

# **SERIAL INTERFACE MANUAL**

Sound Level Meter

**NL-20**



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# Organization of the NL-20 Documentation

The documentation for the Sound Level Meter NL-20 consists of three separate manuals.

- **Instruction Manual**

Describes operating procedures for the Sound Level Meter NL-20, connection and use of peripheral equipment such as a level recorder and printer.

- **Serial Interface Manual (this document)**

Describes how to use the serial interface built into the Sound Level Meter NL-20. The manual covers the communication protocol, use of control commands for the sound level meter, format of data output by the sound level meter, and other topics.

- **Technical Notes**

This document provides in-depth information about the circuit configuration and performance of the sound level meter, microphone construction and characteristics, influence of extension cables and windscreen on the measurement, and other topics.

\* Company names and product names mentioned in this manual are usually trademarks or registered trademarks of their respective owners.

# Contents

|  |    |
|--|----|
| Organization of the NL-20 Documentation .....    | i  |
| Outline .....                                    | 1  |
| Connection to a Computer .....                   | 2  |
| Transfer Protocol and Transfer Procedure .....   | 4  |
| Transfer Protocol .....                          | 4  |
| Remote Mode/Local Mode .....                     | 4  |
| Transfer Codes .....                             | 6  |
| Transfer Format .....                            | 7  |
| ID Number .....                                  | 9  |
| ATTR Block Attribute .....                       | 10 |
| BCC Block Check Code .....                       | 10 |
| Block Reception Processing .....                 | 11 |
| Command Types .....                              | 11 |
| Error Processing .....                           | 12 |
| Flow Control .....                               | 13 |
| Transfer Sequence .....                          | 15 |
| Communication Cutoff .....                       | 22 |
| Power Save Mode .....                            | 22 |
| Power Off .....                                  | 22 |
| Auto Shutdown .....                              | 22 |
| Ratings .....                                    | 23 |
| Multiple Unit Operation .....                    | 24 |
| Command List .....                               | 25 |
| Commands .....                                   | 28 |
| Command Format .....                             | 28 |
| Command Send Example .....                       | 30 |
| Command Description .....                        | 31 |
| Examples for Control Via External Commands ..... | 49 |
| Command List (in alphabetical order) .....       | 53 |

# Outline

The Sound Level Meter NL-20 incorporate a serial interface. This interface allows the use of a computer to make measurement parameter settings and to control the measurement. It is also possible to send measurement results (current results as well as data stored in the memory of the sound level meter) to the computer for further processing.

This manual describes the use of the RS-232-C interface for interaction with a computer. The manual is divided into the following sections:

- **Connection to a Computer**

The separately available interface cable CC-92 is required for connection to a computer.

- **Transfer Protocol and Transfer Procedure**

This section explains the RS-232-C interface transfer protocol and the procedure to send and receive data.

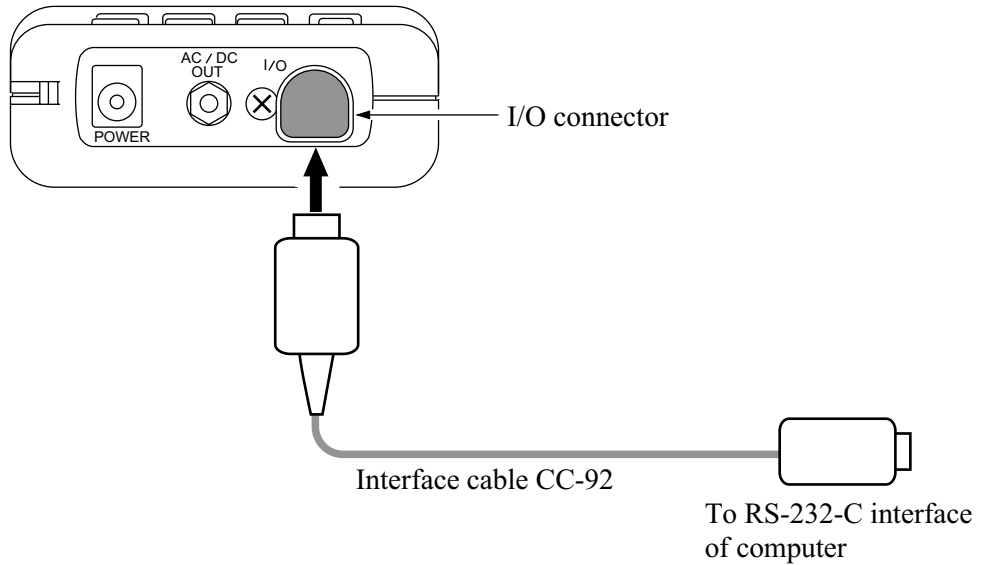
- **Commands and output data**

In this section, all commands which can be used to control the NL-20 are listed, and command format and functions are explained.

This section explains how measurement data and stored data are output via the RS-232-C interface.

# Connection to a Computer

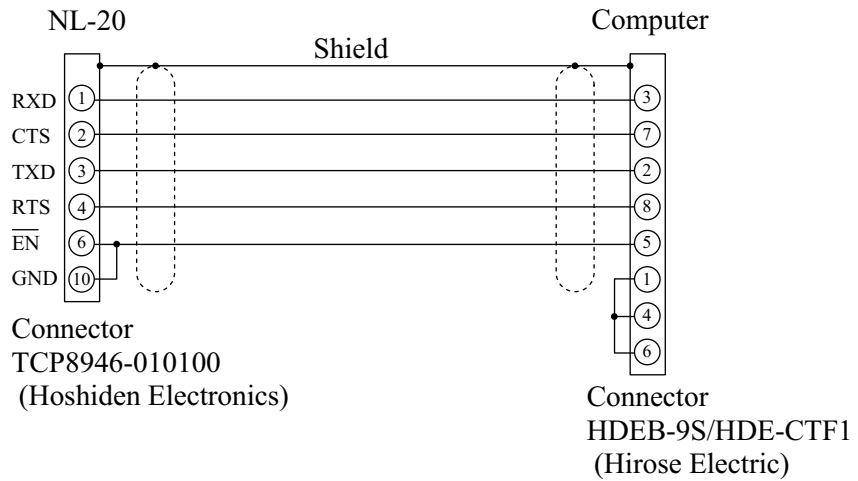
The illustration below shows how to connect the NL-20 to a computer. Use the separately available interface cable for this connection.



The CC-92 interface cable uses a 9-pin connector (female). The computer-side connector is a HDE-CTF1/HDEB-9S (Hirose Electric).

The cable is available as an option.

Interface cable CC-92



# Transfer Protocol and Transfer Procedure

## Transfer Protocol

|                       |                                     |
|-----------------------|-------------------------------------|
| Transfer principle:   | full duplex                         |
| Sync principle:       | asynchronous                        |
| Transfer rate:        | 4800/9600/19200 bps                 |
| Data word length:     | 8 bit                               |
| Stop bits:            | 1                                   |
| Parity check:         | none                                |
| X parameter control:  | X parameter or RTS/CTS (selectable) |
| Maximum block size:   | 256 bytes                           |
| Command flow control: | yes/no (selectable)                 |

## Remote Mode/Local Mode

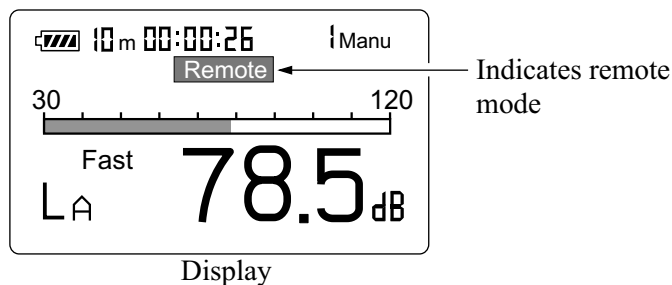
| Operation mode | Key operation | Communication |
|----------------|---------------|---------------|
| Remote         | Disabled      | Enabled       |
| Local          | Enabled       | Enabled       |

### Local mode

In this mode, the NL-20 is operated with the controls on the unit. This is the default mode after power-on.

### Remote mode

In this condition, the controls on the unit are inactive, and the unit only carries out communication with the computer. The indication "Remote" appears on the display.





### **Remote mode/local mode switching**

Switching between local mode and remote mode is carried out by a command.

### **Key operation in remote mode**

Only the power key is active. All other keys are disabled.

## Transfer Codes

The following codes are used for communication with the unit.

### Control codes

| Code  | Hex notation | Meaning                    |
|-------|--------------|----------------------------|
| <ENQ> | 05H          | Enquire                    |
| <ACK> | 06H          | Acknowledge                |
| <NAK> | 15H          | Not acknowledge            |
| <STX> | 02H          | Start block                |
| <ETX> | 03H          | End block                  |
| <CR>  | 0DH          | Terminator (1st character) |
| <LF>  | 0AH          | Terminator (2nd character) |
| <SUB> | 1AH          | Stop                       |
| <DC3> | 13H          | Pause                      |
| <DC1> | 11H          | Restart                    |

### Special codes

| ATTR | Control code or special code | Block attribute      |
|------|------------------------------|----------------------|
| ID   | 01H to FFH                   | Other/own station ID |
| BCC  | 00H to FFH                   | Block check code     |

Commands, parameters, data

ASCII codes 20H to 7EH

## Transfer Format

Command block: Command from computer

|       |    |      |         |           |       |     |      |      |      |
|-------|----|------|---------|-----------|-------|-----|------|------|------|
| <STX> | ID | ATTR | Command | Parameter | <ETX> | BCC | <CR> | <LF> |      |
| 1     | 1  | 1    | M       | N         | 1     | 1   | 1    | 1    | byte |

\* ATTR = 'C'

If there are two or more parameters, they are separated by single spaces.

Data response block: Data from sound level meter (response data in ASCII)

|       |    |      |               |       |     |      |      |      |
|-------|----|------|---------------|-------|-----|------|------|------|
| <STX> | ID | ATTR | Response data | <ETX> | BCC | <CR> | <LF> |      |
| 1     | 1  | 1    | N             | 1     | 1   | 1    | 1    | byte |

\* ATTR = 'A' or 'Q'

If there are two or more data, they are separated by commas.

Acknowledgment block: Computer or sound level meter

|       |    |      |       |     |      |      |      |
|-------|----|------|-------|-----|------|------|------|
| <STX> | ID | ATTR | <ETX> | BCC | <CR> | <LF> |      |
| 1     | 1  | 1    | 1     | 1   | 1    | 1    | byte |

\* ATTR = <ACK>

Negative Acknowledgment block: Computer or sound level meter

|       |    |      |            |       |     |      |      |      |
|-------|----|------|------------|-------|-----|------|------|------|
| <STX> | ID | ATTR | Error code | <ETX> | BCC | <CR> | <LF> |      |
| 1     | 1  | 1    | 4          | 1     | 1   | 1    | 1    | byte |

\* ATTR = <NAK>

Verify other station block: Computer

|       |    |      |       |     |      |      |      |
|-------|----|------|-------|-----|------|------|------|
| <STX> | ID | ATTR | <ETX> | BCC | <CR> | <LF> |      |
| 1     | 1  | 1    | 1     | 1   | 1    | 1    | byte |

\* ATTR = <ENQ>

Stop request block: Computer

|       |    |      |       |     |      |      |      |
|-------|----|------|-------|-----|------|------|------|
| <STX> | ID | ATTR | <ETX> | BCC | <CR> | <LF> |      |
| 1     | 1  | 1    | 1     | 1   | 1    | 1    | byte |

\* ATTR = <SUB>

Stop request code: Computer

<SUB>

1

Pause request with X parameter control: Computer

<DC3>

1

Restart request with X parameter control: Computer

<DC1>

1

## **ID Number**

### **Outline**

When multiple units are connected, ID numbers are used to distinguish between individual units. The ID number range is 1 to 255 (01H to FFH). Numbers are expressed in binary notation. In strings sent out by the computer, the ID selects the unit to be controlled. In strings sent out by the sound level meter, the ID identifies the data source.

### **Broadcasting**

In commands sent from the computer, the ID 00 has a special meaning. It selects all units (broadcast command).

### **Sound level meter response**

The sound level meter responds only to a communication block that contains its own ID. Other blocks are disregarded.

When the ID is 00 (zero), setting commands are processed but no response is returned. Request commands are not processed and no response is returned.

## ATTR Block Attribute

The block attribute information is added by the sender, to facilitate processing of the block at the receiving end.

| Code      | Meaning                                  |
|-----------|--|
| <ACK> 06H | Acknowledge block                        |
| <NAK> 15H | Not acknowledge block                    |
| <ENQ> 05H | Enquiry block                            |
| <SUB> 1AH | Stop request block                       |
| <EOT> 03H | End-of-transmission block                |
| 'C' 43H   | Command block                            |
| 'A' 41H   | Data response block (last block)         |
| 'Q' 51H   | Data response block (intermediate block) |

## BCC Block Check Code

The BCC is calculated by the sender. The receiver applies checksum processing to the same range to verify the block.

Calculation range: From STX to ETX

Calculation method: Exclusive OR sum of range

If the computer sends a block where BCC is set to 00H (NULL), the sound level meter omits block check processing.

This is to allow simple sending from the computer.

# Block Reception Processing

For reception processing, the unit is initially in the <STX> wait (standby) mode, except during a sequence while waiting for response from the computer.

## Command Types

There are two types of commands: setting commands and request commands.

### Setting command

This type of command serves for changing the sound level meter status or measurement parameters. Only some commands of this type will produce a response from the sound level meter. The response consists of status information returned after the setting command has been processed.

### Request command

This type of command serves for getting information about unit settings and for obtaining measurement data including display data and stored data. The sound level meter returns the requested data.

## Error Processing

### Transmission errors

Transmission errors can be detected in the following categories.

| Error item    | Contents  | Measure   |
|---------------|---|---|
| Framing error | Character level framing error                               | Disregard character and wait for next character |
| Block reset   | <STX> received after incomplete block (excluding ID number) | Start block again from that point               |

### Command processing errors

Block format is correct, but command interpretation or processing has resulted in an error.

| Error item         | Contents  | Measure                |
|--------------------|---|------------------------|
| Undefined command  | Command problem                                   | Return error code 0001 |
| Parameter error    | Parameter number or value not correct             | Return error code 0002 |
| Processing error   | Processing cannot be carried out in current state | Return error code 0003 |
| Processing timeout | Timeout interval has elapsed                      | Return error code 0004 |



## Flow Control

The sound level meter implements X parameter and RTS/CTS flow control. When  $XON = 1$ , the X parameter is used to perform control. When  $XON = 0$ , RTS/CTS is used to perform control.

### X parameter control mode

In the send sequence for multiple blocks, the next block is sent after the computer returns an acknowledge code.

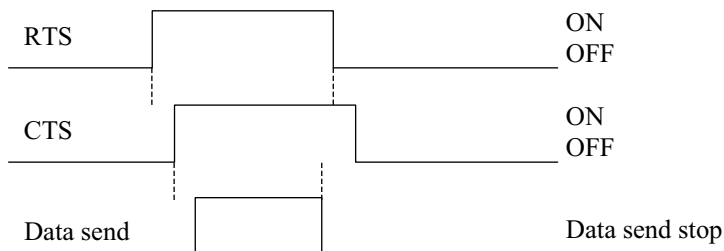
While a block is being sent, the computer cannot interrupt the transmission. RTS and CTS control is not possible.

### RTS/CTS control mode

#### Send

To send data, the sound level meter sets RTS to ON, waits until CTS becomes ON, and then sends the data.

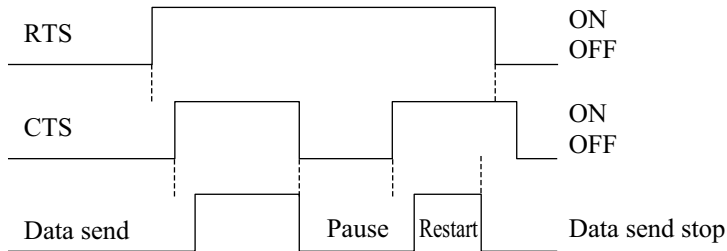
Immediately after sending the data, the sound level meter sets RTS to OFF.



When the computer sets RTS to OFF (CTS at sound level meter becomes OFF), sending is interrupted immediately.

Because RTS/CTS control is hardware control, sending can be interrupted also midway in a block.

Sending is not resumed until the computer sets RTS to ON (sound level meter CTS becomes ON).



## Receive

The sound level meter constantly monitors CTS. CTS = ON while sending is not in progress means that there is a send request from the computer. The sound level meter then sets RTS to ON.

Because no provision is made for receive overflow at the sound level meter, a send request from the computer (sound level meter CTS = ON) always triggers RTS = ON. The sound level meter is always ready for receiving.

When this mode is used, X parameter control is not available.

## Transfer Sequence

The transfer sequences are as follows.

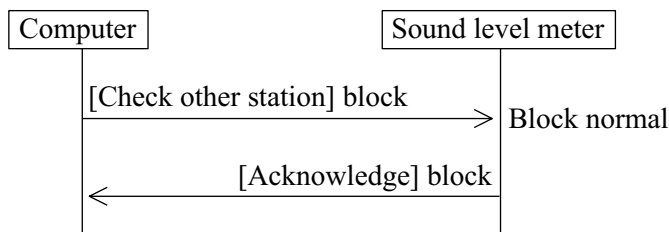
- [Check other station] sequence
- [Setting command without response] sequence
- [Setting command with response] sequence
- [Request] sequence
- [Continuous request] sequence
- [Error] sequence

The setting sequence can be selected to have a response or not.

The sample sequences shown below generally assume that the block from the computer comprises the ID of the sound level meter.

### [Check other station] sequence

An acknowledge block is returned in response to the [check other station] block. This is an independent sequence. It does not need to come before a command sequence.

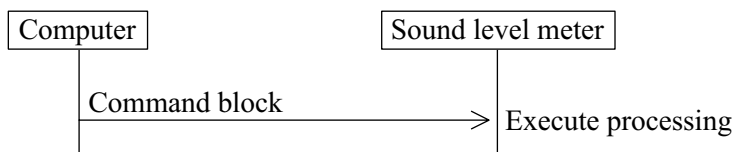


### [Setting command without response] sequence

This type of command is executed without producing a response. Because it corresponds to an error code request, the processing result (including error) of the last command is retained.

The "RET0" command activates this sequence.

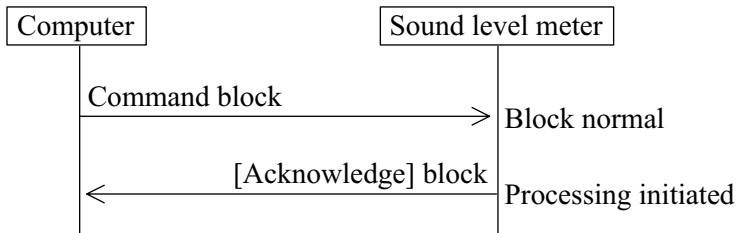
#### Execute processing



## [Setting command with response] sequence

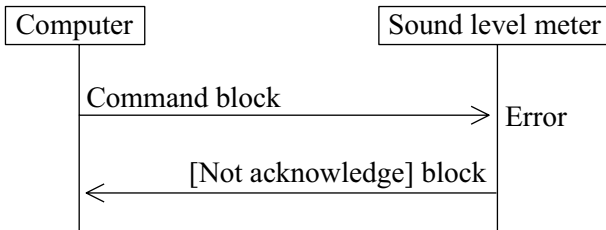
### Normal processing

An [acknowledge] response is returned after command processing was initiated. "Initiated" means that for example execution of the "Store" command was started. It does not mean that the store process was completed.



### Error processing

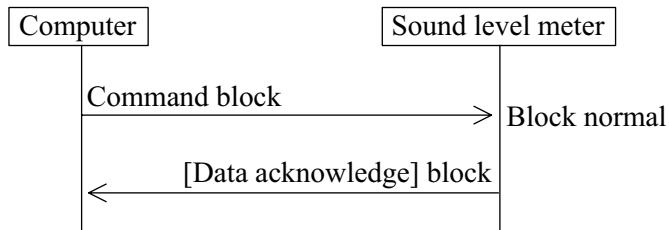
When an error has occurred during block or command processing, a [not acknowledge] response is returned.



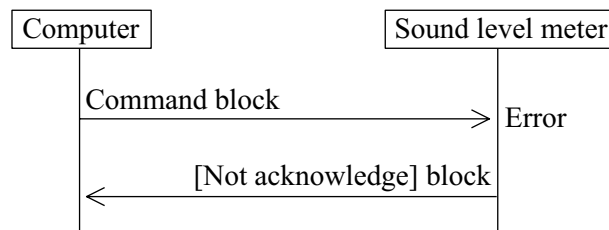
The "RET1" command activates this sequence.

**[Request] sequence (1 block)****Normal processing**

A response is returned immediately to the request command.

**Error processing**

When an error has occurred during block or command processing, a [not acknowledge] response is returned.



## [Request] sequence (multiple blocks)

### X parameter flow control

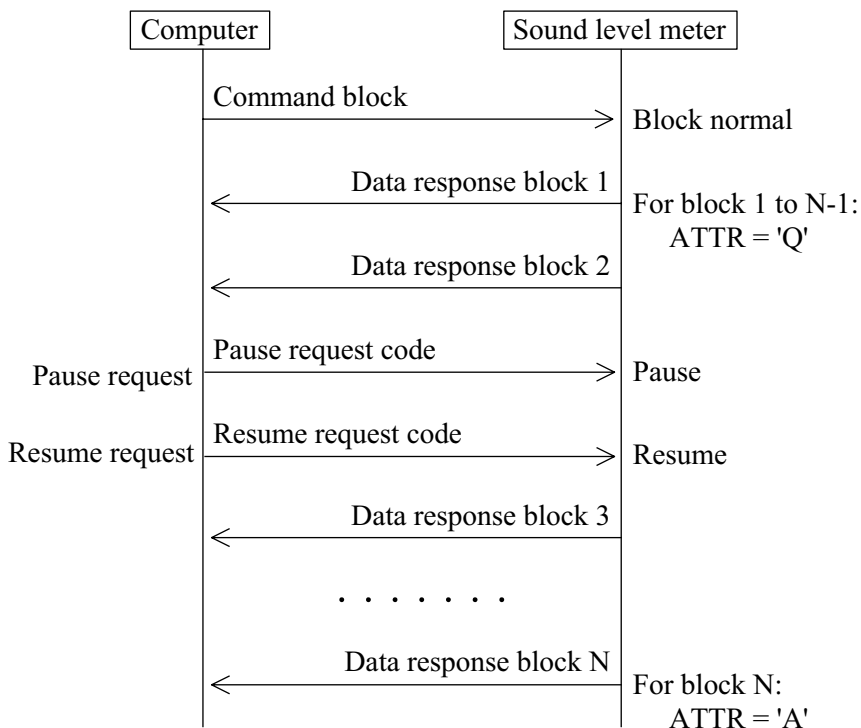
#### Normal processing

In general, there is no need for returning response codes from the computer. The sound level meter sends blocks continuously.

The computer can send a pause request code to pause the transmission, a resume code to resume the transmission, or a stop code to stop the transmission. The sound level meter disregards any other codes that are received. (Processing is not carried out also after stop.)

When sending a pause or stop code to the sound level meter, wait until the current block has been fully sent. (Do not send a pause or stop code in the middle of a block.)

After the last block has been sent or after stop mode was entered, the sound level meter goes into the idling state.



**RTS/CTS flow control**

When the computer sets RTS to OFF (CTS at sound level meter becomes OFF), sending is interrupted immediately.

Because RTS/CTS control is hardware control, sending can be interrupted also midway in a block.

Sending is not resumed until the computer sets RTS to ON (sound level meter CTS becomes ON).

## Continuous request sequence

This sequence uses only commands to periodically request measurement data.

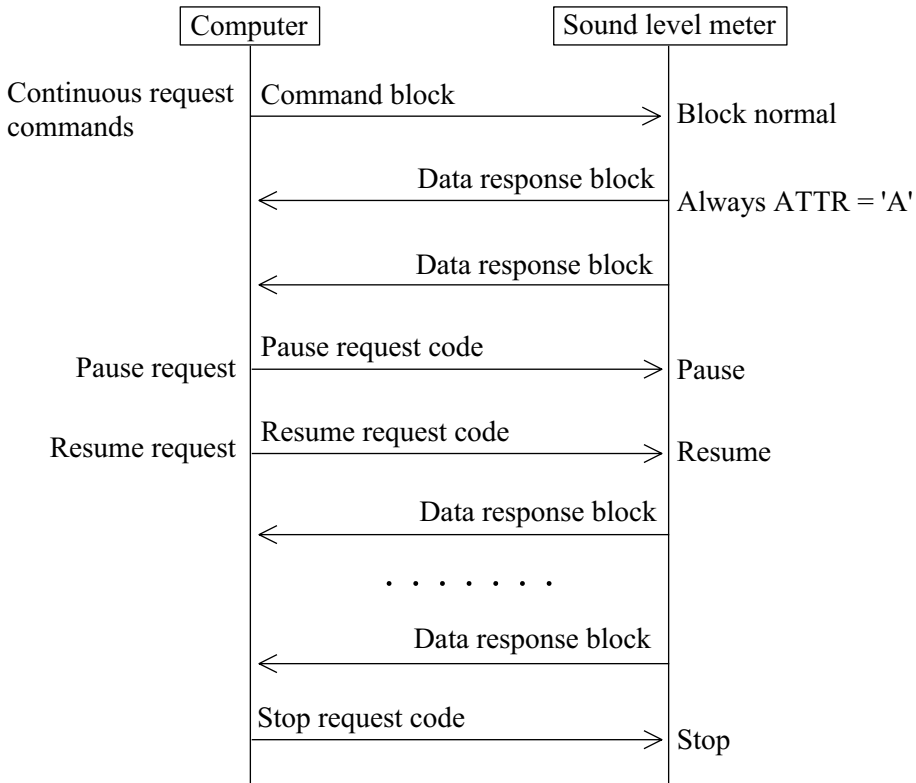
### X parameter flow control

In general, there is no need for returning response codes from the computer. The sound level meter sends blocks periodically.

The computer can send a pause request code to pause the transmission, a resume code to resume the transmission, or a stop code to stop the transmission. The sound level meter disregards any other codes that are received. (Processing is not carried out also after stop.)

When sending a pause or stop code to the sound level meter, wait until the current block has been fully sent. (Do not send a pause or stop code in the middle of a block.)

After the stop mode was entered, the sound level meter goes into the idling state.





## RTS/CTS flow control

When the computer sets RTS to OFF (CTS at sound level meter becomes OFF), sending is interrupted immediately.

Because RTS/CTS control is hardware control, sending can be interrupted also midway in a block.

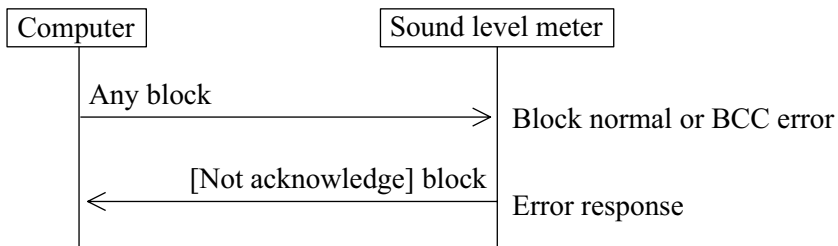
Sending is not resumed until the computer sets RTS to ON (sound level meter CTS becomes ON).

While interrupted, periodic data do not accumulate, but are overwritten.

## Error response

When an error has occurred at the block level, the following error sequence occurs.

After an error response, the unit returns to the idling state and does not continue to send multiple blocks etc.



# Communication Cutoff

## **Power Save Mode**

When power save mode is enabled, the unit enters the sleep state after the current block has been sent. In the sleep state, the sound level meter does not send or accept commands.

## **Power Off**

During power off processing, communication is terminated after the current block was sent.

## **Auto Shutdown**

Same as power off.

# Ratings

## Guaranteed Values

| Case                            | Rating      | Remarks  |
|---------------------------------|-------------|--|
| Sound level meter response time | Max. 3 s    | Processing timeout error response if due to processing reasons |
| Send character interval         | Max. 100 ms | —  |

## Rated Values

| Case  | Rating   | Remarks                                 |
|---|----------|---|
| Multiple block request sequence ACK wait                | 10 s     | Pause sequence and go into idling state |
| Send timeout with flow control (except RTS/CTS control) | 3 s      | Pause sequence and go into idling state |
| Block generation wait time after receiving <STX>        | No limit | —                                       |
| Receive character interval                              | No limit | —                                       |

# Multiple Unit Operation

These specifications also include cases where communication includes several sound level meters of the same type or compatible type. The X parameter and stop request code are received without ID by all units, but during a request sequence, only one unit is supposed to be active and all others are in the idling state, so that processing is carried out normally only by one unit.

When multiple units are connected, observe the following points.

- Do not broadcast request commands. These will be disregarded.
- Do not send a request command sequence simultaneously to multiple units. Wait until processing of a request command sequence at one unit has finished before sending other request commands.

# Command List

| Command Function                          | Page   |
|---|--|
| <b>Basic setting and display commands</b> |  |
| BER                                       | Set data exclusion (back-erase) function ..... 31          |
| BER?                                      | Get data exclusion (back-erase) function setting ..... 31  |
| DPI                                       | Set display of various processing values ..... 31          |
| DPI?                                      | Get display setting for various processing values ..... 32 |
| DSP                                       | Set type of display data ..... 32                          |
| DSP?                                      | Get currently displayed processing types ..... 32          |
| LXI                                       | Set percentile level ..... 33                              |
| LXI?                                      | Get percentile level settings ..... 33                     |
| MTI                                       | Set measurement time ..... 33                              |
| MTI?                                      | Get measurement time setting ..... 33                      |
| RNG                                       | Set level range ..... 34                                   |
| RNG?                                      | Get level range setting ..... 34                           |
| TMC                                       | Set time weighting for main processing ..... 34            |
| TMC?                                      | Get time weighting setting ..... 34                        |
| WGT                                       | Set frequency weighting ..... 35                           |
| WGT?                                      | Get frequency weighting setting ..... 35                   |
| <b>Operation commands</b>                 |  |
| PSE                                       | Pause/restart measurement and memory store ..... 36        |
| PSE?                                      | Get measurement and memory store pause status ..... 36     |
| SRT                                       | Start/stop measurement ..... 36                            |
| SRT?                                      | Get measurement running status ..... 36                    |
| STO                                       | Start/stop memory store ..... 37                           |
| STO?                                      | Get memory store running status ..... 37                   |

| Command   | Function   | Page |
|---|--|------|
| <b>Memory and store commands</b>                |  |      |
| ADR   | Set address .....  | 38   |
| ADR?  | Get address setting .....                                      | 38   |
| MDC   | Delete manual data from internal memory .....                  | 38   |
| RCL   | Activate recall state .....                                    | 39   |
| RCL?  | Get recall state .....   | 39   |
| <b>Calibration commands</b>                     |  |      |
| CAL   | Activate calibration mode .....                                | 40   |
| CAL?  | Get calibration status .....                                   | 40   |
| CBM   | Perform adjustment with Cal control .....                      | 40   |
| CBM?  | Get Cal control level setting .....                            | 40   |
| <b>Various setting and information commands</b> |  |      |
| BAT?  | Get battery status .....                                       | 41   |
| BLA   | Set backlight auto turn-off function .....                     | 41   |
| BLA?  | Get backlight auto turn-off setting .....                      | 41   |
| DCL   | Initialize unit (reset to factory defaults) .....              | 42   |
| LTI?  | Get elapsed time since start of measurement or memory store .. | 42   |
| OUT   | Set NL-20 output signal output to AC or DC .....               | 43   |
| OUT?  | Get AC/DC output setting .....                                 | 43   |
| VER?  | Get version information .....                                  | 44   |

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| Command Function   | Page |
|--|------|
| <b>Measurement data retrieve commands</b>                                    |      |
| DOD? Get level value shown on display .....                                  | 44   |
| DOR? Get data stored in memory .....   | 44   |
| DRD? Set continuous output of sound level or short-term value $L_{eq}$ ..... | 45   |
| <b>Communication control commands</b>  |      |
| BRT Set baud rate .....  | 46   |
| EST? Get error information .....   | 46   |
| IDX Set index number .....   | 46   |
| IDX? Get index number .....  | 46   |
| RET Set response processing for commands to On or Off .....                  | 47   |
| RET? Get response processing setting .....                                   | 47   |
| RMT Set remote/local mode .....  | 47   |
| RMT? Get remote/local mode setting .....                                     | 47   |
| XON Select control mode .....  | 48   |
| XON? Get control mode setting .....  | 48   |

# Commands

## Command Format

In this manual, 1 character is represented as "□", a space as "\_", parameters as "p1,p2,...", and response data as "d1,d2,...". Parameters and response data may be more than 1 character long.

Commands consists of three letters which are not case-sensitive (upper-case or lower-case can be used).

□□□

When a command has one parameter, the parameter follows the command. It can be appended to the command either directly or with a separating space.

□□□p1            Acceptable

□□□\_p1          Acceptable

When a command has several parameters, the parameters must be separated by a space.

□□□p1\_p2        Acceptable

□□□p1p2        Not acceptable

| Note  |
|---|
| One command block can only contain one command. Do not include several commands in a block. |

A request command consists of the command, any required parameter, and a "?". The command and "?" or parameter and "?" may be separated by a space.

□□□?            Acceptable

□□□\_?          Acceptable

□□□p1?        Acceptable

□□□p1\_?        Acceptable



Unless specified otherwise, parameters and response data are of variable length. Depending on the value range, the length of the parameter will differ. There is no need for padding with spaces or other measures.

- \_1            Acceptable
- \_10         Acceptable
- \_01         Not acceptable

## Command Send Example

To set frequency weighting to "C"

|       |     |     |     |     |       |     |          |
|-------|-----|-----|-----|-----|-------|-----|----------|
| <STX> | 1   | C   | WGT | 1   | <ETX> | 00  | <CR><LF> |
| (1)   | (2) | (3) | (4) | (5) | (6)   | (7) | (8)      |

- (1) Start of transfer data and command
- (2) ID number (hexadecimal). The ID number range is 0 to 255. In a command string, this is expressed as 01 (= ID number 1) to FF (= ID number 255).

|             |
|-------------|
| <b>Note</b> |
|-------------|

|  |
|--|
| Use the binary code "01", not Ascii "1". |
|--|

- (3) Attribute ("C" for command)
- (4) Command
- (5) Parameter (corresponds to p1, p2, etc. in command description section of the manual)
- (6) Command end
- (7) BCC (Entering 00 disables BCC checking for (1) to (6).)
- (8) Transfer data end

## Command Description

For details on the transfer format, please refer to page 7.

### Basic setting and display commands

#### BER

Set data exclusion (back-erase) function

BER\_p1

p1 = 0: Back-erase off

p1 = 1: Back-erase on

Transfer format: Command block

Get data exclusion (back-erase) function setting

BER?

NL-20 response data to BER?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

#### DPI

Set display of various processing values

DPIp1\_p2

p1 = 1:  $L_{eq}$                       p1 = 2:  $L_E$

p1 = 3:  $L_{max}$                       p1 = 4:  $L_{min}$

p1 = 5:  $L_{N1}$                       p1 = 6:  $L_{N2}$

p1 = 7:  $L_{N3}$                       p1 = 8:  $L_{N4}$

p1 = 9:  $L_{N5}$

p1 = 11: List                      p1 = 12: Time-Level

p2 = 0: Off                      p2 = 1: On

Operation: Sets p1 display to p2. Toggles the On/Off setting on the display menu.

Transfer format: Command block

## Get display setting for various processing values

DPI?

NL-20 response data to DPI?

Response data  $d_1, d_2, d_3, \dots, d_n, \dots, d_{12}$

$d_n$  corresponds to  $p_n$  for the display on/off setting of processing values.

$d_n = 0$ : Off (not displayed)

$d_n = 1$ : On (displayed)

Transfer format: Response block

## DSP

### Set type of display data

DSP $p_1$

$p_1 = 1$ :  $L_{eq}$                        $p_1 = 2$ :  $L_E$

$p_1 = 3$ :  $L_{max}$                        $p_1 = 4$ :  $L_{min}$

$p_1 = 5$ :  $L_{N1}$                        $p_1 = 6$ :  $L_{N2}$

$p_1 = 7$ :  $L_{N3}$                        $p_1 = 8$ :  $L_{N4}$

$p_1 = 9$ :  $L_{N5}$

$p_1 = 11$ : List                       $p_1 = 12$ : Time-Level

Transfer format: Command block

### Get currently displayed processing types

DSP?

NL-20 response data to DSP?

Response data  $d_1$

$d_n = 1$  to  $12$ : Displayed processing types

Transfer format: Response block

**LXI**

## Set percentile level

LXI p1\_p2

p1 = 1 to 5: Specify number out of 5

p2 = 1 to 99: Specify percentage

Transfer format: Command block

## Get percentile level settings

LXI?

NL-20 response data to LXI?

Response data d1,d2,d3,d4,d5: Percentage for five settings

d1 to d5: Corresponds to p2

Transfer format: Response block

**MTI**

## Set measurement time

MTI p1

p1 = 0 Arbitrary p1 = 1 to 3: Not accepted

p1 = 4: 10 s p1 = 5: 1 m

p1 = 6: 5 m p1 = 7: 10 m

p1 = 8: 15 m p1 = 9: 30 m

p1 = 10: 1 h p1 = 11: 8 h

p1 = 12 24 h

Transfer format: Command block

## Get measurement time setting

MTI?

NL-20 response data to MTI?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

**RNG**

## Set level range

RNGp1

|          |              |          |              |
|----------|--------------|----------|--------------|
| p1 = 7:  | Not accepted | p1 = 8:  | 20 to 80 dB  |
| p1 = 9:  | 20 to 110 dB | p1 = 10: | 20 to 100 dB |
| p1 = 11: | 20 to 110 dB | p1 = 12: | 30 to 120 dB |
| p1 = 13: | 40 to 130 dB |          |              |

Transfer format: Command block

## Get level range setting

RNG?

NL-20 response to RNG?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

**TMC**

## Set time weighting for main processing

TMCp1

|         |      |
|---------|------|
| p1 = 0: | Fast |
| p1 = 1: | Slow |

Transfer format: Command block

## Get time weighting setting

TMC?

NL-20 response data to TMC?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

**WGT**

Set frequency weighting

WGTp1

p1 = 0: A weighting

p1 = 1: C weighting

p1 = 2: Flat characteristics

Transfer format: Command block

Get frequency weighting setting

WGT?

NL-20 response data to WGT?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

## Operation commands

### PSE

Pause/restart measurement and memory store

PSEp1

p1 = 0: Restart measurement or memory store

p1 = 1: Pause measurement or memory store

Transfer format: Command block

Get measurement and memory store pause status

PSE?

NL-20 response data to PSE?

Response data d1

d1: 1 if paused, otherwise 0

Transfer format: Response block

### SRT

Start/stop measurement

SRTp1

p1 = 0: Stop measurement

p1 = 1: Start measurement

Transfer format: Command block

Get measurement running status

SRT?

NL-20 response data to SRT?

Response data d1

d1: 1 if measurement in progress, otherwise 0

Transfer format: Response block



**STO**

Start/stop memory store

STOp1

p1 = 1: Execute store (data number incremented by 1)

Transfer format: Command block

Get memory store running status

STO?

NL-20 response data to STO?

Response data d1

d1 = 0: Memory store not in progress

d1 = 1: Memory store in progress

Transfer format: Response block

## Memory and store commands

### ADR

Set address

Address setting

ADRp1

p1 = Any address

Transfer format: Command block

Get address setting

ADR?

NL-20 response data to ADR?

Response data d1

d1: Currently selected address number  
(displayed address)

Transfer format: Response block

### MDC

Delete manual data from internal memory

No parameter

Transfer format: Command block

## RCL

### Activate recall state

This command immediately calls up the recall screen. The displayed address is the address that was selected when the recall screen was last terminated.

RCLp1\_p2

p1 = 0: Cancel recall mode  
p1 = 1: Activate recall mode  
p2: 0000

Transfer format: Command block

### Get recall state

RCL?

NL-20 response data to RCL?

Response data d1

d1=1: recall state  
d1=2: not recall state

Transfer format: Response block

## Calibration commands

### CAL

Activate calibration mode

CALp1

p1 = 0: Cancel calibration mode

p1 = 1: Internal calibration mode

p1 = 2: External calibration mode

Transfer format: Command block

Get calibration status

CAL?

NL-20 response data to CAL?

Response data d1

d1: Corresponds to p1

d1 = 1: Internal calibration mode

d1 = 2: External calibration mode

d1 = 0: Other mode

Transfer format: Response block

### CBM

Perform adjustment with Cal control

CBMp1

p1 = 0: Reduce level setting

p1 = 1: Increase level setting

Transfer format: Command block

Get Cal control level setting

CBMp1?

NL-20 response data to CBM?

Response data d1

p1 = 118 to 670 (irregular steps)

Transfer format: Response block

## Various setting and information commands

### BAT?

Get battery status

BAT?

NL-20 response data to BAT?

Response data d1

d1 = 0: Battery indicator flashing

d1 = 1:  d1 = 2: 

d1 = 3:  d1 = 4: 

Transfer format: Response block

### BLA

Set backlight auto turn-off function

BLAp1

p1 = 0: Enable

p1 = 1: Disable

Transfer format: Command block

Get backlight auto turn-off setting

BLA?

NL-20 response data to BLA?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

## **DCL**

Initialize unit (reset to factory defaults)

- Clock is not reset.
- Contents of manual store memory are not cleared.
- Option function setting is not changed.
- No parameter

Transfer format: Command block

## **LTI?**

Get elapsed time since start of measurement or memory store

LTI?

NL-20 response data to LTI?

Response data d1,d2,d3

d1: Hours

d2: Minutes

d3: Seconds

Maximum: 200:00:00

Transfer format: Response block

**OUT**

Set NL-20 output signal output to AC or DC

OUTp1

p1 = 0: AC OUT

p1 = 1: DC OUT

Transfer format: Command block

Get AC/DC output setting

OUT?

NL-20 response data to OUT?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

**VER?**

Get version information

VER?

NL-20 response data to VER?

Response data d1,d2

d1: Sound level meter model

Example: NL-20

d2: Software version

Example: 1.00

Transfer format: Response block

## Measurement data retrieve commands

### DOD?

Get level value shown on display

DODp1?

p1 omitted: Get data shown on screen

|         |                     |         |           |
|---------|---------------------|---------|-----------|
| p1 = 0: | $L_p$ (sound level) | p1 = 1: | $L_{eq}$  |
| p1 = 2: | $L_E$               | p1 = 3: | $L_{max}$ |
| p1 = 4: | $L_{min}$           | p1 = 5: | $L_{N1}$  |
| p1 = 6: | $L_{N2}$            | p1 = 7: | $L_{N3}$  |
| p1 = 8: | $L_{N4}$            | p1 = 9: | $L_{N5}$  |

Response data d1,d2

|     |   |
|-----|---|
| d1: | Level value                                     |
| d2: | Over-range information (yes: 1, no: 0 [space])  |
| d3: | Under-range information (yes: 1, no: 0 [space]) |

Transfer format: Response block

### DOR?

Get data of specified address by ADRp1

DORp1?

p1 = 1

Response data d1,d2 ... d16

|      |   |      |  |
|------|---|------|--|
| d1:  | $L_p$   | d5:  | $L_E$  |
| d2:  | Sound level over-range information (yes: 1, no: 0)  | d7:  | $L_{min}$  |
| d3:  | Sound level under-range information (yes: 1, no: 0) | d9:  | $L_{N2}$   |
| d4:  | $L_{eq}$  | d11: | $L_{N4}$   |
| d6:  | $L_{max}$   | d12: | $L_{N5}$   |
| d8:  | $L_{N1}$  | d13: | 00.0   |
| d10: | $L_{N3}$  | d14: | Processing over-range information (yes: 1, no: 0)  |
| d12: | $L_{N5}$  | d15: | Processing under-range information (yes: 1, no: 0) |
| d13: | 00.0  | d16: | Processing pause information (yes: 1, no: 0)       |

Transfer format: Response block



**DRD?**

Set continuous output of sound level or short-term value  $L_{eq}$

DRDp1?

p1 = 1: 100 ms                      p1 = 2: 200 ms

p1 = 3: 1 s                              p1 = 4:  $L_{eq, 1 \text{ sec}}$

Response data format

For response data p1 = 1 to 4

d1,d2,d3

d1: XXX.X (level value)

d2: Over-range information (yes: 1, no: 0)

d3: Under-range information (yes: 1, no: 0)

Transfer format: Response block

## Communication control commands

### BRT

Set baud rate

BRTp1

p1 = 2: 4800 bps

p1 = 3: 9600 bps

p1 = 4: 19200 bps

The baud rate setting is changed after a confirmation response.

Transfer format: Command block

### EST?

Get error information

EST?

NL-20 response data to EST?

Response data d1

d1: Error processing or command processing error  
(see page 12)

Recorded 4-digit error code

Transfer format: Response block

### IDX

Set index number

IDXp1

p1 = 1 to 255, default: 1

Transfer format: Command block

Get index number

IDX?

NL-20 response data to IDX?

Response data d1

d1 = Corresponds to p1 (selected index number)

Transfer format: Response block

**RET**

Set response processing for commands to On or Off

RETp1

p1 = 0: Enable response processing

p1 = 1: Disable response processing

Transfer format: Command block

Get response processing setting

RET?

NL-20 response data to RET?

Response data d1

d1 = Corresponds to p1

Transfer format: Response block

**RMT**

Set remote/local mode

RMTp1

p1 = 0: Set to local mode

p1 = 1: Set to remote mode

Transfer format: Command block

Get remote/local mode setting

RMT?

NL-20 response data to RMT?

Response data d1

d1 = Corresponds to p1

Transfer format: Response block

## **XON**

### Select control mode

XONp1

p1 = 0: Use RTS/CTS control (no X parameter control)

p1 = 1: Use X parameter control  
(no RTS/X parameter control)

Transfer format: Command block

### Get control mode setting

XON?

NL-20 response data to XON?

Response data d1

d1: Corresponds to p1

Transfer format: Response block

## Examples for Control Via External Commands

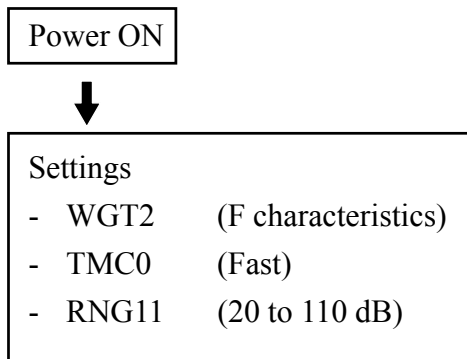
This section contains several examples for controlling operation of the sound level meter via commands. Some initial steps are common to all operations:

- Check baud rate setting
- Check index number
- Enable or disable response sequence (with RET command)
- Select X parameter or RTS/CTS control (with XON command)

To check whether a setting was made properly, using a request command after sending a setting command is recommended.

### Example: Get sound pressure level (sound exposure level)

(Measured with frequency weighting "F", dynamic characteristics "Fast", level range "20 to 110 dB")



Establish above settings to prepare sound level meter for measurement

↓  
DOD? (Get display value)

**Example: Get sound level (continuous)**

(Measured with frequency weighting "A", dynamic characteristics "Slow", level range "40 to 130 dB")

Power ON



Settings

- WGT0 (A characteristics)
- TMC1 (Slow)
- RNG13 (40 to 130 dB)

Establish above settings to prepare sound level meter for measurement

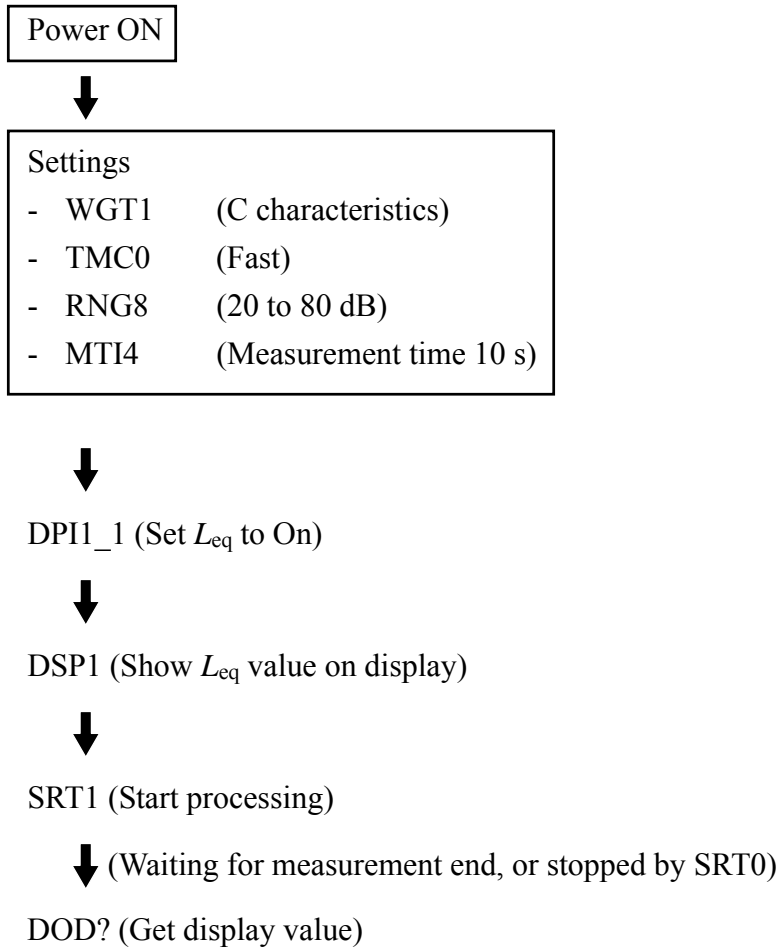


(For continuous output at 100 ms intervals)

DRD1? (Stop with <SUB>)

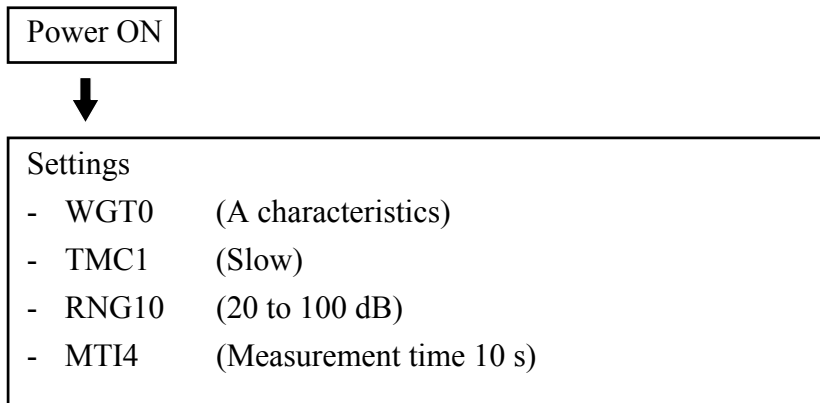
**Example:  $L_{eq}$  measurement (sound exposure level)**

(Measured with frequency weighting "C", dynamic characteristics "Fast", level range "20 to 80 dB", measurement time "10 s")



## Store example

(Measured with frequency weighting "A", dynamic characteristics "Slow", measurement time "10 s", level range "20 to 100 dB")



Establish above settings to prepare sound level meter for store operation



SRT1 (Start processing)



(Measurement end, or stopped by SRT0)

STO1 (Perform store operation. Data are stored and address is incremented by one.)



# Command List (in alphabetical order)

| Command | Function  | Page |
|---------|---|------|
| ADR     | Set address .....   | 38   |
| ADR?    | Get address setting .....                                       | 38   |
| BAT?    | Get battery status .....  | 41   |
| BER     | Set data exclusion (back-erase) function .....                  | 31   |
| BER?    | Get data exclusion (back-erase) function setting .....          | 31   |
| BLA     | Set backlight auto turn-off function .....                      | 41   |
| BLA?    | Get backlight auto turn-off setting .....                       | 41   |
| BRT     | Set baud rate .....   | 46   |
| CAL     | Activate calibration mode .....                                 | 40   |
| CAL?    | Get calibration status .....                                    | 40   |
| CBM     | Perform adjustment with Cal control .....                       | 40   |
| CBM?    | Get Cal control level setting .....                             | 40   |
| DCL     | Initialize unit (reset to factory defaults) .....               | 42   |
| DOD?    | Get level value shown on display .....                          | 44   |
| DOR?    | Get data stored in memory .....                                 | 44   |
| DPI     | Set display of various processing values .....                  | 31   |
| DPI?    | Get display setting for various processing values .....         | 32   |
| DRD?    | Set continuous output of sound level or short-term value Leq .. | 45   |
| DSP     | Set type of display data .....                                  | 32   |
| DSP?    | Get currently displayed processing types .....                  | 32   |
| EST?    | Get error information .....                                     | 46   |

| Command | Function   | Page |
|---------|--|------|
| IDX     | Set index number .....   | 46   |
| IDX?    | Get index number .....   | 46   |
| LTI?    | Get elapsed time since start of measurement or memory store .. | 42   |
| LXI     | Set percentile level .....                                     | 33   |
| LXI?    | Get percentile level settings .....                            | 33   |
| MDC     | Delete manual data from internal memory .....                  | 38   |
| MTI     | Set measurement time .....                                     | 33   |
| MTI?    | Get measurement time setting .....                             | 33   |
| OUT     | Set NL-21/NL-31 output signal output to AC or DC .....         | 43   |
| OUT?    | Get AC/DC output setting .....                                 | 43   |
| PSE     | Pause/restart measurement and memory store .....               | 36   |
| PSE?    | Get measurement and memory store pause status .....            | 36   |
| RCL     | Activate recall state .....                                    | 39   |
| RCL?    | Get recall state .....   | 39   |
| RET     | Set response processing for commands to On or Off .....        | 47   |
| RET?    | Get response processing setting .....                          | 47   |
| RMT     | Set remote/local mode .....                                    | 47   |
| RMT?    | Get remote/local mode setting .....                            | 47   |
| RNG     | Set level range .....  | 34   |
| RNG?    | Get level range setting .....                                  | 34   |
| SRT     | Start/stop measurement .....                                   | 36   |
| SRT?    | Get measurement running status .....                           | 36   |
| STO     | Start/stop memory store .....                                  | 37   |
| STO?    | Get memory store running status .....                          | 37   |
| TMC     | Set time weighting for main processing .....                   | 34   |
| TMC?    | Get time weighting setting .....                               | 34   |

| Command | Function                             | Page |
|---------|--------------------------------------|------|
| VER?    | Get version information .....        | 44   |
| WGT     | Set frequency weighting .....        | 35   |
| WGT?    | Get frequency weighting setting..... | 35   |
| XON     | Select control mode .....            | 48   |
| XON?    | Get control mode setting .....       | 48   |

