **CMD ERR<CR><LF>**   (When there is an error in the transmission command)

Data Types

Returned message is the ASCII string from the instrument responding to a query.
A query is a command followed by a question mark.
The following table 2 is explanation for data types.

Table 2: Data Types of Responding Message and Parameter

Data Type	Explanation	Example
NR1	An integer	0, 1, 2, 3, etc.
NR2	This numeric representation has an explicit radix point.	+13.234, 400.0, etc.
ASCII	ASCII string	XXXXXXXXXXXX (device ID etc.)

NOTE

When key operation is used with the SS7012 and memory write mode or memory clear mode is enabled, commands are disabled and "**CMD ERR<CR><LF>**" is returned. Before sending a command, always exit memory write mode or memory clear mode.

See: Memory write mode ⇒ Instruction manual of the SS7012 (p. 53)
      Memory clear mode ⇒ Instruction manual of the SS7012 (p. 61)

Command Message List

1. Sourcing
1-1. Normal source

Command	Description	Formats
FCC	Set the source function. The setting value will be 0, the output will be "OFF." d1 (Setting of source function: 0 to 4) 　　0: CV:2.5V 　　1: CV:25V 　　2: CC:25mA 　　3: TC:0°C 　　4: TC:RJ	[Format] 　FCC d1 　d1: NR1 format [Response] 　OK or CMD ERR
FCC?	Query the setting of source function. 　　The contents of responses are the same as the settings.	[Format] 　FCC? [Response] 　d1: NR1 format
OUT	Set the output ON or OFF d1 (Setting of output: 0 to 1) 　　0: OFF 　　1: ON A CMD ERR response is issued in the following situations. Furthermore, bit2 of the ERR? Query is 1. 1. When all memory is SKIP in recall source mode or scan source mode 2. In the battery low status 3. In TC:RJ function, when no temperature probe is connected or the measurement temperature is outside the -25°C to 80°C range 4. In TC:RJ function, when the thermocouple type is B and the measurement temperature is less than 0 °C	[Format] 　OUT d1 　d1: NR1 format [Response] 　OK or CMD ERR
OUT?	Query the output setting 　　The contents of responses are the same as the settings.	[Format] 　OUT? [Response] 　d1: NR1 format
CVV	Set the source voltage value This command is valid only in CV:2.5V or CV:25V. d1 (Source voltage value (in CV:2.5V): unit; V) 　　-2.5000 to 2.5000 d1 (Source voltage value (in CV:25V): unit; V) 　　-25.000 to 25.000	[Format] 　CVV d1 　d1: NR2 format [Response] 　OK or CMD ERR
CVV?	Query the source voltage value This command is valid only in CV:2.5V or CV:25V. 　　The contents of responses are the same as the settings.	[Format] 　CVV? [Response] 　d1: NR2 format 　or 　d1: SKIP (ASCII format, when a skip setting in memory source)

Command	Description	Formats

CCA	Set the source current value
	This command is valid only in CC:25mA.
	d1 (Source current value: unit; mA)
	   -25.000 to 25.000
		[Format]
		   CCA d1
		   d1: NR2 format
		
		[Response]
		   OK or CMD ERR

CCA?	Query the source current value
	This command is valid only in CC:25mA.
	   The contents of responses are the same as the settings.
		[Format]
		   CCA?
		
		[Response]
		   d1: NR2 format
		   or
		   d1: SKIP (ASCII format, when a skip setting in memory source)

TCC	Set the source thermoelectromotive force value
	This command is valid only in TC:0°C or TC:RJ.
	d1 (Thermocouple type: K, E, J, T, R, S, B, N)
	  K(K thermocouple) temperature range: -174.0 to 1372.0
	  E(E thermocouple) temperature range: -220.0 to 839.0
	  J(J thermocouple) temperature range: -208.0 to 1108.0
	  T(T thermocouple) temperature range: -169.0 to 400.0
	  R(R thermocouple) temperature range: -50 to 1768
	  S(S thermocouple) temperature range: -50 to 1768
	  B(B thermocouple) temperature range: 300 to 1820
	  N(N thermocouple) temperature range: -113.0 to 1300.0
	d2 (Temperature: unit; °C)
	  The temperature value of the above mentioned thermo-couple ranges
		[Format]
		   TCC d1, d2
		   d1: ASCII format
		   d2: NR2 format
		
		[Response]
		   OK or CMD ERR

TCC?	Query the source thermoelectromotive force value
	This command is valid only in TC:0°C or TC:RJ.
	   The contents of responses are the same as the settings.
		[Format]
		   TCC?
		
		[Response]
		   d1: ASCII format
		   d2: NR2 format
		   or
		   d1: SKIP (ASCII format, when a skip setting in memory source)

ROV?	Query the overload status
	d1 (Query of overload status: 0 to 1)
	   0: Overload not detected
	   1: Overload detected
		[Format]
		   ROV?
		
		[Response]
		   d1: NR1 format

8

1-2. Output monitor

Command	Description	Formats

MON	Set the monitor ON or OFF
	d1 (Setting of monitor: 0 to 1)
	    0: Monitor OFF
	    1: Monitor ON
		[Format]
		    MON d1
		    d1: NR1 format
		
		[Response]
		    OK or CMD ERR

MON?	Query the setting of monitor
	    The contents of responses are the same as the settings.
		[Format]
		    MON?
		
		[Response]
		    d1: NR1 format

RMV?	Query the current monitor value during output of voltage
	This command is valid only in CV:2.5V or CV:25V.
	d1 (Current monitor value: unit; mA)
	    -28.00 to 28.00
		[Format]
		    RMV?
		
		[Response]
		    d1: NR2 format or
		    CMD ERR: When the input is
		               out of the measure-
		               ment range.

RMC?	Query the voltage monitor value during output of current
	This command is valid only in CC:25mA.
	d1 (Voltage monitor value: unit; V)
	    -28.00 to 28.00
		[Format]
		    RMC?
		
		[Response]
		    d1: NR2 format or
		    CMD ERR: When the input is
		               out of the measure-
		               ment range.

RMT?	Query the temperature monitor value
	This command is valid only in TC:0°C or TC:RJ.
	d1 (Temperature monitor value (in TC:RJ): unit; °C)
	    -25.0 to 80.0
	d1 (Temperature monitor value (in TC:0°C): unit; °C)
	    0.0
		[Format]
		    RMT?
		
		[Response]
		    d1: NR2 format or
		    CMD ERR: When the input is
		               out of the measure-
		               ment range.

1-3. Memory source

Command	Description	Formats

MMD	Set the source mode.
	d1 (Setting of source mode: 0 to 2)
	    0: Normal source mode
	    1: Recall source mode
	    2: Scan source mode
		[Format]
		    MMD d1
		    d1: NR1 format
		
		[Response]
		    OK or CMD ERR

MMD?	Query the setting of source mode.
	    The contents of responses are the same as the settings.
		[Format]
		    MMD?
		
		[Response]
		    d1: NR1 format

MEM	Saving setting value to memory
	(Refer to the caution on p.11)
	Set the source function to store the setting value ahead of time.
	This command is valid only in normal source mode.
	d1 (Address)
	    01 to 20
	d2 (Source voltage value (in CV:2.5V): unit; V)
	    -2.5000 to 2.5000
	d2 (Source voltage value (in CV:25V): unit; V)
	    -25.000 to 25.000
	d2 (Source current value (in CC:25mA): unit; mA)
	    -25.000 to 25.000
	d2 (Source temperature value (in TC:0°C or TC:RJ): unit; °C)
	    The temperature values for the following thermocouples
	* A SKIP string can be set for d2
	
	d3 (Thermocouple type: K, E, J, T, R, S, B, N)
	  K (K thermocouple) temperature range: -174.0 to 1372.0
	  E (E thermocouple) temperature range: -220.0 to 839.0
	  J (J thermocouple) temperature range: -208.0 to 1108.0
	  T (T thermocouple) temperature range: -169.0 to 400.0
	  R (R thermocouple) temperature range: -50 to 1768
	  S (S thermocouple) temperature range: -50 to 1768
	  B (B thermocouple) temperature range: 300 to 1820
	  N (N thermocouple) temperature range: -113.0 to 1300.0
		[Format 1]
		    MEM d1, d2, d3
		    d1: NR1 format
		    d2: NR2 format
		    d3: ASCII format
		
		[Format 2]
		    MEM d1, d2
		    d1: NR1 format
		    d2: NR2 format
		
		[Format 3]
		    MEM d1, SKIP
		
		[Response]
		    OK or CMD ERR

MEM?	Query setting values saved to memory
	d1 (Source voltage value (in CV:2.5V): unit; V)
	    -2.5000 to 2.5000
	d1 (Source voltage value (in CV:25V): unit; V)
	    -25.000 to 25.000
	d1 (Source current value (in CC:25mA): unit; mA)
	    -25.000 to 25.000
	d1 (Source temperature value (in TC:0°C or TC:RJ): unit; °C)
	    Temperature value corresponding to each thermocouple
	d2 (Thermocouple type (in TC:0°C or TC:RJ))
	    K, E, J, T, R, S, B, N
		[Format]
		    MEM? d1
		    d1: Address (NR1 format)
		
		[Response]
		    d1: Source value (NR2 format)
		    d2: Thermocouple type
		       (ASCII format, in TC:0°C or TC:RJ)

MRM	Initialize setting values saved to memory
	(Refer to the caution on p.11)
	This command is valid only in normal source mode.
	d1 (Source function: 0 to 4)
	    0: CV:2.5V
	    1: CV:25V
	    2: CC:25mA
	    3: TC:0°C, TC:RJ
	    4: ALL
		[Format]
		    MRM d1
		    d1: NR1 format
		
		[Response]
		    OK or CMD ERR

Command Message List

Command	Description	Formats

RCL	Set the address for recall sourcing
	This command is valid only in recall source mode.
	d1 (Address: 01 to 20)
		[Format]
		  RCL d1
		  d1: NR1 format
		[Response]
		  OK or CMD ERR

SCN	Set the start address for sourcing and sourcing time interval for scan sourcing (Refer to the caution on p.11)
	This command is valid only in scan source mode.
	d1 (Start address for sourcing)
	  01 to 20
	d2 (Sourcing time interval: unit; sec.)
	  01 to 99
		[Format]
		  SCN d1, d2
		  d1: NR1 format
		  d2: NR1 format
		[Response]
		  OK or CMD ERR

SCN?	Query the scan sourcing
	  The contents of responses are the same as the settings.
		[Format]
		  SCN?
		[Response]
		  d1: Address (NR1 format)
		  d2: Sourcing time interval
		    (NR1 format)

2. Measurement

Command	Description	Formats

FCM	Set the measure function.
	d1 (Setting of measure function: 0 to 4)
	  0: OFF
	  1: V:2.5V
	  2: V:25V
	  3: A:25mA
	  4: TEMP
		[Format]
		  FCM d1
		  d1: NR1 format
		
		[Response]
		  OK or CMD ERR

FCM?	Query the setting of measure function.
	  The contents of responses are the same as the settings.
		[Format]
		  FCM?
		
		[Response]
		  d1: NR1 format

RDV?	Query the measured voltage value
	This command is valid only in V:2.5V or V:25V.
	d1 (Measured voltage value (in V:2.5V): unit; V)
	  -2.8000 to 2.8000
	d1 (Measured voltage value (in V:25V): unit; V)
	  -28.000 to 28.000
		[Format]
		  RDV?
		[Response]
		  d1: NR2 format or
		  CMD ERR: When the input is
		        out of the measure-
		        ment range.

RDC?	Query the measured current value
	This command is valid only in A:25mA.
	d1 (Measured current value: unit; mA)
	  -28.000 to 28.000
		[Format]
		  RDC?
		[Response]
		  d1: NR2 format or
		  CMD ERR: When the input is
		        out of the measure-
		        ment range.

RDT?	Query the measured temperature value
	This command is valid only in TEMP.
	d1 (Measured temperature value: unit; °C)
	  -25.0 to 80.0
		[Format]
		  RDT?
		[Response]
		  d1: NR2 format or
		  CMD ERR: When the input is
		        out of the measure-
		        ment range.

ADJ	Zero adjustment
	Zero adjust the current measurement value.
	This command is valid when the measurement value is within ±100 counts in V:2.5V, V:25V or A:25mA.
		[Format]
		  ADJ
		[Response]
		  OK or CMD ERR

3. Others

Command	Description	Formats

RBT?	Query the battery low status
	d1 (Query of battery low status: 0 to 1)
	    0: Battery low status not detected
	    1: Battery low status detected
		[Format]
		   RBT?
		
		[Response]
		   d1: NR1 format

RRJ?	Query the temperature probe connection status
	This command is valid only in TC:RJ sourcing or temperature measurement.
	d1 (Query of temperature probe status: 0 to 1)
	    0: Temperature probe not connected, the input temperature is outside the measurement range (of -25°C to 80°C).
	    1: Temperature probe connected
		[Format]
		   RRJ?
		
		[Response]
		   d1: NR1 format

ERR?	Query the error register.
	d1 (error register query: 0 to 255)
	    bit7: unused
	    bit6: MLE Message length error
	    bit5: HDE Message header error
	    bit4: DFE Data notation error
	    bit3: DRE Data range error
	    bit2: CNE Command not enforceable
	    bit1: ISE Internal signal error
	    bit0: BDE Environment data corrupted
		[Format]
		   ERR?
		
		[Response]
		   d1: NR1 format

*IDN?	Query the Device ID.
	d1: Query the Device ID.
	Manufacturer's name, Model name, Software version
	
	(Response example)
	   HIOKI,SS7012, Ver 1.01
		[Format]
		   ∗IDN?
		
		[Response]
		   d1: ASCII format

⚠ **CAUTION**

Do not turn off the power switch of SS7012 while executing MEM, MRM or SCN command. Do not execute these commands while Battery low warning indicator flashing. These may damage SS7012 and cause the internal error.

Examples of sending commands

1. Sourcing
1-1. Normal sourcing

When sourcing 4 mA

Command	Description
FCC 2<CR><LF>	Sets [CC:25mA].
CCA 4<CR><LF>	Sets the setting value to 4 mA.
OUT 1<CR><LF>	Sets output to ON.
OUT 0<CR><LF>	Sets output to OFF.

1-2. Output monitor

When monitoring the output current while sourcing 24 V.

Command	Description
FCC 1<CR><LF>	Sets [CV:25V].
CVV 24<CR><LF>	Sets the setting value to 24 V.
OUT 1<CR><LF>	Sets output to ON.
MON 1<CR><LF>	Switches monitor on.
RMV?<CR><LF>	Query the output current.
MON 0<CR><LF>	Switches monitor off.
OUT 0<CR><LF>	Sets output to OFF.

1-3. Memory sourcing

When sourcing the setting value in address 01 with recall sourcing in the current source function.

Command	Description
FCC 2<CR><LF>	Sets [CC:25mA].
MMD 1<CR><LF>	Sets recall source mode.
RCL 1<CR><LF>	Sets the address to 1.
OUT 1<CR><LF>	Sets output to ON.
OUT 0<CR><LF>	Sets output to OFF.

2. Measurement

When performing voltage measurement at [V:25V]

Command	Description
FCM 2<CR><LF>	Sets [V:25V].
ADJ<CR><LF>	Execute the zero adjustment. Short out the ends of the test leads.
RDV?<CR><LF>	Query the measured voltage value.

MEMO