

# **SERIAL INTERFACE MANUAL**

Precision Integrating Sound Level Meter

with 1/3 octave band real-time analyzer

## **NA-27**

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# Outline

The precision sound level meter NA-27 incorporates an RS-232-C interface and an optical interface. These interfaces allow the use of a computer to set measurement parameters and to control the measurement. High-speed transfer of measurement data is possible through the use of a block transfer protocol. This manual describes the communication features of the NA-27. The manual is divided into the following sections:

- **Connection to a Computer**

This section describes how to link the NA-27 to a computer and how to set up communication parameters.

- **Transfer Protocol and Transfer Procedure**

This section describes the interface transfer protocols and the procedure to send and receive data.

- **Commands**

In this section, all commands which can be used to control the NA-27 are listed, and command format and functions are explained.

- **Output Data Format**

This section describes how measurement data are output by the NA-27.

## **Optical Communication**

The NA-27 supports the IrDA standard (version 1.0) for data communication using infrared signals. The NA-27 therefore can communicate with a computer equipped with an IrDA compatible infrared port. However, because the NA-27 uses a dedicated protocol as described in this manual, the communication software must support this protocol.

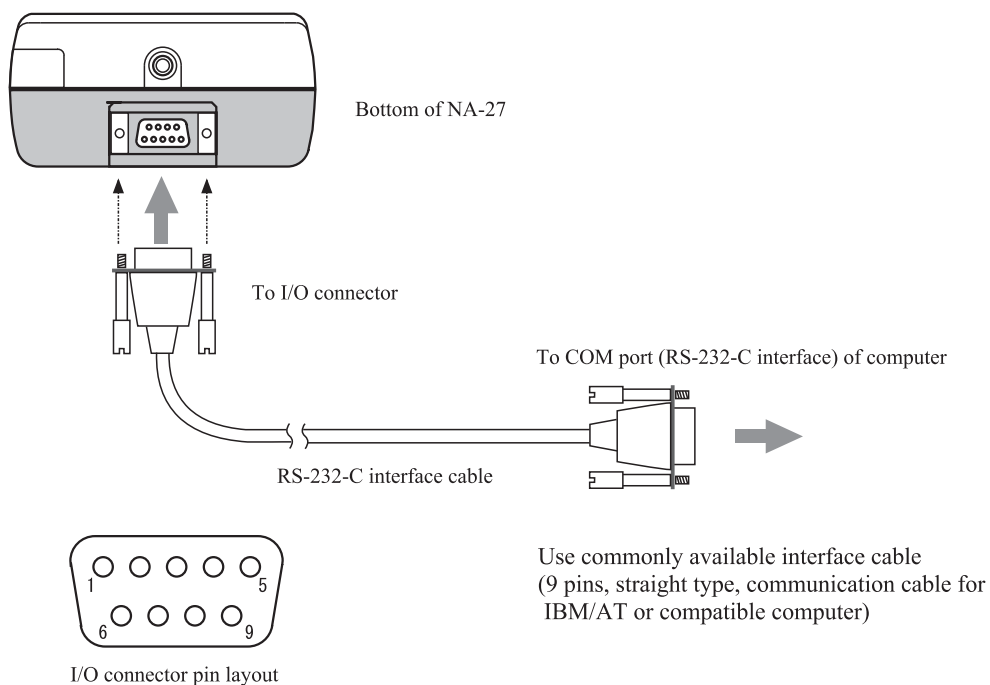
The NA-27 does not support the ASK principle. Data communication with equipment using an ASK optical port is not possible.

# Connection to a Computer

Choose the interface you wish to use, and establish the connection as shown below.

## RS-232-C Interface

Use a standard RS-232-C interface cable (crossed serial cable) to connect the NA-27 to the computer, as shown below. The connector on the NA-27 side must be a female 9-pin D-sub connector.



Pin No.	Description	Common abbreviation	JIS abbreviation	NA-27 usage status
1	Data channel carrier detect	DCD	CD	Not used
2	Receive data	RxD	RD	Used
3	Send data	TxD	SD	Used
4	Data terminal ready	DTR	ER	Not used
5	Signal ground	GND	SG	Used
6	Data set ready	DSR	DR	Not used
7	Request to send	RTS	RS	Used
8	Clear to send	CTS	CS	Used
9	Response indication	RI	CI	Not used

## Optical Communication

Place the NA-27 so that its optical port faces the optical port on the computer, at a distance of less than 50 cm.

## Communication Parameters

Use the I/O menu of the NA-27 to select the interface and to set the communication parameters.

- INTERFACE PORT

SERIAL: RS-232-C interface (I/O connector)

OPTICAL: Optical port

- BAUD RATE

Set this parameter to the same value as used by the computer.

For RS-232-C port: 4800/9600/19200/38400 bps

For optical port: 57600/115200 bps

# Transfer Protocol and Transfer Procedure

## Transfer Protocol

The NA-27 has a RS-232-C interface and an optical interface, which use the transfer principles shown below.

	<u>RS-232-C</u>	<u>Optical</u>
Transfer rate:	4800/9600/19200/38400 bps	57600/115200 bps
Data word length:	8 bit	8 bit
Stop bits:	1	1
Parity check:	None	None
Flow control:	RTS/CTS	None



## Remote Mode/Local Mode

- Local mode

In this mode, the NA-27 is operated with the controls on the unit or with the supplied remote control. Commands from the computer are also accepted. This is the default mode when the NA-27 is turned on.

- Remote mode

In this condition, the controls on the NA-27 (except for the ENTER key) and the supplied remote control are inactive, and the unit is operated only by commands from the computer. If a menu screen is being displayed on the NA-27 when the remote mode is activated, the menu screen closes and the measurement screen appears.

- Remote mode/local mode switching

To switch from local mode to remote mode, the RMT command with the remote mode parameter is used.

To switch from remote mode to local mode, the RMT command with the local mode parameter is used. It is also possible to switch to local mode by pressing the ENTER key on the NA-27.

## Transfer Control Procedure

In order to control the NA-27 from a computer or to retrieve measurement data, commands using a certain format must be sent to the sound level meter. The data exchange must be performed according to matching rules, to ensure that both the sound level meter and the computer recognize the commands and data properly. All commands sent to the NA-27, as well as data returned to the computer, consist of fixed-length data blocks and a control code.

Commands sent from the computer to the NA-27 use a 32-byte or 128-byte data block as well as a start header, block number, and checksum code, totalling 36 bytes or 132 bytes. Data sent from the NA-27 to the computer employ the same fixed-length 36-byte or 132-byte format.

### Transfer Format

Communication between the computer and NA-27 uses fixed-length data blocks accompanied by a 1-byte control code.

- Data block

Commands sent from the computer to the NA-27 and response data sent from the NA-27 to the computer (measurement parameter information and measurement data) are fixed-length data blocks, as shown below.

SOH (1 byte)	BLK (1 byte)	$\overline{\text{BLK}}$ (1 byte)	DATA (32 or 128 bytes)	SUM (1 byte)
-----------------	-----------------	-------------------------------------	---------------------------	-----------------

Data block configuration (36 or 132 bytes)

#### SOH (start header)

A header of  $01_{\text{H}}$  indicates that the size of the DATA block is 128 bytes. A header of  $02_{\text{H}}$  indicates that the size of the DATA block is 32 bytes.

#### BLK (block number)

If the data consist of several blocks, the block number is indicated by BLK. Block numbering is cyclic, starting at  $01_{\text{H}}$  and running to  $\text{FF}_{\text{H}}$ . Then

it returns to 00<sub>H</sub>.

If the data consist of one block only, the block number is always 01<sub>H</sub>.

## BLK

1-complement for BLK

### DATA (transfer data)

Commands from the computer to the NA-27 and response data from the NA-27. If the data are less than 32 or 128 bytes in length, the remaining space is filled with 1A<sub>H</sub>. The DATA block can contain any 8-bit code.

### SUM (checksum code)

This is the lower 8 bits of the data checksum (obtained by adding all bytes from the first to the last byte of the DATA block).

### ● Control codes

These are 1-byte codes that govern the data block transfer. The following control codes are used.

#### <ACK> Acknowledge (06<sub>H</sub>)

Issued by the receiving side if the received data block was normal.

#### <NAK> Not acknowledge (15<sub>H</sub>)

Issued by the receiving side if the received data block or the data itself was not normal. Errors can include protocol errors (checksum error, receive timeout, block number and 1-complement mismatch) and data level errors (invalid command, inexecutable command, parameter numeric error, parameter range error).

At the beginning of data transfer from the NA-27 to the computer, a <NAK> code is issued once when the computer is ready to receive data.

#### <EOT> End of transmission (04<sub>H</sub>)

This code is issued by the NA-27 after all data blocks have been sent. The computer can use this code to check for the end of data transmission.

<CAN> Cancel (18<sub>H</sub>)

When the count of resend tries after a <NAK>, a cyclic block number error, or a timeout exceeds 10, the <CAN> code is issued by the NA-27 to cancel the data transmission. Transmission is also canceled when <CAN> is received from the computer.

**Transfer Sequence**

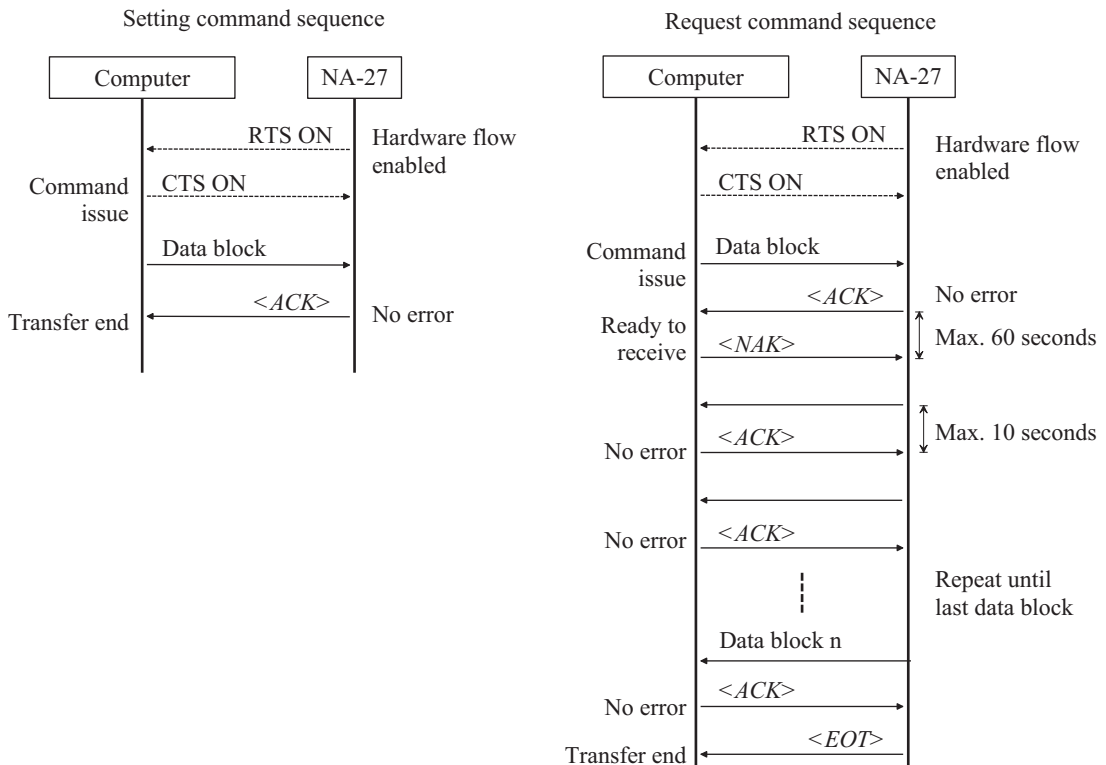
The following two types of transfer sequences are used by the NA-27: setting command sequence and request command sequence.

- Setting command sequence

This sequence is used for sending a command from the computer to the NA-27 for controlling operation or changing a setting without requesting response data.

- Request command sequence

This sequence is used for sending a command from the computer to the NA-27 that calls for response data.



## Computer-Side Processing

The computer-side software has to perform mainly the following two functions:

- Protocol control  
Control the protocol for sending data blocks
- Data processing  
Generate the send data block based on a send command and extract the data from the received data blocks.

The data block size and number of data blocks sent from the NA-27 is determined as follows.

If 32 bytes or less, data are sent as a 32-byte block, and if more than 32 bytes, as a 128-byte block (data block 1). If there are still remaining data after a block has been sent, the same evaluation is carried out, and data block 2 is sent as a 32-byte block or 128-byte block, depending on the amount of remaining data. This process is repeated until all data have been sent. When there are no more data, an *<EOT>* is sent.

Except for measurement data (sent by the NA-27 in response to the DOD 0? or similar commands) or for multiple commands sent as a string, data sent from and to the NA-27 will normally fit within a 32-byte block. But the NA-27 can handle both block sizes without problems. The software running on the computer should be set up to allow processing in a similar way. When sending multiple commands from the computer to the NA-27, these should be contained in single data block (total max. 128 bytes).

### ● Receiving a data block

1. After receiving a data block, the computer should check the block number and checksum and then perform handshaking.
2. This process is to be repeated until *<EOT>* is received.
3. When *<EOT>* is received, all data blocks have been received, and the data can be extracted.

- Data extraction

1. Look at the start header (SOH) to determine data block size (32 or 128 bytes), and then extract the data.
2. Remove filler code (1A<sub>H</sub>) and extract the real data.

If data are in ASCII format, remove all 1A<sub>H</sub> codes.

If data are in binary format, some 1A<sub>H</sub> codes may be data. Therefore data size information is incorporated in the data itself, as shown below (3rd and 4th byte). This information shows the size of the data that were requested by the command.

Error code (2 bytes)	Data size (2 bytes)	Data requested by command	Filler code
-------------------------	------------------------	---------------------------	-------------

First, read the data size, then retrieve the specified number of bytes starting from byte 5, and discard all bytes after the specified data size (i.e. the filler code).

If (data size + 4) is larger than the data block size (32 or 128 bytes), the data will continue in the next block. The size to be read from the next block is determined as (data size + 4) - (data block size).

3. Repeat steps 1 and 2 for all data blocks and combine the extracted data.

Only data sent in response to the DRB, DOB, and MRB commands are binary. Data sent in response to all other commands are in ASCII format. All commands sent from the computer to the NA-27 are in ASCII format.

## Transmission Error Handling

If correct data communication procedure is not followed or if commands or response data are not normal, an error occurs. Error handling is described below.

### Protocol Errors

- If received data contain a checksum error or a mismatch of block numbers and 1-complement, the NA-27 sends a *<NAK>*. If a data block ends prematurely, timeout occurs after 10 seconds, and the NA-27 sends a *<NAK>*.

When receiving a *<NAK>* from the NA-27, the computer should resend the data block. If the data block is not resent within 10 seconds, timeout will occur and the NA-27 again generates a *<NAK>*.

*<NAK>* can be generated continuously up to 10 times. If a normal data block is not received by then, the NA-27 sends a *<CAN>* and cancels the transfer sequence.

- If block numbers are incorrect, the NA-27 sends a *<CAN>* and cancels the transfer sequence.
- For a request command sequence, if the computer does not send a *<NAK>* indicating the receive ready condition within 60 seconds, timeout occurs. The NA-27 then sends a *<CAN>* and cancels the transfer sequence.
- If the NA-27 receives a *<NAK>* after sending a data block, it resends the data block. If there is no response within 10 seconds after sending the data block, timeout occurs and the NA-27 resends the data block. The maximum resend count is 10. If no *<ACK>* is received after 10 resend tries, the NA-27 sends a *<CAN>* and cancels the transfer sequence.

## Command Interpretation Errors

When a data block has been received normally, the NA-27 checks the format, parameter range, and whether the command can be executed in the current mode. If there is a problem, this is defined as a command error. The response of the NA-27 to a command error depends on whether the command was a setting command or a request command.

- Response to setting command errors

The NA-27 sends a <NAK> and interrupts the transfer sequence. If there is still a command error when the same command is sent again, the NA-27 again sends a <NAK>. This is repeated for as long as there is a command error. There is no 10-time limit as for protocol errors. Therefore, if a <NAK> is received from the NA-27 by the computer 11 times or more, this can be used to determine that the error is a command error and not a protocol error. In case of a command error, the computer can send the EST ? command after receiving a <NAK> response to determine which error has occurred (see explanation on page 43).

- Response to request command errors

The transfer sequence is the same, regardless of whether an error has occurred or not. For details on the transfer sequence, see the explanation on page 8.

When the NA-27 receives a request command, the NA-27 sends response data corresponding to the command. If no command error has occurred, the response data consist of an error code indicating the no-error condition and the data itself. (If the data are in ASCII format, the error code and data are delimited by a comma. If the data are binary, the first two bytes are the error code.)

If a command error has occurred, only the error code indicating the error is returned. Since the error code is always at the beginning of the response data, checking this position can be used to determine whether an error has occurred or not.



The error codes are as follows.

- err=0: Normal end (no command error)
- err=1: Invalid command name
- err=2: Invalid number of parameters
- err=3: Out-of-range parameter
- err=4: Command cannot be executed

# Commands

This section describes all commands that can be sent to the NA-27 and the response data output by the NA-27.

The transfer of commands and output data is to be performed as described in the preceding section. To send a command to the NA-27, the command must be augmented by filler code (1A<sub>H</sub>), a start header (SOH), block number (BLK) and 1-complement, and checksum information (SUM), to form a data block. This data block must then be sent according to the prescribed transfer sequence. In the same way, response data from the NA-27 are sent as one or several data blocks. After receiving the data blocks, error check and data extraction must be carried out.

The commands used by the NA-27 are divided into request command and setting commands, which use a different transfer sequence, as described on page 8.

- Request command

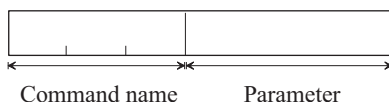
This is a command which requires response data from the NA-27. Such commands have the parameter "?".

- Setting command

This is a command that changes a setting at the NA-27 or initiates an operation, without requiring response data from the NA-27. Such commands do not have the parameter "?".

## Command Format

Commands used for the NA-27 consist of the 3-character command name (3 bytes) and one or several parameters. The command name uses only capital letters from A to Z. Parameters can be numerals from 0 to 9, ?, or #.



A numeric parameter specifies a certain mode or function of the command. The # parameter means that the current setting should be retained without change. The ? parameter means that information about a setting is required. Thus, a command using only numeric parameters or the # parameter is a setting command, and a command comprising the ? parameter is a request command.

The command and parameters may be separated by a space (20<sub>H</sub>), but this is not mandatory. Both of the examples shown below are valid.

Valid: SYS1

Valid: SYS 1

When there are several parameters, these must be separated by a space.

Valid: TMC 1 1

Invalid: TMC 11 (no space)

Invalid: TMC 1,1 (comma)

Several setting commands can be sent together. In this case, commands are to be separated by a space.

Valid: TMC 1 1 RMT 1

Invalid: TMC 11RMT 1 (no space)

Invalid: TMC 11,RMT 1 (comma)

- When sending multiple commands together, they should fit within one data block (max. 128 bytes).
- If an error occurs due to a command in a command string, commands following the one which caused the error will be disregarded.
- Several setting commands and one request command can be combined, but the request command must be placed last. If there are any setting commands after the request command, these will be disregarded.
- It is not possible to send several request commands together. All request commands after the first one will be disregarded.

## Organization of Command Description

Commands are explained in this manual as follows.

- Parameters are denoted as p1 (parameter 1), p2 (parameter 2), p3 (parameter 3) etc. The request parameter ? is shown as is.
- Data output by the NA-27 in response to a request command are denoted as d1 (data 1), d2 (data 2), d3 (data 3) etc. The error code preceding the actual data is denoted as "err". If there are several data, they are delimited by commas.

Error codes and values are shown below.

- err=0: Normal end (no error)
- err=1: Invalid command name
- err=2: Invalid number of parameters
- err=3: Out-of-range parameter
- err=4: Command cannot be executed

If an error has occurred (i.e. if response is other than err = 0), subsequent data are not sent.

### Setting command example

WGT p1 p2	Set frequency weighting	Command and parameter / Function description
p1:	Main channel frequency weighting .....	p1 description
	0: FLAT 1: A 2:C	
	#: Keep current setting .....	Possible values for p1 and their meaning
p2:	Sub channel frequency weighting .....	p2 description
	0: FLAT 1: A 2: C	
	#: Keep current setting .....	Possible values for p2 and their meaning

For example, to set the main channel frequency weighting to "FLAT" and the sub channel frequency weighting to "A", the command would be "WGT 0 1" (p1 = 0, p2 = 1).

### Request command example

WGT? Get frequency weighting	Command and parameter / Function description
------------------------------	---

---

Response data: err,d1,d2 ..... Format of response data

d1: Main channel frequency weighting ..... d1 description

0: FLAT 1: A 2:C ..... Possible values for d1  
and their meaning

d2: Sub channel frequency weighting ..... d2 description

0: FLAT 1: A 2: C ..... Possible values for d2  
and their meaning

For example, if main channel frequency weighting is set to "FLAT" and sub channel frequency weighting is set to "A", the response data would be "0,0,1" (err = 0, d1 = 0, d2 = 1).

## Command List

This list shows all available commands, grouped by function. Parameters are not shown here. The explanation of commands starting on page 19 also uses the same order.

<b>Measurement parameter setting and control commands</b>		<b>Page</b>
CLK	Set (get) time and date of internal clock .....	19
CAL	Perform calibration (Get calibration status) .....	20
RNG	Set (get) level range .....	21
WGT	Set (get) frequency weighting .....	21
TMC	Set (get) time constant .....	22
IMD	Set (get) instruction mode .....	23
MSR	Set (get) measurement calculation functions .....	23
STT	Set (get) statistics calculation function .....	24
SMT	Set (get) statistics calculation time .....	24
PMT	Set (get) power calculation time .....	25
MAX	Set (get) maximum/minimum value hold type .....	25
BER	Set (get) pause back-erase time .....	26

TRG	Set (get) trigger mode .....	26
LTR	Set (get) level trigger conditions .....	27
TTR	Set (get) time trigger conditions .....	27
DLT	Set (get) delay time .....	28
RCL	Set (get) current mode/recall mode .....	28
RMT	Set (get) remote mode/local mode .....	29
BEP	Set (get) beep function .....	29
DCO	Set (get) DC output channel .....	29
RMC	Set (get) infrared remote control status .....	29
PRA	Set (get) recall mode continuous print range .....	30
PRN	Set (get) recall mode printer mode .....	30
SRT	Start/stop measurement (Get measurement status) .....	31
PSE	Pause/resume measurement (Get pause status).....	31

### Screen display commands

ADP	Set (get) additional display .....	32
SCH	Set (get) sub channel display status .....	32
OPE	Set (get) display operation status .....	33
GRP	Set (get) analysis mode display type .....	34
MKP	Set (get) analysis mode marker position .....	35
LVT	Set (get) level-time display conditions .....	36

### Memory commands

SMD	Set (get) memory block for processing .....	38
ADR	Set (get) addresses for processing .....	38
PRO	Set (get) memory block protection status .....	39
AUT	Set (get) auto store conditions .....	40
STO	Start/stop data store (Get data store status) .....	41
RCC	Set (get) recall mode calculation type .....	41
RCA	Set (get) recall mode calculation range .....	42
CLR	Clear memory data .....	42

### Data request and output commands

EST	Get communication error status .....	43
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FLG	Get operation status information .....	43
LTI	Get calculation time .....	44
DIR	Get memory directory information .....	44
RCD	Get recall calculation results .....	45
BOC	Set (get) byte output order for binary data .....	46
DOB	Get binary output of active data .....	46
DOD	Get ASCII output of active data .....	46
DRB	Get continuous binary output of instantaneous values .....	47
MRB	Get continuous binary output of memory data .....	47
MRD	Get continuous ASCII output of memory data .....	47
VER	Get NA-27 system version .....	47

## Command Description

### Measurement Parameter Setting and Control Commands

CLK p1 p2 p3 p4 p5 p6    Set time and date of internal clock

---

p1: Year

0 - 99: last two digits of year    #: Keep current setting

p2: Month

1 - 12    #: Keep current setting

p3: Day

1 - 31    #: Keep current setting

p4: Hour

0 - 23    #: Keep current setting

p5: Minute

0 - 59    #: Keep current setting

p6: Second

0 - 59    #: Keep current setting

- This command cannot be used in the following modes:  
     During calculation ( $L_{eq}$ ,  $L_x$ , etc.) / During auto store/  
     After trigger start

CLK ?    Get time and date of internal clock

---

Response data:    err,d1,d2,d3,d4,d5,d6

d1: Year

0 - 99: last two digits of year

d2: Month

1 - 12

d3: Day

1 - 31

d4: Hour

0 - 23

d5: Minute

0 - 59

d6: Second

0 - 59

CAL p1    Perform calibration

---

p1: Calibration function

0: Cancel calibration    1: Start calibration

- Can only be used in current mode, when calculation ( $L_{eq}$ ,  $L_x$ , etc.) is not being carried out.

CAL ?    Get calibration status

---

Response data: err,d1

d1: Calibration status

0: Calibration not active

1: Calibration active



---

**RNG p**    **Set level range**


---

p1: Level range

0: 20-80 dB    1: 30-90 dB    2: 40-100 dB    3: 50-110 dB

4: 60- 120 dB    5: 70-130 dB    6: 80-140 dB

- The level range values shown above apply to the sound level meter mode.  
During 1/1 and 1/3 octave analysis, the lower limit is 10 dB lower.
- This command cannot be used in the following modes:
  - Recall mode or calibration mode
  - During calculation ( $L_{eq}$ ,  $L_x$ , etc.)
  - During auto store

---

**RNG ?**    **Get level range**


---

Response data: err,d1

d1: Level range

0: 20-80 dB    1: 30-90 dB    2: 40-100 dB    3: 50-110 dB

4: 60- 120 dB    5: 70-130 dB    6: 80-140 dB

- The level range values shown above apply to sound level meter mode.  
During 1/1 and 1/3 octave analysis, the lower limit is 10 dB lower.

---

**WGT p1 p2**    **Set frequency weighting**


---

p1: Set main channel frequency weighting

0: FLAT    1: A    2: C    #: Keep current setting

p2: Set sub channel frequency weighting

0: FLAT    1: A    2: C    #: Keep current setting

- This command cannot be used in the following modes:
  - Recall mode or calibration mode
  - During calculation ( $L_{eq}$ ,  $L_x$ , etc.)
  - During auto store

WGT ?    Get frequency weighting

---

Response data: err,d1,d2

d1: main channel frequency weighting

0: FLAT    1: A        2: C

d2: Sub channel frequency weighting

0: FLAT    1: A        2: C

TMC p1 p2    Set time constant

---

p1: Main channel time constant

0: FAST            1: SLOW            2: 35 ms            3: 10 ms

#: Keep current setting

p2: Sub channel time constant

0: FAST            1: SLOW            2: 35 ms            3: 10 ms

4: Impulse        #: Keep current setting

- This command cannot be used in the following modes:

Recall mode or calibration mode

During calculation ( $L_{eq}$ ,  $L_x$ , etc.)

During auto store

TMC ?    Get time constant

---

Response data: err,d1,d2

d1: Main channel time constant

0: FAST            1: SLOW            2: 35 ms            3: 10 ms

d2: Sub channel time constant

0: FAST            1: SLOW            2: 35 ms            3: 10 ms

4: Impulse

---

## IMD p1 Set instruction mode

---

p1: Instruction mode

0: Sound level meter mode

1: 1/1 octave analysis mode

2: 1/3 octave analysis mode

- This command cannot be used in the following modes:

Recall mode or calibration mode

During calculation ( $L_{eq}$ ,  $L_x$ , etc.)

After trigger start of during auto store

---

## IMD ? Get instruction mode

---

Response data: err,d1

d1: Instruction mode

0: Sound level meter mode

1: 1/1 octave analysis mode

2: 1/3 octave analysis mode

---

## MSR p1 Set measurement calculation functions

---

p1: Calculation function

0: Power calculation

1: Statistics calculation

- This command cannot be used in the following modes:

Recall mode or calibration mode

During calculation ( $L_{eq}$ ,  $L_x$ , etc.)

During auto store

---

## MSR ? Get measurement calculation functions

---

Response data: err,d1

d1: Calculation function

0: Power calculation

1: Statistics calculation

**STT p1 p2 p3 p4 p5 p6 p7 p8 p9 p10 Set statistics calculation function**

---

p1:  $L_1$    p2:  $L_5$    p3:  $L_{10}$    p4:  $L_{50}$    p5:  $L_{90}$    p6:  $L_{95}$

p7:  $L_{99}$    p8:  $L_{\max}$    p9:  $L_{\min}$    p10:  $L_{\text{eq}}$

For each parameter

0: OFF                      1: ON                      #: Keep current setting

- Only up to five parameters can be ON (including "Keep current setting") at the same time.
- During calculation, this command cannot be used.

**STT ? Get statistics calculation function**

---

Response data: err,d1,d2,d3,d4,d5,d6,d7,d8,d9,d10

d1:  $L_1$    d2:  $L_5$    d3:  $L_{10}$    d4:  $L_{50}$    d5:  $L_{90}$    d6:  $L_{95}$

d7:  $L_{99}$    d8:  $L_{\max}$    d9:  $L_{\min}$    d10:  $L_{\text{eq}}$

For each parameter

0: OFF                      1: ON

**SMT p1 p2 Set statistics calculation time**

---

p1: Calculation time value

1 - 99                      #: Keep current setting

p2: Calculation time unit

0: seconds    1: minutes    2: hours    #: Keep current setting

- This command cannot be used in the following modes:
  - Recall mode or calibration mode
  - During calculation ( $L_{\text{eq}}$ ,  $L_x$ , etc.)
  - During auto store

**SMT ? Get statistics calculation time**

---

Response data: err,d1,d2

d1: Calculation time value

1 - 99

d2: Calculation time unit

0: seconds    1: minutes    2: hours

---

**PMT p1 p2    Set power calculation time**


---

p1: Calculation time value

1 - 99            #: Keep current setting

p2: Calculation time unit

0: seconds    1: minutes    2: hours    #: Keep current setting

- This command cannot be used in the following modes:

Recall mode or calibration mode

During calculation ( $L_{eq}$ ,  $L_x$ , etc.)

During auto store

---

**PMT ?    Get power calculation time**


---

Response data: err,d1,d2

d1: Calculation time value

1 - 99

d2: Calculation time unit

0: seconds    1: minutes    2: hours

---

**MAX p1    Set maximum/minimum value hold type**


---

p1: Hold type

0: AP (hold each band level when all-pass level is at maximum/minimum)

1: Band (hold each band level at maximum/minimum)

- This command cannot be used in the following modes:

Recall mode or calibration mode

During calculation ( $L_{eq}$ ,  $L_x$ , etc.)

During auto store

---

**MAX ?    Get maximum/minimum value hold type**


---

Response data: err,d1

d1: Hold type

0: AP            1: Band

**BER p1 Set pause back-erase time**

---

p1: Back-erase time

0: 0 seconds (back-erase function not used)

1 - 5: 1 - 5 seconds

- This command can be used in the current mode and cannot be used during calculation ( $L_{eq}$ ,  $L_x$ , etc.).

**BER ? Get pause back-erase time**

---

Response data: err,d1

d1: Back-erase time

0: 0 seconds (back-erase function not used)

1 - 5: 1 - 5 seconds

**TRG p1 Set trigger mode**

---

p1: Trigger mode

0: OFF 1: Level trigger 2: External trigger 3: Time trigger

- When this command is executed with  $p1 = 0$ , the trigger is canceled. When executed with  $p1 = 1-3$ , trigger standby is activated.
- This command cannot be used in the following modes:
  - Recall mode or calibration mode
  - During calculation ( $L_{eq}$ ,  $L_x$ , etc.)
  - During auto store

**TRG ? Get trigger mode**

---

Response data: err,d1

d1: Trigger mode

0: OFF 1: Level trigger 2: External trigger 3: Time trigger

---

**LTR p1 p2      Set level trigger conditions**

---

p1: Trigger level

10 - 140: 10 - 140 dB

#: Keep current setting

p2: Trigger slope

0: - (from positive to negative)

1: + (from negative to positive)

#: Keep current setting

- This command cannot be used after trigger standby was activated.

---

**LTR ?      Get level trigger conditions**

---

Response data: err,d1,d2

d1: Trigger level

10 - 140: 10 - 140 dB

d2: Trigger slope

0: - (from positive to negative)    1: + (from negative to positive)

---

**TTR p1 p2 p3      Set time trigger conditions**

---

p1: Trigger time (hours)

0 - 23: 00 - 23 hours

#: Keep current setting

p2: Trigger time (minutes)

0 - 59: 00 - 59 minutes

#: Keep current setting

p3: Trigger cycle

0 - 24: 0 - 24 hours (0 means one-time trigger only)

#: Keep current setting

- This command cannot be used after trigger standby was activated.

TTR ?    Get time trigger conditions

---

Response data: err,d1,d2,d3

d1: Trigger time (hours)

0 - 23: 00 - 23 hours

d2: Trigger time (minutes)

0 - 59: 00 - 59 minutes

d3: Trigger cycle

0 - 24: 0 - 24 hours (0 means one-time trigger only)

DLT p1    Set delay time

---

p1: Delay time (from measurement start command to actual measurement start)

0: 0 seconds (no delay)                      1 - 10: 1 - 10 seconds

- This command cannot be used in the following modes:

Recall mode or calibration mode

During calculation ( $L_{eq}$ ,  $L_x$ , etc.)

DLT ?    Get delay time

---

Response data: err,d1

d1: Delay time (from measurement start command to actual measurement start)

0: 0 seconds (no delay)                      1 - 10: 1 - 10 seconds

RCL p1    Set current mode/recall mode

---

p1: Mode

0: Current mode                                  1: Recall mode

- This command cannot be used during calculation ( $L_{eq}$ ,  $L_x$ , etc.)

RCL ?    Get current mode/recall mode

---

Response data: err,d1

d1: Mode

0: Current mode                                  1: Recall mode



---

RMT p1 Set remote mode/local mode

---

p1: Mode

0: Local mode

1: Remote mode

---

RMT ? Get remote mode/local mode

---

Response data: err,d1

d1: Mode

0: Local mode

1: Remote mode

---

BEP p1 Set beep function

---

p1: ON/OFF setting

0: OFF (no beep)

1: ON (beep active)

---

BEP ? Get beep function

---

Response data: err,d1

d1: ON/OFF setting

0: OFF (no beep)

1: ON (beep active)

---

DCO p1 Set DC output channel

---

p1: Output channel

0: Main channel

1: Sub channel

---

DCO ? Get DC output channel

---

Response data: err,d1

d1: Output channel

0: Main channel

1: Sub channel

---

RMC p1 Set infrared remote control status

---

p1: Infrared remote control status

0: OFF

1: ON

**RMC ?    Get infrared remote control status**

---

Response data: err,d1

d1: Infrared remote control status

0: OFF                    1: ON

**PRA p1 p2    Set recall mode continuous print range**

---

p1: Continuous print start address

1 - nnnnn: address 1 - nnnnn (lower than p2)

#: Keep current setting

p2: Continuous print end address

1 - nnnnn: address 1 - nnnnn (higher than p1)

#: Keep current setting

**PRA ?    Get recall mode continuous print range**

---

Response data: err,d1,d2

d1: Continuous print start address

1 - nnnnn: address 1 - nnnnn

d2: Continuous print end address

1 - nnnnn: address 1 - nnnnn

**PRN p1    Set recall mode printer mode**

---

p1: Printer mode

0: Single sheet

1: Continuous

- This command sets only the printer mode; it does not initiate printing.

**PRN ?    Get recall mode printer mode**

---

Response data: err,d1

d1: Printer mode

0: Single sheet

1: Continuous

---

**SRT p1 Start/stop measurement ( $L_{eq}$ ,  $L_x$  calculation)**

---

p1: Start/stop measurement

0: Stop measurement                      1: Start measurement

- This command cannot be used in the following modes:

Recall mode or calibration mode

During auto store

- To stop auto store, the STO command rather than the SRT command should be used.

---

**SRT ? Get measurement ( $L_{eq}$ ,  $L_x$  calculation) status**

---

Response data: err,d1

d1: Measurement status

0: Measurement not in progress   1: Measurement in progress

---

**PSE p1 Pause/restart measurement**

---

p1: Pause operation

0: Restart measurement                      1: Pause measurement

- This command cannot be used in recall mode or calibration mode.

---

**PSE ? Get pause status**

---

Response data: err,d1

d1: Pause status

0: Unit is not in pause condition

1: Unit is in pause condition

## Screen Display Commands

ADP p1 p2      Set additional display

---

p1: Additional display for main channel

0: OFF      1:  $L_{\min}/L_{\max}$       #: Keep current setting

p2: Additional display items for sub channel

0: OFF      1:  $L_{\min}/L_{\max}$       2:  $L_{\text{tm}3}/L_{\text{tm}5}$

#: Keep current setting

ADP ?      Get additional display status

---

Response data: err,d1,d2

d1: Additional display for main channel

0: OFF      1:  $L_{\min}/L_{\max}$

d2: Additional display for sub channel

0: OFF      1:  $L_{\min}/L_{\max}$       2:  $L_{\text{tm}3}/L_{\text{tm}5}$

SCH p1 p2      Set sub channel display status

---

p1: Sub channel data display

0: OFF      1: ON      #: Keep current setting

p2: Sub channel peak display

0: OFF      1: ON      #: Keep current setting

SCH ?      Get sub channel display status

---

Response data: err,d1,d2

d1: Sub channel data display

0: OFF      1: ON

d2: Sub channel peak display

0: OFF      1: ON

---

## OPE p1 Set display operation status

---

p1: Measurement value

Power calculation

0:  $L_p$  (Instantaneous value)

1:  $L_{\max}$       2:  $L_{\min}$       3:  $L_{\text{eq}}$       4:  $L_E$

Statistics calculation

0:  $L_p$  (Instantaneous value)

1:  $L_1$     2:  $L_5$     3:  $L_{10}$     4:  $L_{50}$     5:  $L_{90}$     6:  $L_{95}$     7:  $L_{99}$

8:  $L_{\max}$     9:  $L_{\min}$     10:  $L_{\text{eq}}$

- During statistics calculation, only the currently used  $L_x$  setting can be specified. If another setting is specified, a parameter out-of-range error (err=3) occurs. Use the STT ? command to check the current calculation setting.

---

## OPE ? Get display operation status

---

Response data: err,d1

d1: Measurement value

Power calculation

0:  $L_p$  (Instantaneous value)

1:  $L_{\max}$       2:  $L_{\min}$       3:  $L_{\text{eq}}$       4:  $L_E$

Statistics calculation

0:  $L_p$  (Instantaneous value)

1:  $L_1$     2:  $L_5$     3:  $L_{10}$     4:  $L_{50}$     5:  $L_{90}$     6:  $L_{95}$     7:  $L_{99}$

8:  $L_{\max}$     9:  $L_{\min}$     10:  $L_{\text{eq}}$

GRP p1 Set analysis (1/1, 1/3 octave) mode display type

---

p1: Display type

0: Bar graph display 1: Numeric display 2: Level-time display

GRP ? Get analysis mode display type

---

Response data: err,d1

d1: Display type

-1: Sound level meter mode

0: Bar graph display 1: Numeric display 2: Level-time display

---

**MKP p1 p2      Set analysis mode marker position**


---

p1: Marker position 1 (specified by octave band frequency or dot position)

When bar graph display is activated, specify the octave band frequency.

0: AP	1: 16 Hz	2: 31.5 Hz	3: 63 Hz
4: 125 Hz	5: 250 Hz	6: 500 Hz	7: 1 kHz
8: 2 kHz	9: 4 kHz	10: 8 kHz	11: 16 kHz

#: Keep current setting

When level-time display is activated, specify the dot position.

1 - 140: dot 1 (leftmost) - 140 (rightmost)

#: Keep current setting

p2: Marker position 2 (specified by 1/3 octave band number)

During 1/1 octave band analysis/bar graph display, specify any value (for example 1) as dummy parameter.

During 1/3 octave band analysis/bar graph display, specify the 1/3 octave band number in the octave band.

0: First 1/3 octave in octave specified by p1
1: Second 1/3 octave in octave specified by p1
2: Third 1/3 octave in octave specified by p1
#: Keep current setting

For the 16 kHz band, only p2=0 can be specified.

During level-time display, specify any value (for example 1) as dummy parameter.

- When level-time display is used and recall calculation is ON, the MKP command also changes the calculation range (the marker position address becomes the calculation end address).
- This command can only be used in 1/1 and 1/3 octave analysis while bar graph display or level-time display is being used.

---

**MKP ?    Get analysis mode marker position**


---

Response data: err,d1,d2,d3

d1: Marker position 1 (indicated by octave band frequency or dot position)

When bar graph display is activated, the data denotes the octave band frequency.

0: AP	1: 16 Hz	2: 31.5 Hz	3: 63 Hz
4: 125 Hz	5: 250 Hz	6: 500 Hz	7: 1 kHz
8: 2 kHz	9: 4 kHz	10: 8 kHz	11: 16 kHz

When level-time display is activated, the data denotes the dot position.

1 - 140: dot 1 (leftmost) - 140 (rightmost)

d2: 1/3 octave band number in octave band

During 1/1 octave band analysis/bar graph display, a dummy parameter is returned.

During 1/3 octave band analysis/bar graph display, the 1/3 octave band number in the octave band is indicated.

0: First 1/3 octave in octave specified by p1
1: Second 1/3 octave in octave specified by p1
2: Third 1/3 octave in octave specified by p1

During level-time display, a dummy parameter is returned.

d3: Marker read value

nnn.n: nnn.n dB

Variable-length value, with non-existing parts compressed (max 3 integers and 1 decimal).

During compressed level-time display, the maximum value in the data is returned.

- This command can only be used in 1/1 and 1/3 octave analysis while bar graph display or level-time display is being used.

---

**LVT p1 p2 p3    Set level-time display conditions**


---

p1: Octave band frequency

0: AP	1: 16 Hz	2: 31.5 Hz	3: 63 Hz
4: 125 Hz	5: 250 Hz	6: 500 Hz	7: 1 kHz
8: 2 kHz	9: 4 kHz	10: 8 kHz	11: 16 kHz

#: Keep current setting



p2: 1/3 octave band number in octave band

During 1/1 octave band analysis and in AP band mode, specify any value (for example 1) as dummy parameter.

During 1/3 octave band analysis/bar graph display, specify the 1/3 octave band number in the octave band.

0: First 1/3 octave in octave specified by p1

1: Second 1/3 octave in octave specified by p1

2: Third 1/3 octave in octave specified by p1

#: Keep current setting

For the 16 kHz band, only p2=0 can be specified.

p3: Current memory block display compression ratio

1 - 32: Compression ratio (1/1 - 1/32 on NA-27 display)

#: Keep current setting

- When recall calculation is ON, the LVT command also updates the display.

## LVT ?      Get level-time display conditions

---

Response data: err,d1,d2,d3

d1: Octave band frequency

0: AP                      1: 16 Hz                      2: 31.5 Hz                      3: 63 Hz

4: 125 Hz                      5: 250 Hz                      6: 500 Hz                      7: 1 kHz

8: 2 kHz                      9: 4 kHz                      10: 8 kHz                      11: 16 kHz

d2: 1/3 octave band number in octave band

During 1/1 octave band analysis and in AP band mode, a dummy parameter (1) is returned.

During 1/3 octave band analysis:

0: First 1/3 octave in octave specified by p1

1: Second 1/3 octave in octave specified by p1

2: Third 1/3 octave in octave specified by p1

d3: Current memory block display compression ratio

1 - 32: Compression ratio (1/1 - 1/32 on NA-27 display)

## Memory Commands

### SMD p1 Set memory block for processing

---

p1: Memory block for processing

0: AUTO 1    1: AUTO 2    2: MANU

- In current mode, this is the memory block where data will be stored (without processing).
- In recall mode, this is the memory block from which data are recalled. Data from the specified address range will be processed.
- This command cannot be used during auto store.

### SMD ? Get memory blocks for processing

---

Response data: err,d1

d1: Memory block for processing

0: AUTO 1    1: AUTO 2    2: MANU

### ADR p1 Set addresses for processing

---

p1: Address number

1 - nnnnn: Address 1 - nnnnn

- The specification applies to the current memory block.
- In current mode, if the MANU memory block is selected, this is the address range where data will be stored (without processing). If the AUTO1 or AUTO2 memory block is selected, this the address range for processing, but data store will always be carried out from address 1.
- In recall mode, this is the address range from which data are recalled. If recall calculation is ON, the command sets the recall calculation start address.
- This command cannot be used during auto store.

---

**ADR ?    Get addresses for processing**

---

Response data: err,d1

d1: Address number

1 - nnnnn:    Address 1 - nnnnn

- The information applies to the current memory block.
- In current mode, if the MANU memory block is selected, this indicates the address range where the next data will be stored. If the AUTO1 or AUTO2 memory block is selected, the address range is irrelevant, because data store will always be carried out from address 1.
- In recall mode, this is the address range from which the current data were recalled.

---

**PRO p1 p2 p3    Set memory block protection status**

---

p1: AUTO 1 memory block

p2: AUTO 2 memory block

p3: AUTO 3 memory block

For each block, the following applies.

0: Enable overwrite (protection off)

1: Disable overwrite (protection on)

#: Keep current setting

- This command cannot be used during auto store.

---

**PRO ?    Get memory block protection status**

---

Response data: err,d1,d2,d3

d1: AUTO 1 memory block

d2: AUTO 2 memory block

d3: AUTO 3 memory block

For each block, the following applies.

0: Overwrite enabled (protection off)

1: Overwrite disabled (protection on)

## AUT p1 p2 p3 Set auto store conditions

---

p1: Store type

0: Single          1: Group          #: Keep current setting

p2: Number of store data (address upper limit)

1 - nnn:  $1 \times 100 - nnn \times 100$

999: To upper limit of memory block

#: Keep current setting

p3: Store interval

1 - 1000: 1 - 1000 ms (1 - 9 in 1-ms steps, 10 - 1000 in 10-ms steps)

#: Keep current setting

- The number of store data depends on the operation mode (sound level meter mode, 1/1 octave analysis mode, 1/3 octave analysis mode). The number can be set separately for each mode. The value of p2 is applied to the currently active mode.
- The store interval is used when storing instantaneous values in single store mode. If this is not the current condition, the p3 setting will be stored and applied when this mode is used.
- This command cannot be used during auto store.

## AUT ? Get auto store conditions

---

Response data: err,d1,d2,d3

d1: Store type

0: Single          1: Group

d2: Number of store data in current mode (address upper limit)

1 - nnn:  $1 \times 100 - nnn \times 100$

999: To upper limit of memory block

d3: Store interval

1 - 1000: 1 - 1000 ms (used when storing instantaneous values in single store mode)

---

## STO p1 Start/stop data store

---

p1: During manual store

0: Do nothing

1: Store data in current processing address

During auto store

0: Stop auto store

1: Start auto store

- During manual store, the address is incremented after the data were stored. Therefore successive storing is possible simply by sending the STO 1 command.
- This command cannot be used in recall mode or calibration mode.

---

## STO ? Get data store status

---

Response data: err,d1

d1: During manual store, d1 is always 0.

During auto store, d1 indicates the store status.

0: Store is not being carried out

1: Store is being carried out

---

## RCC p1 Set recall mode calculation type

---

p1: Recall mode calculation type

0: Calculation off

1: Power average

2: Power sum

3: Reverb time

#: Keep current setting

- This command can be used only in recall mode.

---

## RCC ? Get recall mode calculation type

---

Response data: err,d1

d1: Recall mode calculation type

0: Calculation off

1: Power average

2: Power sum

3: Reverb time

### RCA p1 p2     Set recall mode calculation range

---

p1: Calculation start address

1 - nnnnn: start address - nnnnn (lower than p2)

#: Keep current setting

p2: Calculation end address

1 - nnnnn: address 1 - nnnnn (higher than p1)

#: Keep current setting

- The setting applies to the current memory block.
- This command can be used only in recall mode.

### RCA ?     Get recall mode calculation range

---

Response data: err,d1,d2

d1: Calculation start address

1 - nnnnn: start address - nnnnn

d2: Calculation end address

1 - nnnnn: address 1 - nnnnn

- The range applies to the current memory block.

### CLR p1     Clear memory data

---

p1: Memory block whose data are to be cleared.

0: AUTO 1     1: AUTO 2     2: MANU

- This command cannot be used during auto store.
- If the specified block is protected, data cannot be cleared.

## Data Request and Output Commands

### EST ?    Get communication error status

---

Response data: d1

d1: Content of immediately preceding error

0: Normal end

1: Invalid command name

2: Invalid number of parameters

3: Out-of-range parameter

4: Command cannot be executed

- Unlike for other commands, there is no "err" included in the response to the EST ? command itself.

### FLG ?    Get operation status information

---

Response data: err,d1,d2,d3,d4,d5,d6,d7

d1: Calculation status

0: Calculation is not being carried out

1: Calculation is being carried out

d2: Pause status

0: Unit is not in pause condition

1: Unit is in pause condition

d3: Delay status

0: Delay is not active

1: Delay is active

d4: Store status

0: Store is not being carried out

1: Store is being carried out

d5: Trigger setting

0: Trigger is OFF

1: Trigger is ON

d6: Trigger start status

0: Trigger standby

1: Trigger start was carried out

d7: Trigger input

0: Trigger input standby

1: Trigger input was received

**LTI ?      Get calculation time**

---

Response data: err,d1,d2,d3

d1: Calculation time (hours)

0 - 99: 0 - 99 hours

d2: Calculation time (minutes)

0 - 59: 0 - 59 minutes

d3: Calculation time (seconds)

0 - 59: 0 - 59 seconds

- If calculation is currently in progress, the time since the start of calculation is returned. If calculation is completed, the total calculation time of the immediately calculation operation is returned.

**DIR p1 ?    Get memory directory information**

---

p1: Memory target

For the manual store memory block, the address can be specified. For auto store, the entire memory block is specified.

1 - 200: MANU memory block address (1 - 200)

201: AUTO 1 memory block

202: AUTO 2 memory block

Response data: err,d1,d2,d3,d4,d5,d6,d7

d1: Operation mode when data were stored

0: Sound level meter

1: 1/1 octave analysis

2: 1/3 octave analysis

d2: Year when data were stored

0 - 99: Last two digits of year

d3: Month when data were stored

1 - 12

d4: Day when data were stored

1 - 31

d5: Hour when data were stored

0 - 23



d6: Minute when data were stored

0 - 59

d7: Second when data were stored

0 - 59

- If no data are stored in the specified memory, a "command cannot be executed" error (err=4) is returned.

## RCD ?    Get recall calculation results

---

Response data: err,d1,d2,d3,d4,d5,d6,d7,d8,d9,...dn<CR><LF>

<CR> = carriage return (0DH), <LF> = line feed (0AH)

d1: Recall calculation type

0: Calculation OFF

1: Power average

2: Power sum

3: Reverb time

d2: Calculation start address of current memory block

1 - nnnnn: address 1 - nnnnn

d3: Calculation end address of current memory block

1 - nnnnn: address 1 - nnnnn

d4 - d6: 0 (dummy data)

d7: Main channel all-pass calculation value

d8: Sub channel all-pass calculation value

d9 - dn: Band calculation values

- When d1=0 (calculation OFF), data from d2 onwards and <CR><LF> are not output.
- In sound level meter mode, data from d4 onwards and <CR><LF> are not output.
- Calculation values for 1/1-octave analysis (10 bands) and 1/3-octave analysis (31 bands) are output in ascending order, starting with the lowest frequency. After the last data, a <CR><LF> is output.
- The power average and power sum calculation values take the format nnn.n (unit: dB), and the reverb time value takes the format nnn.nn (unit: seconds). All three values are of variable length, with empty digits being omitted.
- The reverb time value is determined as follows: data from the specified calculation range are subject to linear approximation using the least square

method, and then the time for the level to fall below 60 dB in each band is determined. If the angle of the linear vector causes the calculation result to be more than 327.67 seconds or a negative value, the data is set to 0. Therefore the data range for the reverb time is 0 to 327.67 seconds.

#### BOC p1 Set byte output order for binary data

---

p1: Byte output order

0: Lower byte upper byte lower byte upper byte...

1: Upper byte lower byte upper byte lower byte...

#### BOC ? Get byte output order for binary data

---

Response data: err,d1

d1: Byte output order

0: Lower byte upper byte lower byte upper byte...

1: Upper byte lower byte upper byte lower byte...

#### DOB p1 ? Get binary output of active data

#### DOD p1 ? Get ASCII output of active data

---

p1: Append measurement parameters

0: No          1: Yes

- If p1=1, measurement parameters and data are output together by the NA-27. If p1=0, only measurement data are output by the NA-27.
- Active data are the data currently shown on the display and related data. For details on active data and the response data of the NA-27, please refer to the explanation starting on page 52.
- Results of recall mode calculation cannot be obtained with this command. Use the RCD ? command (p. 45) for this purpose.

---

**DRB ?    Get continuous binary output of instantaneous values**


---

- Depending on the baud rate setting, the update frequency for continuous data output by the NA-27 is as follows.

19200 bps or higher: 100 ms

9600 bps: 200 ms

4800 bps: 400 ms

After receiving <ACK> from the computer, the NA-27 sends data at the next update interval. If the <ACK> signal intervals are longer than the update cycle, some data before receiving <ACK> may not be sent. For details, please refer to the explanation of the output data format for the DRB command (p. 53).

- For details about the response data format, please refer to the section starting on page 48.
- This command cannot be used in recall mode or calibration mode.

**MRB p1 p2 p3 p4 ?    Get continuous binary output of memory data**
**MRD p1 p2 p3 p4 ?    Get continuous ASCII output of memory data**


---

p1: Append measurement parameters

0: No                    1: Yes

p2: Target memory block

0: AUTO 1            1: AUTO 2            2: MANU

p3: Start address

1 - nnnnn: address 1 - nnnnn (lower than p4)

p4: End address

1 - nnnnn: address 1 - nnnnn (higher than p3)

- For details about the response data format, please refer to the section starting on page 48.
- Results of recall mode calculation cannot be obtained with this command. Use the RCD ? command (p. 45) for this purpose.

---

**VER ?    Get NA-27 system version**


---

Response data: err,d1

d1: System version

version n.n

# Output Data Format

This section explains the format of data output by the NA-27 in response to the DOD, DOB, DRB, MRD, and MRB commands.

## Data Structure

### Output format and data configuration

Response data from the NA-27 can take two basic formats:

- ASCII format: response data to DOD and MRD commands
- Binary format: response data to DOB, MRB, and MRD commands

In either format, the NA-27 appends error code information, measurement parameters, and measurement date/time to the measurement data.

Whether measurement parameter information is appended can be set by a command parameter, except for the DRB command. Output data in response to this command do not contain measurement parameter information.

When response data are in binary format, the data size is indicated after the error code. This number denotes the total number of bytes including measurement parameter information, measurement date/time, and measurement data. The information about the data size is used to discard the filler code and extract the actual data (see p. 9-10).

- ASCII format: Error code + measurement parameters + measurement date/time + measurement data
- Binary format: Error code + data size + measurement parameters + measurement date/time + measurement data

- Error code

The error code information included with the data is the same as that output in response to the EST ? command. If a command error has occurred (i.e. if the error code is not 0), the error code only is output by the NA-27.

Error code	Description
0	Normal end
1	Invalid command name
2	Invalid number of parameters
3	Out-of-range parameter
4	Command cannot be executed

- Data size

Indicates the total number of bytes containing data, including measurement parameters, measurement date/time, and measurement data. The computer can use this information to extract the actual data from the data block (see p. 9-10).

- Measurement conditions

These are the measurement conditions that apply to the requested data. For data in current mode, this means the parameters that are active at the time when the data are output. For stored data, this means the parameters that were active at the time of the store operation.

Depending on the type of request command and the command parameter, this information may not be included.

- Measurement date/time

For instantaneous values, this denotes the date/time when the instantaneous value was gathered. For processed values such as  $L_{eq}$ ,  $L_x$  etc., this indicates the calculation start date/time.

- Measurement data

This information includes level data for instantaneous value or calculation as well as overload/under-range information. The number of output data depends on the command and the measurement parameters. Level data in ASCII format are expressed as nnn.n (unit: dB). This is a variable length string, with empty digits being omitted.

Level data in binary format are expressed by multiplying the level with the factor 10 and converting the result to hexadecimal notation. To calculate the actual level from the data, use the formula shown below. The upper byte is  $D_H$  and the lower byte is  $D_L$ .

- If  $D_H \times 256 + D_L \leq 32767$ :

$$\text{Level (dB)} = (D_H \times 256 + D_L) / 10$$

- If  $D_H \times 256 + D_L > 32767$ :

$$\text{Level (dB)} = \{65536 - (D_H \times 256 + D_L)\} \times (-1) / 10$$

For binary output, the default byte order is lower byte - upper byte. This can be changed with the BOC command.

The main channel and sub channel overload/under-range information is included at the beginning of the measurement data. The information is coded as follows.

- 0: Normal (no overload/under-range)
- 1: Overload has occurred
- 2: Under-range has occurred
- 3: Overload/under-range has occurred

## Data output order and size

Data are output in the order error code, data size (for binary data), measurement parameters, measurement date/time, measurement data.

### ● ASCII format

Data type	Data size	Size	Coding	Delimiter	End delimiter
Error code	1	Variable	Character string		Comma
Measurement parameters	33	Variable	Character string	Comma	<CR><CF>
Measurement date/time	6	2 bytes	Character string	Comma	Comma
Measurement data	Variable	Variable	Character string	Comma	<CR><CF>

### ● Binary format

Data type	Data size	Size	Coding	Delimiter	End delimiter
Error code	1	2 bytes	Hex		None
Data size	1	2 bytes	Hex	None	None
Measurement parameters	33	2 bytes	Hex	None	None
Measurement date/time	6	2 bytes	Hex	None	None
Measurement data	Variable	2 bytes	Hex	None	None

Size: Size of one set of data

Delimiter: Separator used within the same data type

End delimiter: Separator used at the end of a data type

- Measurement data in binary format are multiplied by a factor 10 and converted to hexadecimal notation.
- Measurement parameters may not be output, depending on the command and command parameter.

## Data Type Categories

Output data depend on the command and on the operation mode of the NA-27 at the time when the command is received. The various types of output data are described below. For details on output for the various commands, please refer to the explanation starting on page 56.

### Data in response to DOD/DOB commands

DOD p1 ? Get binary output of active data

DOB p1 ? Get ASCII output of active data

p1: Append measurement parameters

0: No            1: Yes

Active data are determined by the operation mode, data store setting, and calculation setting of the NA-27. In current mode, these are the currently active settings, and in recall mode the settings that were active when the data were stored. If these settings are the same, the same data will be output regardless of the current mode/recall mode status. If the settings for operation mode, data store, and calculation were the same, the data values will differ for current mode and recall mode, but the data type will be identical. The settings for additional display, sub channel display, and waveform peak display do not affect the output data.

During level-time display, the active data are different. For details, refer to the explanation of the various data types.

Output data types in response to DOD/DOB command

Operation mode	Data store setting	Calculation	Data type	See page
Sound level meter	Auto/single	-	A-1	56
	Auto/group or manual	Power calculation	B-1	58
Statistics calculation		C-1	60	
1/1-octave analysis	Auto/single	-	D-1	62
	Auto/group or manual	Power calculation	F-1	66
Statistics calculation		G-1	68	
1/3-octave analysis	Auto/single	-	E-1	64
	Auto/group or manual	Power calculation	H-1	70
Statistics calculation		I-1	72	
Level-time display	-	-	J	74



## Data in response to DRB command

DRB ? Get continuous binary output of instantaneous values

Update frequency for continuous data output depends on the baud rate.

19200 bps or higher: 100 ms

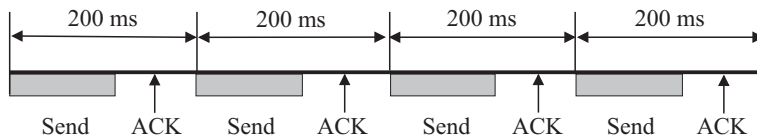
9600 bps: 200 ms

4800 bps: 400 ms

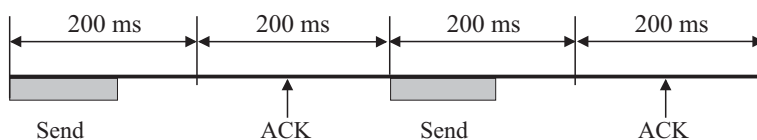
- This command cannot be used in recall mode or calibration mode.
- Output data type depends on the operation mode. Measurement parameters are not output.
- Data for one time point are output as one data block. One data block will never contain data for several time points.
- NA-27 does not send  $\langle EOT \rangle$ . It will keep on sending data until  $\langle CAN \rangle$  is received.
- After receiving  $\langle ACK \rangle$  from the computer, the NA-27 sends data at the next update interval. If the  $\langle ACK \rangle$  signal intervals are longer than the update cycle, some data before receiving  $\langle ACK \rangle$  may not be sent.

Example: 9600 bps

ACK input interval within update interval



ACK input interval longer than update interval



Time required to send the data is as follows.

Mode	Baud rate	Send time	Remarks
Sound level meter	115200 bps	approx. 3 ms	$\times 2$ at 576000 bps
	38400 bps	approx. 10 ms	$\times 2, \times 4, \times 8$ at 19200, 9600, 4800 bps
1/1-octave analysis 1/3-octave analysis	115200 bps	approx. 12 ms	$\times 2$ at 576000 bps
	38400 bps	approx. 35 ms	$\times 2, \times 4, \times 8$ at 19200, 9600, 4800 bps

- The first data block consists of error code + data size + measurement date/time + measurement data. Subsequent data blocks contain no error code and consist only of data size + measurement date/time + measurement data.
- The data size indicates the total of measurement date/time + measurement data for that data block. Use this information to extract the data from each block.

Output data type for DRB command

Operation mode	Data type	See page
Sound level meter	A-2	56
1/1-octave analysis	D-2	62
1/3-octave analysis	E-2	64

### Data in response to MRD/MRB command

MRB p1 p2 p3 p4 ? Get continuous binary output of memory data

MRD p1 p2 p3 p4 ? Get continuous ASCII output of memory data

---

p1: Append measurement parameters

0: No            1: Yes

p2: Target memory block

0: AUTO 1    1: AUTO 2    2: MANU

p3: Start address

1 - nnnnn: address 1 - nnnnn (lower than p4)

p4: End address

1 - nnnnn: address 1 - nnnnn (higher than p3)

- Only data for addresses within the specified range containing data are output. Addresses which contain no data are skipped. If the entire address range contains no data, only an error code is output.
- The data from one address may be split into several data blocks, but one data block will never contain data from more than one address. When the data from one address are complete, the next data block is started.
- The error code is included only in the first data block (first data block of first address).

- For binary output, the first data block of each address contains the data size information. If data from one address are split over several data blocks, the second and subsequent data blocks contain only measurement data, not the data size information. The data size information denotes the total of (measurement parameters +) measurement date/time + measurement data for the address. For binary output, the computer should therefore use the data size information to extract data for each address.
- When data for the last address have been sent, the NA-27 returns an <EOT> to the <ACK> from the computer.

### Output data types in response to MRD/MRB command

The output data type depends on the operation mode, data store conditions and calculation setup that were active when the requested data were gathered. The relationship between these factors is shown in the table below.

Operation mode	Data store setting	Calculation	Data type	See page
Sound level meter	Auto/single	-	A-3	56
	Auto/group	Power calculation	B-2	58
		Statistics calculation	C-2	60
1/1-octave analysis	Auto/single	-	D-3	62
	Auto/group	Power calculation	F-2	66
		Statistics calculation	G-2	68
1/3-octave analysis	Auto/single	-	E-3	64
	Auto/group	Power calculation	H-2	70
		Statistics calculation	I-2	72
Level-time display	Manual	-	M	75

## Data Types

This section describes the output data order and data contents for each data type. The following conventions are used in this section.

**Delimiter:** A code sent at the end of a data set when output is in ASCII format; either a comma or a  $\langle CR \rangle \langle LF \rangle$  (carriage return  $0D_H$  line feed  $0A_H$ ).

When output is in binary format, no delimiters are used.

**Size:** Data size in bytes when output is in binary format.

### Type A

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
		Only when requested. See measurement parameter data on page 77.		
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	Overload/under-range (main)	,	2
	2	Overload/under-range (sub)	,	2
	3	Waveform peak value	,	2
	4	All-pass (main)	,	2
	5	All-pass (sub)	$\langle CR \rangle \langle LF \rangle$	2

- A-1 DOD/DOB command -- sound level meter mode, auto/single store data
- For the DOB command, the data size is output after the error code.
  - When measurement parameters have been requested, these are output before the measurement date/time.
- A-2 DRB command -- sound level meter mode data
- Measurement parameters are not output.
  - Data size is output after the error code.
  - After the first time, data size + measurement date/time + measurement data output is repeated (until NA-27 receives <CAN>).
- A-3 MRD/MRB command -- sound level meter mode, auto/single store data
- For the MRB command, the data size is output after the error code.
  - After the first time, (data size +) measurement date/time + measurement data output is repeated for the number of addresses.

**Type B**

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
Only when requested. See measurement parameter data on page 77.				
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	Overload/under-range (main)	,	2
	2	Overload/under-range (sub)	,	2
	3	Waveform peak value	,	2
	4	All-pass $L_{\max}$ (main)	,	2
	5	All-pass $L_{\max}$ (sub)	,	2
	6	All-pass $L_{\min}$ (main)	,	2
	7	All-pass $L_{\min}$ (sub)	,	2
	8	All-pass $L_{\text{eq}}$ (main)	,	2
	9	All-pass $L_{\text{eq}}$ (sub)	,	2
	10	All-pass $L_E$ (main)	,	2
	11	All-pass $L_E$ (sub)	,	2
	12	All-pass $L_{\text{m}3}$ (main)	,	2
	13	All-pass $L_{\text{m}3}$ (sub)	<CR><LF>	2

B-1 DOD/DOB command -- sound level meter mode, auto/group store or manual store power calculation data

- For the DOB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time.

B-2 MRD/MRB command -- sound level meter mode, auto/group store power calculation data

- For the MRB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before measurement date/time for first address.
- After the first address, (data size +) measurement date/time + measurement data output is repeated for the number of addresses.

**Type C**

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
Only when requested. See measurement parameter data on page 77.				
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	Overload/under-range (main)	,	2
	2	Overload/under-range (sub)	,	2
	3	Waveform peak value	,	2
	4	All-pass $L_x(1)$ (main)	,	2
	5	All-pass $L_x(1)$ (sub)	,	2
	6	All-pass $L_x(2)$ (main)	,	2
	7	All-pass $L_x(2)$ (sub)	,	2
	8	All-pass $L_x(3)$ (main)	,	2
	9	All-pass $L_x(3)$ (sub)	,	2
	10	All-pass $L_x(4)$ (main)	,	2
	11	All-pass $L_x(4)$ (sub)	,	2
	12	All-pass $L_x(5)$ (main)	,	2
	13	All-pass $L_x(5)$ (sub)	<CR><LF>	2



C-1 DOD/DOB command -- sound level meter mode, auto/group store or manual store statistics calculation data

- For the DOB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time.

C-2 MRD/MRB command -- sound level meter mode, auto/group store statistics calculation data

- For the MRB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before measurement date/time for first address.
- After the first address, (data size +) measurement date/time + measurement data output is repeated for the number of addresses.

For the  $L_{x(1)} - L_{x(5)}$ , up to five Lx calculation items are possible. If fewer items are selected, fewer data will be output. For example, if only 3 items are selected, output will stop after  $L_{x(1)} - L_{x(3)}$ . (No dummy data will be output.)

The  $L_{x(1)} - L_{x(5)}$  order is determined by the raised bits of the "store data identifier" (measurement parameter data no. 32), in ascending order (see p. 77 - 80). For example, if the store data identifier value is 992 (=0x3e0), the following applies:

$$L_{x(1)} = L_1 \quad L_{x(2)} = L_5 \quad L_{x(3)} = L_{10} \quad L_{x(4)} = L_{50} \quad L_{x(5)} = L_{90}$$

**Type D**

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
Only when requested. See measurement parameter data on page 77.				
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	Overload/under-range (main)	,	2
	2	Overload/under-range (sub)	,	2
	3	Waveform peak value	,	2
	4	All-pass (main)	,	2
	5	All-pass (sub)	,	2
	6	16 Hz band (main)	,	2
	7	31.5 Hz band (main)	,	2
	8	63 Hz band (main)	,	2
	9	125 Hz band (main)	,	2
	10	250 Hz band (main)	,	2
	11	500 Hz band (main)	,	2
	12	1 kHz band (main)	,	2
	13	2 kHz band (main)	,	2
	14	4 kHz band (main)	,	2
	15	8 kHz band (main)	<CR><LF>	2

D-1 DOD/DOB command -- 1/1-octave analysis mode, auto/single data

- For the DOB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time.

D-2 DRB command -- 1/1-octave analysis mode data

- Measurement parameters are not output.
- Data size is output after the error code.
- After the first time, data size + measurement date/time + measurement data output is repeated (until NA-27 receives <CAN>).

D-3 MRD/MRB command -- 1/1-octave analysis mode, auto/single store data

- For the MRB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before measurement date/time for first address.
- After the first address, (data size +) measurement date/time + measurement data output is repeated for the number of addresses.

**Type E**

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
Only when requested. See measurement parameter data on page 77.				
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	Overload/under-range (main)	,	2
	2	Overload/under-range (sub)	,	2
	3	Waveform peak value	,	2
	4	All-pass (main)	,	2
	5	All-pass (sub)	,	2
	6	12.5 Hz band (main)	,	2
	7	16 Hz band (main)	,	2
	8	20 Hz band (main)	,	2
	9	25 Hz band (main)	,	2
	10	31.5 Hz band (main)	,	2
	11	40 Hz band (main)	,	2
	12	50 Hz band (main)	,	2
	13	63 Hz band (main)	,	2
	14	80 Hz band (main)	,	2
	15	100 Hz band (main)	,	2
	16	125 Hz band (main)	,	2
	17	160 Hz band (main)	,	2
	18	200 Hz band (main)	,	2
	19	250 Hz band (main)	,	2
	20	315 Hz band (main)	,	2

---

21	400 Hz band (main)	,	2
22	500 Hz band (main)	,	2
23	630 Hz band (main)	,	2
24	800 Hz band (main)	,	2
25	1 kHz band (main)	,	2
26	1.25 kHz band (main)	,	2
27	1.6 kHz band (main)	,	2
28	2 kHz band (main)	,	2
29	2.5 kHz band (main)	,	2
30	3.15 kHz band (main)	,	2
31	4 kHz band (main)	,	2
32	5 kHz band (main)	,	2
33	6.3 kHz band (main)	,	2
34	8 kHz band (main)	,	2
35	10 kHz band (main)	,	2
36	12.5 kHz band (main)	<CR><LF>	2

---

E-1 DOD/DOB command -- 1/3-octave analysis mode, auto/single data

- For the DOB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time.

E-2 DRB command -- 1/3-octave analysis mode data

- Measurement parameters are not output.
- Data size is output after the error code.
- After the first time, data size + measurement date/time + measurement data output is repeated (until NA-27 receives <CAN>).

E-3 MRD/MRB command -- 1/3-octave analysis mode, auto/single store data

- For the MRB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before measurement date/time for first address.
- After the first address, (data size +) measurement date/time + measurement data output is repeated for the number of addresses.

**Type F**

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
Only when requested. See measurement parameter data on page 77.				
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	Overload/under-range (main)	,	2
	2	Overload/under-range (sub)	,	2
	3	Waveform peak value	,	2
	4	All-pass $L_{\max}$ (main)	,	2
	5	All-pass $L_{\max}$ (sub)	,	2
	6	16 Hz band $L_{\max}$ (main)	,	2
	15	8 kHz band $L_{\max}$ (main)	,	2
	16	All-pass $L_{\min}$ (main)	,	2
	17	All-pass $L_{\min}$ (sub)	,	2
	18	16 Hz band $L_{\min}$ (main)	,	2
	27	8 kHz band $L_{\min}$ (main)	,	2
	28	All-pass $L_{\text{eq}}$ (main)	,	2
	29	All-pass $L_{\text{eq}}$ (sub)	,	2
	30	16 Hz band $L_{\text{eq}}$ (main)	,	2
	39	8 kHz band $L_{\text{eq}}$ (main)	,	2
	40	All-pass $L_E$ (main)	,	2

---

41	All-pass $L_E$ (sub)	,	2
42	16 Hz band $L_E$ (main)	,	2
51	8 kHz band $L_E$ (main)	<CR><LF>	2

---

F-1 DOD/DOB command -- 1/1-octave analysis mode, auto/group store or manual store power calculation data

- For the DOB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time.

F-2 MRD/MRB command -- 1/1-octave analysis mode, auto/group store power calculation data

- For the MRB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before measurement date/time for first address.
- After the first address, (data size +) measurement date/time + measurement data output is repeated for the number of addresses.

**Type G**

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
Only when requested. See measurement parameter data on page 77.				
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	Overload/under-range (main)	,	2
	2	Overload/under-range (sub)	,	2
	3	Waveform peak value	,	2
	4	All-pass $L_x(1)$ (main)	,	2
	5	All-pass $L_x(1)$ (sub)	,	2
	6	16 Hz band $L_x(1)$ (main)	,	2
	15	8 kHz band $L_x(1)$ (main)	,	2
	16	All-pass $L_x(2)$ (main)	,	2
	17	All-pass $L_x(2)$ (sub)	,	2
	18	16 Hz band $L_x(2)$ (main)	,	2
	27	8 kHz band $L_x(2)$ (main)	,	2
	28	All-pass $L_x(3)$ (main)	,	2
	29	All-pass $L_x(3)$ (sub)	,	2
	30	16 Hz band $L_x(3)$ (main)	,	2
	39	8 kHz band $L_x(3)$ (main)	,	2
	40	All-pass $L_x(4)$ (main)	,	2
	41	All-pass $L_x(4)$ (sub)	,	2



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42	16 Hz band $L_{x(4)}$ (main)	,	2
51	8 kHz band $L_{x(4)}$ (main)	,	2
52	All-pass $L_{x(5)}$ (main)	,	2
53	All-pass $L_{x(5)}$ (sub)	,	2
54	16 Hz band $L_{x(5)}$ (main)	,	2
63	8 kHz band $L_{x(5)}$ (main)	<CR><LF>	2

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G-1 DOD/DOB command -- 1/1-octave analysis mode, auto/group store or manual store statistics calculation data

- For the DOB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time.

G-2 MRD/MRB command -- 1/1-octave analysis mode, auto/group store statistics calculation data

- For the MRB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before measurement date/time for first address.
- After the first address, (data size +) measurement date/time + measurement data output is repeated for the number of addresses.

For the  $L_{x(1)} - L_{x(5)}$ , up to five  $L_x$  calculation items are possible. If fewer items are selected, fewer data will be output. For example, if only 3 items are selected, output will stop after  $L_{x(1)} - L_{x(3)}$ . (No dummy data will be output.)

The  $L_{x(1)} - L_{x(5)}$  order is determined by the raised bits of the "store data identifier" (measurement parameter data no. 32), in ascending order (see p. 77 - 80). For example, if the store data identifier value is 992 (=0x3e0), the following applies:

$$L_{x(1)} = L_1 \quad L_{x(2)} = L_5 \quad L_{x(3)} = L_{10} \quad L_{x(4)} = L_{50} \quad L_{x(5)} = L_{90}$$

## Type H

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
Only when requested. See measurement parameter data on page 77.				
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	Overload/under-range (main)	,	2
	2	Overload/under-range (sub)	,	2
	3	Waveform peak value	,	2
	4	All-pass $L_{\max}$ (main)	,	2
	5	All-pass $L_{\max}$ (sub)	,	2
	6	12.5 Hz band $L_{\max}$ (main)	,	2
	36	12.5 kHz band $L_{\max}$ (main)	,	2
	37	All-pass $L_{\min}$ (main)	,	2
	38	All-pass $L_{\min}$ (sub)	,	2
	39	12 Hz band $L_{\min}$ (main)	,	2
	69	12.5 kHz band $L_{\min}$ (main)	,	2
	70	All-pass $L_{\text{eq}}$ (main)	,	2
	71	All-pass $L_{\text{eq}}$ (sub)	,	2
	72	12 Hz band $L_{\text{eq}}$ (main)	,	2
	102	12.5 kHz band $L_{\text{eq}}$ (main)	,	2
	103	All-pass $L_E$ (main)	,	2
	104	All-pass $L_E$ (sub)	,	2

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105	12.5 Hz band $L_E$ (main)	,	2
135	12.5 kHz band $L_E$ (main)	<CR><LF>	2

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H-1 DOD/DOB command -- 1/3-octave analysis mode, auto/group store or manual store power calculation data

- For the DOB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time.

H-2 MRD/MRB command -- 1/3-octave analysis mode, auto/group store power calculation data

- For the MRB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before measurement date/time for first address.
- After the first address, (data size +) measurement date/time + measurement data output is repeated for the number of addresses.

**Type I**

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
		Only when requested. See measurement parameter data on page 77.		
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	Overload/under-range (main)	,	2
	2	Overload/under-range (sub)	,	2
	3	Waveform peak value	,	2
	4	All-pass $L_x(1)$ (main)	,	2
	5	All-pass $L_x(1)$ (sub)	,	2
	6	12.5 Hz band $L_x(1)$ (main)	,	2
	36	12.5 kHz band $L_x(1)$ (main)	,	2
	37	All-pass $L_x(2)$ (main)	,	2
	38	All-pass $L_x(2)$ (sub)	,	2
	39	12 Hz band $L_x(2)$ (main)	,	2
	69	12.5 kHz band $L_x(2)$ (main)	,	2
	70	All-pass $L_x(3)$ (main)	,	2
	71	All-pass $L_x(3)$ (sub)	,	2
	72	12.5 Hz band $L_x(3)$ (main)	,	2
	102	12.5 kHz band $L_x(3)$ (main)	,	2
	103	All-pass $L_x(4)$ (main)	,	2
	104	All-pass $L_x(4)$ (sub)	,	2

105	12.5 Hz band $L_{x(4)}$ (main)	,	2
135	12.5 kHz band $L_{x(4)}$ (main)	,	2
136	All-pass $L_{x(5)}$ (main)	,	2
137	All-pass $L_{x(5)}$ (sub)	,	2
138	12.5 Hz band $L_{x(5)}$ (main)	,	2
168	12.5 kHz band $L_{x(5)}$ (main)	<CR><LF>	2

I-1 DOD/DOB command -- 1/3-octave analysis mode, auto/group store or manual store statistics calculation data

- For the DOB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time.

I-2 MRD/MRB command -- 1/3-octave analysis mode, auto/group store statistics calculation data

- For the MRB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before measurement date/time for first address.
- After the first address, (data size +) measurement date/time + measurement data output is repeated for the number of addresses.

For the  $L_{x(1)} - L_{x(5)}$ , up to five  $L_x$  calculation items are possible. If fewer items are selected, fewer data will be output. For example, if only 3 items are selected, output will stop after  $L_{x(1)} - L_{x(3)}$ . (No dummy data will be output.)

The  $L_{x(1)} - L_{x(5)}$  order is determined by the raised bits of the "store data identifier" (measurement parameter data no. 32), in ascending order (see p. 77 - 80). For example, if the store data identifier value is 992 (=0x3e0), the following applies:

$$L_{x(1)} = L_1 \quad L_{x(2)} = L_5 \quad L_{x(3)} = L_{10} \quad L_{x(4)} = L_{50} \quad L_{x(5)} = L_{90}$$

**Type J**

Type	No.	Item and content	Delimiter	Size
Error code		Error code for request command	,	2
Data size		Only output for binary data		2
Measurement parameters				
Only when requested. See measurement parameter data on page 77.				
Measurement date/time				
	1	Year last two digits of year	,	2
	2	Month 1-12	,	2
	3	Day 1-31	,	2
	4	Hour 0-23 (24-hour notation)	,	2
	5	Minute 0-59	,	2
	6	Second 0-59	,	2
Measurement data				
	1	1st dot level value	,	2
	2	2nd dot level value	,	2
	139	139th dot level value	,	2
	140	140th dot level value	<CR><LF>	2

**J DOD/DOB command -- level-time data**

- For the DOB command, the data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time.
- If display compression is used, the highest value of all data for a dot is output.

## Type M

Type	No.	Item and content	Delimiter	Size	
Error code		Error code for request command	,	2	
Data size		Only output for binary data		2	
Measurement parameters					
		Only when requested. See measurement parameter data on page 77.			
Measurement date/time					
	1	Year	last two digits of year	,	2
	2	Month	1-12	,	2
	3	Day	1-31	,	2
	4	Hour	0-23 (24-hour notation)	,	2
	5	Minute	0-59	,	2
	6	Second	0-59	,	2
Measurement data					
		See below			

Measurement mode and calculation functions are separate for each address. The data types for the measurement data are as follows.

Sound level meter mode / power calculation:	Type B
Sound level meter mode / statistics calculation:	Type C
1/1-octave analysis / power calculation:	Type F
1/1-octave analysis / statistics calculation:	Type G
1/3-octave analysis / power calculation:	Type H
1/3-octave analysis / statistics calculation:	Type I

### Manual store data obtained with MRB command

- Data size is output after the error code.
- When measurement parameters have been requested, these are output before the measurement date/time (for all addresses).
- Only processed values are output. Stored instantaneous values are not output.
- After the first address, data size + (measurement parameters +) measurement date/time + measurement data output is repeated for the number of addresses.

### Manual store data obtained with MRD command

- When measurement parameters have been requested, these are output before the measurement date/time.
- Only processed values are output. Stored instantaneous values are not output.
- After the first address, (measurement parameters +) measurement date/time + measurement data output is repeated for the number of addresses.



## Measurement Parameter Data

Measurement parameter data are appended to the response data of a request command, if specified. The measurement parameter data contents and sort order are identical for all data types. For information on the position where the measurement parameter data are appended, refer to the sections on the various data types.

**Delimiter:** A code sent at the end of a data set when output is in ASCII format; either a comma or a <CR><LF> (carriage return 0D<sub>H</sub> line feed 0A<sub>H</sub>). When output is in binary format, no delimiters are used.

**Size:** Data size in bytes when output is in binary format.

### Measurement parameter data order and contents

No.	Item and description	ASCII	Binary
		Delimiter	Size
1	Memory block protect status 1: Auto/Single 2: Auto/Group 3: MANU	,	2
2	Memory block protect status 0: Overwrite enabled 1: Overwrite disabled	,	2
3	Measurement date/time Year Last two digit of year	,	2
4	Measurement date/time Month 1-12	,	2
5	Measurement date/time Day 1-31	,	2
6	Measurement date/time Hour 0-23 (24-hour notation)	,	2
7	Measurement date/time Minute 0-59	,	2

8	Measurement date/time Second 0-59	,	2
9	Level range 80: 80 dB 90: 90 dB 100: 100 dB 110: 110 dB 120: 120 dB 130: 130 dB 140: 140 dB	,	2
10	Main channel time constant 0: FAST 1: SLOW 2: 35 ms 3: 10 ms	,	2
11	Sub channel time constant 0: FAST 1: SLOW 2: 35 ms 3: 10 ms 4: IMPULSE	,	2
12	Main channel frequency weighting 0: FLAT 1: A 2: C	,	2
13	Sub channel frequency weighting 0: FLAT 1: A 2: C	,	2
14	Calculation function 0: Power calculation 1: Statistics calculation	,	2
15	Operation mode 0: Sound level meter 1: 1/1-octave analysis 2: 1/3-octave analysis	,	2
16	Delay time 0-10: 0-10 seconds	,	2
17	Max. value/min. value hold type 0: AP(all-pass) 1: Band	,	2
18	Power calculation time setting 1-99	,	2
19	Power calculation time unit 0: seconds 1: minutes 2: hours	,	2
20	Statistics calculation time setting 1-99	,	2

21	Statistics calculation time unit 0: seconds 1: minutes 2: hours	,	2
22	Auto store interval 1-1000: 1-1000 ms	,	2
23	Upper 16 bits of actual calculation time	,	2
24	Lower 16 bits of actual calculation time 0-231: $0 \times 10$ -231 $\times 10$ ms (see page 80)	,	2
25	Trigger mode 0: OFF 1: Level trigger 2: External trigger 3: time trigger	,	2
26	Trigger level (dB) 10-140: 10-140 dB	,	2
27	Trigger slope 0: - (positive to negative) 1: + (negative to positive)	,	2
28	Trigger time (hours) 0-23: (24-hour notation)	,	2
29	Trigger time (minutes) 0-59: 0-59 minutes	,	2
30	Trigger cycle (time) 0-24: 0-24 hours	,	2
31	Pause back-erase time 0-5: 0-5 seconds	,	2
32	Store data identifier Denotes the type of instantaneous value/calculation value included in the transmitted measurement data bit0: $L_p$ bit1: $L_{max}$ bit2: $L_{min}$ bit3: $L_{eq}$ bit4: $L_E$ bit5: $L_1$ bit6: $L_5$ bit7: $L_{10}$ bit8: $L_{50}$ bit9: $L_{90}$ bit10: $L_{95}$ bit11: $L_{99}$ bit12: $L_{tm3}/L_{tm5}$	,	2

33	Display data					<CR><LF> 2
	Power calculation					
	0: $L_p$	1: $L_{max}$	2: $L_{min}$	3: $L_{eq}$	4: $L_E$	
	Statistics calculation					
	0: $L_p$	1: $L_1$	2: $L_5$	3: $L_{10}$	4: $L_{50}$	
	5: $L_{90}$	6: $L_{95}$	7: $L_{99}$	8: $L_{max}$	9: $L_{min}$	
	10: $L_{eq}$					

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- No. 3 - 8 Measurement date/time

For instantaneous value data, this is the date/time when the data occurred. For calculation value data ( $L_{eq}$ ,  $L_x$  etc.), this is the calculation start date/time. For instantaneous values gathered with auto store or single store, only the date/time at the start of auto store is indicated. Therefore the same date/time information is output for all addresses.

The date/time information is the same as the "measurement date/time" data output before the measurement data.

- No. 23, 24 Actual calculation time

From these data, the calculation time can be calculated as follows.

#### ASCII format data

Taking the value of no. 23 as  $D_{23}$  and the value of no. 24 as  $D_{24}$ :

$$\text{Actual calculation time} = (D_{23} \times 65536 + D_{24}) \times 10 \quad (\text{unit: ms})$$

#### Binary format data

Taking the upper byte and lower byte no. 23 and no. 24 as  $D_{23H}$ ,  $D_{23L}$ ,  $D_{24H}$ ,  $D_{24L}$ :

$$\text{Actual calculation time} = \{(D_{23H} \times 256 + D_{23L}) \times 65536 + (D_{24H} \times 256 + D_{24L})\} \times 10 \quad (\text{unit: ms})$$

If the data are obtained after a preset calculation run has been completed, this value is identical with the data of no. 18/19 or 20/21. If calculation is still in progress, or if calculation was stopped midway, the data of no. 23/24

indicate the actual calculation time up to that point.

When calculation values gathered with auto store are collected from several addresses continuously, the calculation time applies to the last address.

For instantaneous values, the data of no. 23/24 have no significance (the calculation time from the previous calculation action are output).

- No. 32 Store data identifier

This indicates the type of data for instantaneous value data and calculation value data contained in the measurement data. If store is set to Auto/single, one bit will be 1. If store is set to Auto/group or manual, the bits for all calculation values will be 1.

