ARCADE
SPHEREA Group

NOISE XT

DNA Series
Phase Noise and Stability Analyzer
Programming Manual

Version	Date		Applicable
1.00	January 05, 2023		*From Software version G3.1.8*
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1.10	June 19, 2023		*From software version G3.2.4* *Adds SYSTEM:ERROR?* *Adds *RST*
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Notices

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1 PREFACE

DNA is a programmable instrument. Command used are text commands
To be use it is necessary to install VISA Library.

2 COMMON COMMANDS

Important Note: After any command or request, a waiting time of 0.2 sec is necessary before any new command or request.

2.1 *IDN?

System identification. Returns the instrument identification.

- ***IDN?** "<Manufacturer>, <part number>, <serial number>, <soft version>"

- **Syntax**

Return values: The *IDN? query returns a comma-separated list of strings which contains the manufacturer, the part number, the serial number and the firmware version.

Example: "NOISE-XT,DNA400M-F,23A00A0983,3.2.1"

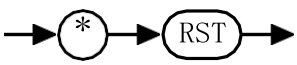
Usage: Query only

2.2 *RST

Reset.

Returns the device to its power-up state. The default settings are the factory defaults settings

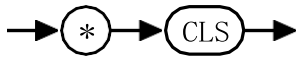
- **Syntax**



2.3 *CLS

The **CLS* (Clear Status) command clears the data structures. The SCPI registers are all cleared.

- **Syntax**



- **Limitation:**
  *CLS has an effect only when *[:][SYSTem:]BUSY?* Return 0

- **Note:**
  The *CLS has no effect during the "Calculation for best parameters" phase, and during the measurement phase.

2.4 *OPC?

Return 1 if instrument is ready for new command

- **Syntax**

This query returns a "1" if all commands sent before "*OPC?" have been executed and the hardware has settled. While the test program is waiting for the response, no further commands are sent to the instrument, but some queries can be sent.

- **Note:**
  - See *Time line *OCP?, ONGOING?, READY?, BUSY?*

3 SYSTEM SUBSYSTEM

The SYSTem subsystem collects the functions that are not related to instrument Performance.

3.1 [:][SYSTem:]READY?

Query only

This query returns 1 (True) if the system is ready to receive a new command or request.
This query returns 0 (False) if the system is not ready to receive a new command, but can receive some query.

- **Example**
  :SYSTEM:READY?
  :SYST:READY?
  :Ready?
  ready?

- ***Response format:*** < 1 | 0 > (True | False)

- **Note:**
  - This query is similar to *OPC?
  - See *Time line *OCP?, ONGOING?, READY?, BUSY?*

3.2 [:][SYSTem:]BUSY?

Query only

This query returns 1 (True) if the system is in processing (*[1]).
This query returns O (False) if the system is not in processing (*[1])

(*[1]) System "in processing" means the system in the calculation for best measurement parameters phase, or measurement is ongoing.

- **Example**
  :SYSTEM:BUSY?
  :SYST: BUSY?
  :Busy?
  busy?

- ***Response format:*** < 1 | 0 > (True | False)

- **Note:**
  - See *Time line *OCP?, ONGOING?, READY?, BUSY?*

3.3 [:]SYSTem:ERRor[:NEXT]?

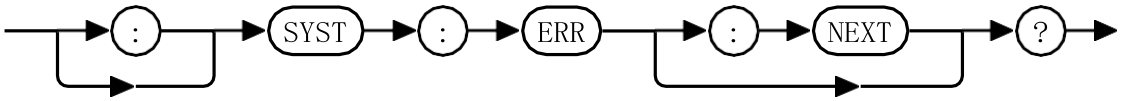
Query only

This query returns error numbers and messages from the device error queue. When an error is generated by the device, the error number and corresponding error message are stored in the error queue. Each time the error queue is queried, the first error in the error queue is returned. The errors are read out in the order of first-in first-out. To clear all errors in the error queue, use the **CLS* command.

When the error queue is empty, a query of the error queue will return a 0, "No error" message. The error queue has a maximum capacity of 20 errors. If the error queue is full, then the last error is set to *error -350, "Error queue overflow".*

The use of the :NEXT token is optional.

- **Syntax**



- **Query Example**

:SYST:ERR? *Queries the system error.*

Error queue messages have the following format:

For example, *-102, "Syntax error"*

- **Reset Condition**

On reset, the error queue is cleared.

4 MEASUREMENT SUBSYSTEM

The « MEASurement » subsystem contains the commands for configuring the triggering measurement actions such as start, stop, and knowing when a measurement is ongoing (on progress).

Remark:
After any command or request, a waiting time of 0.2 sec is necessary before any new command or request.

4.1 [:]MEASurement:START

This command allows the user to start a new measurement. The command is valid only when there is no ongoing measurement.

- **Parameters:** None
- **Example**
  :MEAS:START This command starts a new measurement.
- **Default**
  On power up, or when a *RST command is received, the default measurement status is stopped.
- **Query:** None

4.2 [:]MEASurement:STOP

This command allows the user to stop a measurement. The command is valid only when there is an ongoing measurement.

- **Parameters:** None
- **Example**
  :MEAS:STOP This command stops the present measurement.
- **Default**
  On power up, or when a *RST command is received, the default measurement status is stopped.
- **Query:** None
- **Note:**
  This command has no effect if the measurement is already stopped.

4.3 [:]MEASurement:ONGOING?

This command allows the user to know if the measurement is ongoing (in progress).

- **Example:**
  :MEASUREMENT:ONGOING?
  :MEAS:ONGOING?

- ***Response format:*** < 1 | 0 > (True | False)

This query returns 1 if the measurement is ongoing, returns 0 if the measurement is finished or if no measurement has been requested.

- **Note:**
  - See *Time line *OCP?, ONGOING?, READY?, BUSY?*

5 PARAMETERS SUBSYSTEM

The « PARAMeters » subsystem contains the commands for configuring the measurement parameters.

Remark:

- ***After any command, a waiting time of 0.2 sec is necessary before any new command.***
- ***All commands or requests on the PARAMeters subsystem have no effect when *OPC? Return 0.***

5.1 [:][MEASurement:]PARAMeters:DURATIONMODE

The DNA support two measurement modes:

- Continuous mode: in this mode the DNA continues the measurement until a stop command is received.
- Time limited mode: in this mode the DNA automatically stops the measurement upon timeout event.

This command allows the user to select the measurement mode.

- **Parameters:** <INFinite | LIMited>
- **Example**

:MEAS:PARAM:DURATIONMODE INF	This command set the measurement to continuous mode
:MEAS:PARAM:DURATIONMODE LIM	This command set the measurement to time-limited mode. The measurement time should be configured using the *[:][MEASurement:]PARAMeters:DURation* command.

- **Default**

On power up, or when a *RST command is received, the default duration mode is time-limited.

- **Query**

[:MEAS]:PARAMeters:DURATIONMODE?

This query returns the actual measurement duration mode of the system. The return value is either INF or LIM

INF	The measurement is in continuous mode
LIM	The measurement is in time-limited mode

5.2 [:][MEASurement:]PARAMeters:DURation

When the measurement is in time-limited mode, this command allows the user to set the measurement duration. The default time unit is in seconds.

- **Parameters:** <numeric value><space> <Unit: ms | s | mn | h >

  The numeric value type is positive integer.
  The accepted time units are:

ms	for millisecond
s	for second
mn	for minute
h	for hour

- **Example**

:MEAS:PARAM:DURATION 300	This command set the measurement duration to 300 seconds
:MEAS:PARAM:DURATION 300000 ms	This command set the measurement duration to 300 seconds
:MEAS:PARAM:DUR 5 mn	This command set the measurement duration to 300 seconds (5 mn)
:MEAS:PARAM:DUR 1 h	This command set the measurement duration to 3600 seconds (1 hour)

- **Default**

On power up, or when a *RST command is received, the default measurement duration is 300 seconds (5 minutes).

- **Query** [:MEAS]:PARAMeters:DURation?

This query returns the actual measurement duration of the system. The return time unit is in seconds.

5.3 [:][MEASurement:]PARAMeters:ENBW

This command allows the user to set the equivalent noise bandwidth of the frequency stability measurement.

- **Parameters**

< | 500HZ | 100HZ | 50HZ | 10HZ | 5HZ>
The parameter must be among the following:

500HZ	for 500 Hz	Equivalent Noise BandWidth
100HZ	for 100 Hz	Equivalent Noise BandWidth
50HZ	for 50 Hz	Equivalent Noise BandWidth
10HZ	for 10 Hz	Equivalent Noise BandWidth
5 HZ	for 5 Hz	Equivalent Noise BandWidth

- **Example**

:MEAS:PARAM:ENBW 500HZ	This command set the ENBW to 500 Hz.
PARAM:ENBW 10HZ	This command set the ENBW to 10 Hz.

- **Default**

On power up, or when a *RST command is received, the default ENBW is 100 Hz.

  - **Note**
    When the measurement is ongoing, the command "MEAS:PARAM:ENBW xxHz" has no effect. The measurement would be disturbed.

- **Query** [:MEAS]:PARAMeters:ENBW?

This query returns the actual equivalent noise bandwidth using for the frequency stability measurement. The return value is in the following list:
<~~1KHZ~~ | 500HZ | 100HZ | 50HZ | 10HZ | 5HZ>

  - **Note**
    A query ":MEAS:PARAM:ENBW?" Is possible when the measurement is ongoing.

- **Remark:**
  Changing the parameter ENBW change automatically the frequency precision corresponding to the ENBW value.

5.4 [:][MEASurement:]PARAMeters:STABility

This command allows the user to select the variance technique used in the frequency stability measurement.

- **Parameters** <ALLAN | OVERLAPPED | HADAMARD | OVERLAPPEDHADAMARD>

The parameter must be among the following:

ALLAN	Allan variance is selected
OVERLAPPED	Overlapped Allan variance is used
HADAMARD	Hadamard variance is used
OVERLAPPEDHADAMARD	Overlapped Hadamard variance is used

- **Example**

:MEAS:PARAM:STABILITY ALLAN	This command select the Allan variance technique.
PARAM:STAB OVERLAPPED	This command select the overlapped Allan variance technique.

- **Default**

On power up, or when a *RST command is received, the default frequency stability measurement technique is the Overlapped Allan variance.

  - **Note**
    - ***When the measurement is ongoing, changing the variance technique is possible***
    - ***When a measurement is finished, changing the variance technique don't change the frequency stability data measured previously.***

- **Query** [:MEAS]:PARAMeters:STABility?

This query returns the actual frequency stability measurement technique. The return value is in the following list:
<ALLAN | OVERLAPPED | HADAMARD | OVERLAPPEDHADAMARD>

  - **Note**
    - ***send a query :PARAM:STABILITY? Is possible when the measurement is ongoing.***

5.5 [:][MEASurement:]PARAMeters:ENHANCed

This command allows the user to select the phase noise enhancement mode.

- **Parameters** <ON | OFF> <1 | 0 >

- **Example**

:MEAS:PARAM:ENHANCED ON	This command enables the phase noise enhancement mode.
:PARAM:ENHAN OFF	This command disables the phase noise enhancement mode.
:MEAS:PARAM:ENHAN 1	This command enables the phase noise enhancement mode.
:PARAM:ENHAN 0	This command disables the phase noise enhancement mode.

- **Default**

On power up, or when a *RST command is received, the default phase noise enhancement mode is ON.

  - **Note**
    When the measurement is ongoing, the command "PARAM:ENHANCed" has no effect. The measurement would be disturbed.

- **Query** [:MEAS]:PARAMeters:ENHANCed?

This query returns the phase noise enhancement status. The return message format is <ON | OFF>

  - **Note**
    A query :PARAM: ENHANCed? is possible when the measurement is ongoing.

5.6 [:][MEASurement:]PARAMeters:VARiance

This command allows the user to select the cross-variance technique used in the frequency stability measurement.

- **Parameters** <VARIANCE | CROSS-VARIANCE>

The parameter must be among the following:

VARIANCE	One cross-correlation path is used to calculated the Allan variance.
CROSS-VARIANCE	Two cross-correlation paths are used to calculate the Allan variance. This option should help reduce the noise of the references. **It is noted that this option is only available when the phase noise enhancement mode is deactivated.**

- **Example**

:MEAS:PARAM:VARIANCE VARIANCE	This command select one path to measure the Allan variance.
PARAM:VAR CROSS-VARIANCE	This command select two cross-correlation paths to measure the Allan variance.

- **Default**

On power up, or when a *RST command is received, the default method is the Variance method.

  - **Note**
    When the measurement is ongoing, the command "PARAM:VARiance" has no effect. The measurement would be disturbed.

- **Query** [:MEAS]:PARAMeters:VARiance?

This query returns the actual frequency stability measurement variance type. The return value is in the following list:
<VARIANCE | CROSS-VARIANCE>

  - **Note**
    A query ":PARAM:VARiance?" is possible when the measurement is ongoing.

5.7 [:][MEASurement:]PARAMeters:SPAN

This command allows the user to select the frequency offset maximum value for the phase noise measurement.

- **Parameters** <1 | 10>

The parameter must be among the following:

1	1 MHz span is selected
10	10 MHz span is selected

- **Example**

:MEAS:PARAM:SPAN 1	This command select 1 MHz frequency span.
PARAM:SPAN 10	This command select 10 MHz frequency span.

- **Default**

On power up, or when a *RST command is received, the default frequency span is 1 MHz.

- **Query** [:MEAS]:PARAMeters:SPAN?

This query returns the actual frequency span. The return value is in the following list:
<1 MHZ | 10 MHz>

5.8 [:][MEASurement:]PARAMeters:SPURTHRESHOLD

This command allows the user to set the spurious detection threshold (dB).

- **Parameters** <numeric value><Space>[Unit: DB]

The unit is optional. It is always presented as dB.

- **Example**

:MEAS:PARAM:SPURTHRESHOLD 1 DB	This command sets the spurious threshold to 1 dB.
PARAM:SPURTHRESHOLD 3	This command sets the spurious threshold to 3 dB.

- **Default**

On power up, or when a *RST command is received, the default frequency span is 5 dB.

  - **Note**

    When the measurement is ongoing, the command "PARAM: SPURTHRESHOLD x" has no effect. The measurement would be disturbed.

- **Query** [:MEAS]:PARAMeters:SPURTHRESHOLD?

This query returns the actual threshold. The return message format is
<numeric value><space>DB

  - **Note**

    A query ":PARAM:SPURTHRESHOLD?" Is possible when the measurement is ongoing.

5.9 [:][MEASurement:]PARAMeters:FREQencyPRECision

This command allows the user to set the estimated frequency precision.

- **Parameters** <numeric value><Space>[Unit: HZ]

The unit is optional. The value is always interpreted as HZ.
The frequency precision can be adjusted from 0.1 Hz to 1Hz.

- **Example**

:MEAS:PARAM:FREQUENCYPRECISION 1 HZ	This command sets the estimated frequency precision to 1 Hz.
:PARAM:FREQPREC 0.2	This command sets the estimated frequency precision to 0.2 Hz.

- **Default**

On power up, or when a *RST command is received, the default frequency precision is 1 Hz.

  - **Note**
    When the measurement is ongoing, the command "PARAM: FREQuencyPRECision x" has no effect. The measurement would be disturbed.

- **Query** [:MEAS]:PARAMeters:FREQuencyPRECision?

This query returns the actual estimated frequency precision. The return message format is <numeric value><space>HZ

  - **Note**
    A query :PARAM:FREQuencyPRECision? Is possible when the measurement is ongoing.

- **Remark:**
  The frequency precision is automatically put to the maximum possible value depending on the ENBW chosen. The user can only change this value to a lower value, but not to a higher value.

Note:

The frequency precision mentioned here is relative to the internal clock of the system

5.10[:][MEASurement:]PARAMeters:DARKPORTCOMP

This command allows the user to enable the dark port thermal compensation option.

- **Parameters** <ON | OFF> <1 | 0 >

- **Example**

:MEAS:PARAM:DARKPORTCOMP ON	This command enables the dark port thermal compensation option.
:PARAM:DARKPORTCOMP OFF	This command disables the dark port thermal compensation option.
:MEAS:PARAM:DARKPORTCOMP 1	This command enables the dark port thermal compensation option.
:PARAM:DARKPORTCOMP 0	This command disables the dark port thermal compensation option.

- **Default**

On power up, or when a *RST command is received, the default compensation option is ON.

  - **Note**

    When the measurement is ongoing, the command "PARAM: DARKPORTCOMP <ON|OFF>" has no effect. The measurement would be disturbed.

- **Query** [:MEAS]:PARAMeters:DARKPORTCOMP?

This query returns the compensation status. The return message format is <ON | OFF>

  - **Note**

    A query ":PARAM:* DARKPORTCOMP*?" is possible when the measurement is ongoing.

5.11[:][MEASurement:]PARAMeters:RAWdata:PHASESAVE

This command allows the user to enable the raw phase data recording option. **It is mandatory that the recording root directory is properly configured too.** *See [:][MEASurement:]PARAMeters:RAWdata:ROOTdir*

- **Parameters:** <ON | OFF> <1 | 0 >

- **Example**

:MEAS:PARAM:RAWDATA:PHASESAVE ON	This command enables the raw phase data recording.
:PARAM:RAW: PHASESAVE OFF	This command disables the raw phase data recording.
:MEAS:PARAM:RAWDATA: PHASESAVE 1	This command enables the raw phase data recording.
:PARAM:RAW: PHASESAVE 0	This command disables the raw phase data recording.

- **Default**

On power up, or when a *RST command is received, the default recording option is OFF.

  - **Note**
    When the measurement is ongoing, the command "PARAM:RAWdata:PHASESAVE" has no effect. The recording would be disturbed.

- **Query** [:MEAS]:PARAMeters:RAWdata: PHASESAVE?

This query returns the raw phase data recording status. The return message format is <ON | OFF>

  - **Note**
    A query ":PARAM:RAWdata:PHASESAVE?" is possible when the measurement is ongoing.

5.12[:][MEASurement:]PARAMeters:RAWdata:FREQSAVE

This command allows the user to enable the fractional frequency data recording option. The data can also be used in the STABLE32 software for analysis. **It is mandatory that the recording root directory is properly configured too. See** *[:][MEASurement:]PARAMeters:RAWdata:ROOTdir*

- **Parameters:** < ON |OFF > < 1 | 0 >

- **Example**

:MEAS:PARAM:RAW:FREQSAVE ON	This command enables the fractional frequency data recording.
:MEAS:PARAM:RAWDATA: FREQSAVE OFF	This command disables the fractional frequency data recording.
:MEAS:PARAM:RAW: FREQSAVE 1	This command enables the fractional frequency data recording.
:MEAS:PARAM:RAW: FREQSAVE 0	This command disables the fractional frequency data recording.

- **Default**

On power up, or when a *RST command is received, the default recording option is OFF.

  - **Note**
    When the measurement is ongoing, the command "PARAM:RAWdata:FREQSAVE" has no effect. The recording would be disturbed.

- **Query** [:MEAS]:PARAMeters:RAWdata: FREQSAVE?

This query returns the fractional frequency data recording status. The return message format is <ON | OFF>

  - **Note**
    A query ":PARAM:RAWdata:FREQSAVE?" is possible when the measurement is ongoing.

5.13[:][MEASurement:]PARAMeters:RAWdata:ROOTdir

This command allows the user to configure the root director where raw phase data will be saved. It is noted that the command is only taken into account when the directory path is valid.

- **Parameters:** <path_to_directory >

- **Example**

:MEAS:PARAM:RAW:ROOTDIR C:\ This command configure the recording data directory to C:\.

- **Default**

On power up, or when a *RST command is received, the default recording directory path is C:\DNA_IHM_WIN10_32\data\AllanVar

  - **Note**

    When the measurement is ongoing, the command "PARAM:RAWdata:ROOTdir" has no effect. The recording would be disturbed.

- **Query** [:MEAS]:PARAMeters:RAWdata:ROOTdir?

This query returns the raw phase data recording directory path. The return message format is <path_to_directory>

  - **Note**

    A query ":PARAM:RAWdata:ROOTdir?" is possible when the measurement is ongoing.

6 RESULT SUBSYSTEM

The « RESULT» subsystem contains the requests for retrieving measurement results.

Remark: After any request, a waiting time of 0.1 sec is necessary before any new request.

6.1 [:][MEASurement:][RESULT:]PHASEnoise:BUFFER_EMPTY?

Query only.

This command returns 1 (True) if the phase noise data buffer is empty.
This command returns 0 (False) if the phase noise data buffer is not empty.

- **Example**
  :MEAS:RESULT:PHASENOISE:BUFFER_EMPTY?
  :RESULT:PHASE:BUFFER_EMPTY?
  :PhaseNoise:Buffer_Empty?
  :Phase:Buffer_Empty?

- ***Response format:*** < 1 | 0 > (True | False)

- **Note:**
  This command is the same as NOT(*[:][MEASurement:][RESULT:]PHASEnoise:READY?*)

- **Comment:**
  Detecting *[:][MEASurement:][RESULT:]PHASEnoise?* = “NONE” gives similar information.
  Detecting *[:][MEASurement:][RESULT:]PHASEnoise:BUFFER_SIZE?* = 0 gives similar information.

6.2 [:][MEASurement:][RESULT:]PHASEnoise:READY?

Query only.

This command returns 1 (True) if some phase noise data are ready to read.
This command returns 0 (False) if there is no phase noise data to read.

- **Example**
  :MEAS:RESULT:PHASENOISE:READY?
  :RESULT:PHASE:READY?
  :PhaseNoise:Ready?
  :Phase:Ready?

- ***Response format:*** < 1 | 0 > (True | False)

- **Note:**
  This command is the same as NOT(*[:][MEASurement:][RESULT:]PHASEnoise:BUFFER_EMPTY?*)

- **Comment:**
- Detecting *[:][MEASurement:][RESULT:]PHASEnoise?* = “NONE” gives similar information.
- Detecting *[:][MEASurement:][RESULT:]PHASEnoise:BUFFER_SIZE?* = 0 gives similar information.

6.3 [:][MEASurement:][RESULT:]PHASEnoise:BUFFER_SIZE?

Query only.

This command returns the size of the phase noise buffer elements (buffer element type is char)

- **Example**
  :MEAS:RESULT:PHASENOISE:BUFFER_SIZE?
  :RESULT:PHASE:BUFFER_SIZE?
  :PhaseNoise:Buffer_Size?
  :Phase:Buffer_Size?

- ***Response format:*** <integer> (number of char)

- **Note:**
  If the answer is 0 then the buffer is empty, and there is no phase noise data to read.
  If the answer is > 0 then the buffer is not empty, and phase noise data can be read.

6.4 [:][MEASurement:][RESULT:]PHASEnoise?

Query only.

This command allows the user to read the measured phase noise results. When there is an ongoing measurement, the command returns the latest measurement points. When there is no ongoing measurement, the command returns the result of the previous measurement.

- **Example**

:MEAS:RESULT:PHASENOISE?	This command request for the phase noise measurement data.
:RESULT:PHASE?	This command request for the phase noise measurement data.
:PhaseNoise?	This command request for the phase noise measurement data.

- **Response format**
  - If there is no phase noise data then answer is
    - "NONE"
  - Else answer is
    - <offset0,data0,offset1,data1,etc.>
    - Data are comma separated

    Where offset is the frequency offset value, fm (in Hz)
    Where data is the single side band phase noise density (L(fm) in dBc/Hz).

- **Example:**

  "NONE" If there is no frequency stability data
  Else
  <1.000,-112.000,2.000,-112.400,Etc>

  At 1 Hz offset, L(fm) = -112 dBc/Hz
  At 2 Hz offset, L(fm) = -112.4 dBc/Hz
  Etc.

- **Comment:**

  Detecting PhaseNoise?="NONE" gives similar information to:

  [:][MEASurement:][RESULT:]PHASEnoise:BUFFER_EMPTY?
  [:][MEASurement:][RESULT:]PHASEnoise:READY?
  [:][MEASurement:][RESULT:]PHASEnoise:BUFFER_SIZE? = 0

6.5 [:][MEASurement:][RESULT:]FREQuencySTABility:BUFFER_EMPTY?

Query only.

This command returns 1 (True) if the frequency stability data buffer is empty.
This command returns 0 (False) if the frequency stability data buffer is not empty.

- **Example**
  :MEAS:RESULT:FREQUENCYSTABILITY:BUFFER_EMPTY?
  :RESULT: FREQuencySTABility:BUFFER_EMPTY?
  :FreqStab:Buffer_Empty?

- ***Response format:*** < 1 | 0 > (True | False)

- **Note:**
  This command is the same as NOT(*[:][MEASurement:][RESULT:]FREQuencySTABility:READY?*)

- **Comment:**
  Detecting *[:][MEASurement:][RESULT:]FREQuencySTABility?* = “NONE” gives similar information.
  Detecting *[:][MEASurement:][RESULT:]FREQuencySTABility:BUFFER_SIZE?* = 0 gives similar information.

6.6 [:][MEASurement:][RESULT:]FREQuencySTABility:READY?

Query only.

This command returns 1 (True) if some frequency stability data are ready to read.
This command returns 0 (False) if there is no frequency stability data to read.

- **Example**
  :MEAS:RESULT: FREQUENCYSTABILITY:READY?
  :RESULT: FREQuencySTAB:READY?
  : FreqStab:Ready?

- ***Response format:*** < 1 | 0 > (True | False)

- **Note:**
  This command is the same as NOT(*[:][MEASurement:][RESULT:]FREQuencySTABility:BUFFER_EMPTY?*)

- **Comment:**
  Detecting *[:][MEASurement:][RESULT:]FREQuencySTABility?* = “NONE” gives similar information.
  Detecting *[:][MEASurement:][RESULT:]FREQuencySTABility:BUFFER_SIZE?* = 0 gives similar information.

6.7 [:][MEASurement:][RESULT:]FREQuencySTABility:BUFFER_SIZE?

Query only.

This command returns the size of the frequency stability buffer elements (buffer element type is char)

- **Example**
  :MEAS:RESULT: FREQUENCYSTABILITY:BUFFER_SIZE?
  :RESULT: FREQuencySTAB:BUFFER_SIZE?
  : FreqStab:Buffer_Size?

- ***Response format:*** <integer> (number of char)

- **Note:**
  If the answer is 0 then the buffer is empty, and there is no frequency stability data to read.
  If the answer is > 0 then the buffer is not empty, and frequency stability data can be read.

6.8 [:][MEASurement:][RESULT:]FREQuencySTABility?

Query only.

This command allows the user to read the frequency stability result. When there is an ongoing measurement, the command returns the latest measurement points. When there is no ongoing measurement, the command returns the result of the previous measurement.

- **Example**
  :MEAS:RESULT:FREQUENCYSTABILITY?
  :RESULT: FREQuencySTAB?
  :FreqStab?
  These commands request for the frequency stability measurement data.

- **Response format**
  - If there is no frequency stability data then answer is
    - "NONE"
  - Else answer is
    - <tau0,data0,tau1,data1,etc.>
    - Data are comma separated

    Where tau is the average time value (in seconds)
    Where data is the Frequency stability deviation
    (Allan deviation if Allan variance is selected)

- **Example**
  "NONE" If there is no frequency stability data
  Else
  <0.00257022228808,1.2526863446E-11,0.00514044457617,1.54384722E-11, Etc>

  At 0.00257022228808 second, frequency stability deviation = 1.2526863446E-11
  At 0.00514044457617 seconds, frequency stability deviation = 1.54384722E-11
  Etc.

6.9 [:][MEASurement:][RESULT:]DUT:POWer? (Updated)

Query Only

This command informs the user about the Device Under Test (DUT) power level on RF IN port of the instrument in dBm.

- **Example**
  :MEAS:RESULT:DUT:POWER?
  :RESULT:DUT:POW?
  :DUT:POW?
  These commands request for the DUT power level.
- **Response format**
  - If there is no DUT power level data then answer is “NONE”
  - Else answer is <numeric value><space>dBm
- **Answer example**
  “NONE” If there is no power level data
  Else
  <12.6 dBm>
  The power level on RF IN port of the instrument is estimated at 12.6 dBm
- **Note:**
  The power level measurement is done only after the command “MEAS:START”, during the phase “Calculation of best parameters”, after that the power level measurement is not updated until the end of the measure in progress.
- **Comments:**
  The REF power level is ready to read when *[:]MEASurement:ONGOING?* = 1

6.10[:][MEASurement:][RESULT:]REF<1|2>:POWer? (updated)

Query Only.

This command informs the user about the Oscillator reference power level on REFERENCE port of the instrument in dBm.

- **Example**

:MEAS:RESULT:REF1:POWER?	This command request for the reference port 1 power level.
:REF1:POW?	This command request for the reference port 1 power level.
:REF2:POW?	This command request for the reference port 2 power level.

- **Response format:**
  - If there is no REFERENCE power level data then answer is "NONE"
  - Else answer is <numeric value><space>dBm

- **Example** Query :REF1:POW?
  Answer
  "NONE" If there is no power level data
  Else
  <12.6 dBm>
  The power level on REFERENCE port 1 of the instrument is estimated at 12.6 dBm

- **Note:**
  The power level measurement is done only after the command "MEAS:START", during the phase "Calculation of best parameters", after that the power level measurement is not updated until the end of the measure in progress.

- **Comments:**
  The REFERENCE power level is ready to read when *[:]MEASurement:ONGOING?* = 1

6.11[:][MEASurement:][RESULT:]DUT:FREQuency?

Query only.

This command informs the user about the Device Under Test (DUT) frequency in Hz.

- **Example**
  :MEAS:RESULT:DUT:FREQUENCY? This command request for the DUT frequency.
  :DUT:FREQ? This command request for the DUT frequency.

- **Response format**
  - If there is no DUT frequency data then answer is “NONE”
  - Else answer is <numeric value><space>Hz

- **Example**
  “NONE” If there is no power level data
  Else
  99'999'998.5 Hz The DUT’s frequency is 99.9999985 MHz ± 2xFrequency Precision

- **Note:**
  The frequency measurement is done only after the command “MEAS:START”, during the phase “Calculation of best parameters”, after that the frequency measurement is not updated until the end of the measure in progress.

- ***Comments:***
  - The DUT frequency is ready to read when *[:]MEASurement:ONGOING?* = 1
  - *The frequency precision mentioned here is relative to the internal clock of the system see chapter 5.9 [:][MEASurement:]PARAMeters:FREQencyPRECision page 18*

6.12[:][MEASurement:][RESULT:]REF<1|2>:FREQuency?

Query only.

This command informs the user about the reference oscillator frequency in Hz.

- **Example**

:MEAS:REF1:FREQUENCY?	This command request for the reference port 1 frequency.
:REF1:FREQ?	This command request for the reference port 1 frequency.
:REF2:FREQ?	This command request for the reference port 2 frequency.

- **Response format:**
  - If there is no REFERENCE frequency data then answer is “NONE”
  - Else answer is <numeric value><space>Hz

- **Example** Query :REF1:FREQ?
  Answer
  “NONE” If there is no frequency data
  Else
  <400'000'000.6 Hz>
  The oscillator’s frequency at reference port 1 is 400.0000006 MHz ± 2xFrequency Precision

- **Note:**
  The frequency measurement is done only after the command “MEAS:START”, during the phase “Calculation of best parameters”, after that the frequency measurement is not updated until the end of the measure in progress.

- ***Comments:***
  - The DUT frequency is ready to read when *[:]MEASurement:ONGOING?* = 1
  - *The frequency precision mentioned here is relative to the internal clock of the system see chapter 5.9 [:][MEASurement:]PARAMeters:FREQencyPRECision page 18*

7 APPENDIX

7.1 Error Message List

Table 1 : Error Codes and Messages

Error code	*Error message*
0	No error
-102	Syntax error Invalid syntax was found in the command string.
-104	Data type error
-108	Parameter not allowed More parameters were received than expected for the command.
-109	Missing parameter
-200	Execution error
-222	Data out of range A numeric parameter value is outside the valid range for the command.
-240	Hardware control error
-350	Error queue overflow
-365	Time out error
200	The measurement has been already Started
201	One or more channels signal is lost
202	One or more channels are saturated
203	DUT signal is lost or its power is too low
204	First reference signal is lost or its power is too low
205	Second reference signal is lost or its power is too low
206	Failed to set default sampling frequency

7.2 Time line *OCP?, ONGOING?, READY?, BUSY?

The timeline below describes the operation of the instrument status query.

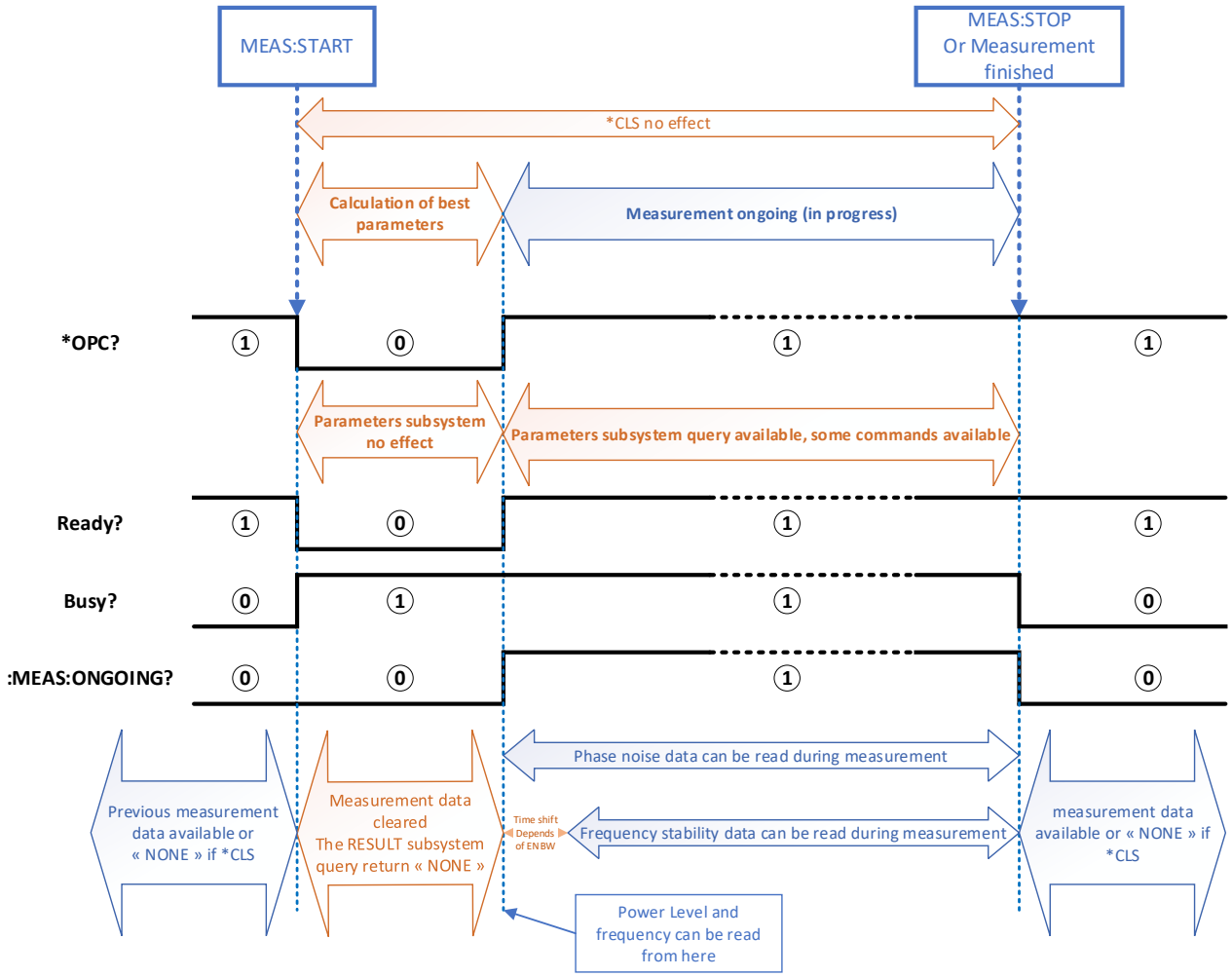


Figure 1 : Time line instrument status query

7.3 Remote control example

Example 1:

- Get the DUT power level and frequency
- Get the References power level and frequency
- Get the phase noise data at the end of the measurement.
- Get the frequency stability deviation at the end of the measurement.

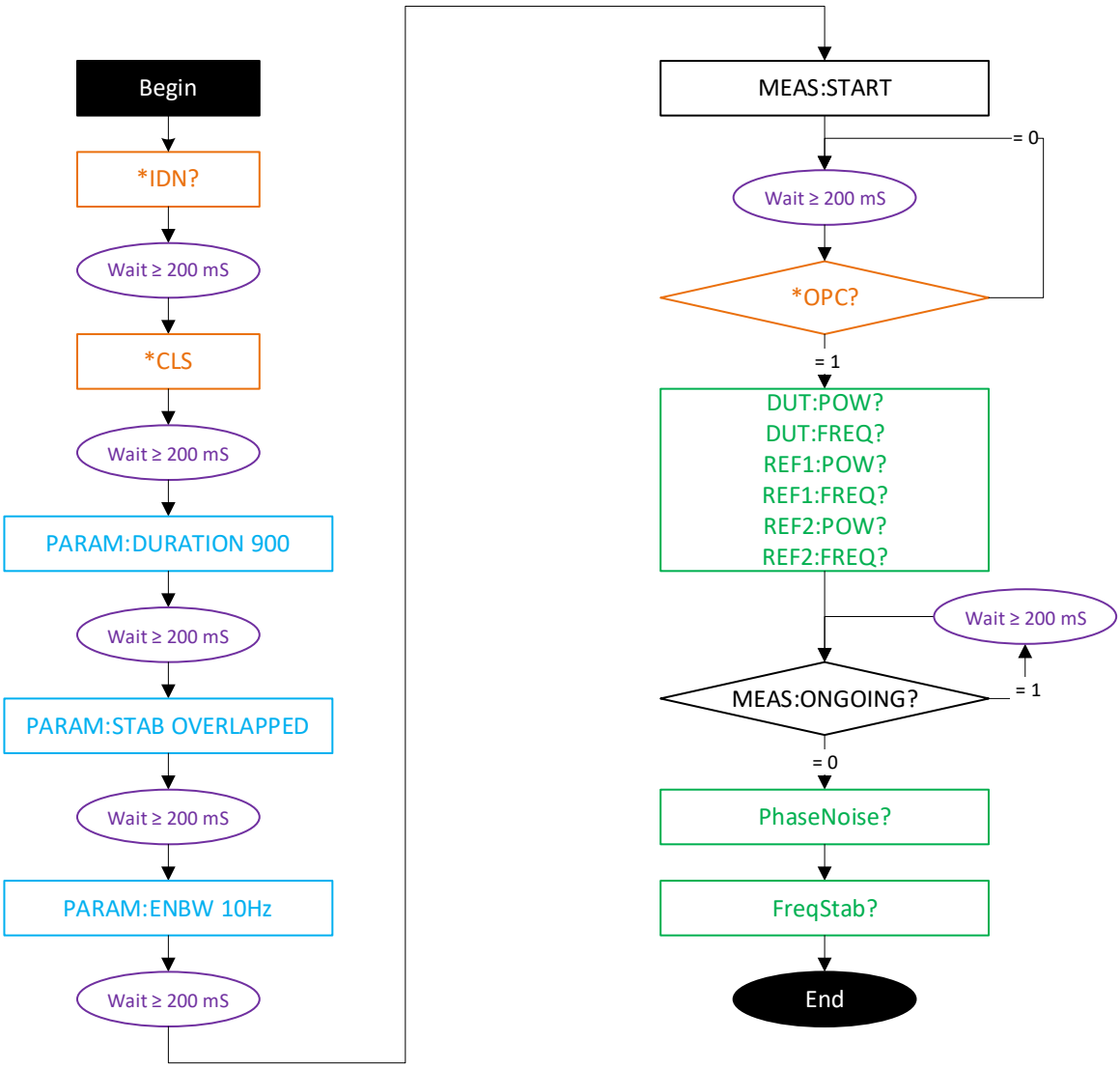


Figure 2 : Remote control example 1

Example 2:

- Get the DUT power level and frequency
- Get the phase noise data during measurement.
- Get the frequency stability deviation during the measurement.
- Get the phase noise data when the measurement is complete.
- Get the frequency stability deviation when the measurement is complete.

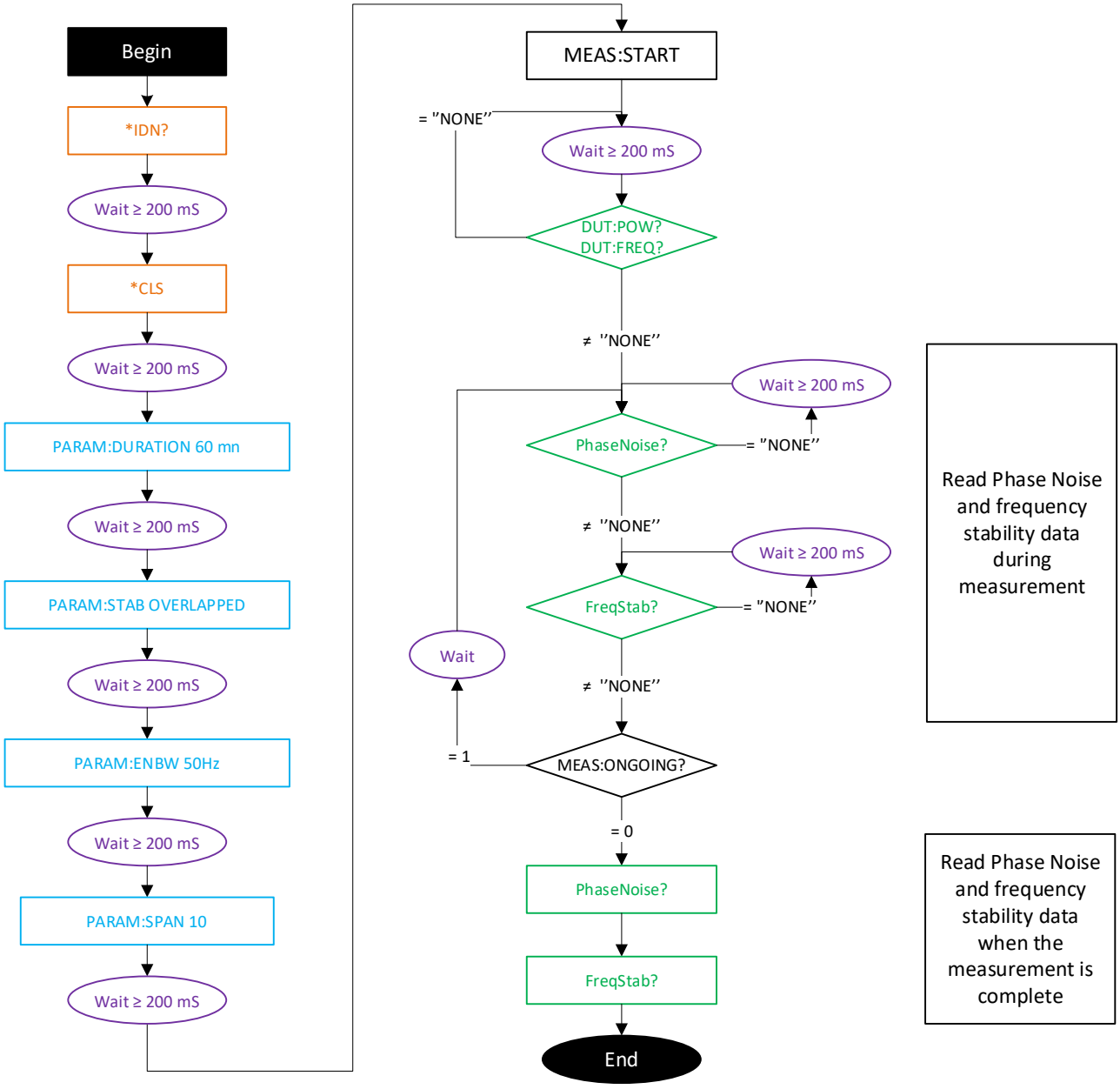


Figure 3 : Remote control example 2

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