Part 2

ANT-20, ANT-20E, ANT-20SE,
DominoCOM ANT-20

“Jitter Module”

Remote Control Operating Manual
SCPI Command List

Contents

Command reference

Introduction

1 ANT-20, ANT-20E, ANT-20SE

1.1 General information

1.1.1 Overview

The ANT-20 can be remotely controlled using the

- IEEE 488 (IEC 625) interface, often referred to as GPIB:
  Option BN 3035/92.10, Remote Control GPIB (PCMCIA)

– or –

- V.24/V.28 (RS 232) interface:
  Option BN 3035/91.01, Remote Control V.24

The programming commands are identical, regardless of the type of remote control interface that is used.

The ANT-20 must be switched to remote control mode manually. In remote control mode, manual control of the ANT-20 is not possible.

To set the ANT-20 to remote control mode, follow these steps:

ANT-20, ANT-20E with Windows 3.11:

⇒ Double-click on the “Remote” icon in the “ANT-20” group in the “Program Manager” window.

Windows 95:

1. Enable remote control mode using the taskbar: “Start/ANT-20/Remote On”.
2. Double-click on the “ANT-20” icon on the desktop
   – or –
   use the taskbar: “Start/ANT-20/ANT-20”.

To switch back to normal manual control, follow these steps:

ANT-20, ANT-20E with Windows 3.11:

⇒ Double-click on the “Remote Disable” icon in the “ANT-20” group in the “Program Manager” window.

Windows 95:

1. Disable remote control mode using the taskbar: “Start/ANT-20/Remote Off”.
2. Double-click on the “ANT-20” icon on the desktop
   – or –
   use the taskbar: “Start/ANT-20/ANT-20”.

From the viewpoint of remote control, each measuring module in the ANT-20 is a fully remote-controllable instrument with its own SCPI command tree, status reporting system and common command set.

The measuring module to be controlled is selected using the command MODule:SELect <module_name> (see Sec. 1.1.2).

The instrument's display shows which measuring modules exist and which one is selected for remote control.

A built-in monitor function can be switched on for debugging purposes (see Sec. 1.1.3).

To change the type of the remote control interface and/or its accompanying configuration parameters, the batch file remote.bat must be edited.

ANT-20, ANT-20E with Windows 3.11:

1. Double-click on the "Remote Configuration" icon in the "ANT-20" group in the "Program Manager" window to edit the remote.bat file.
2. Follow the on-screen instructions.

Windows 95:

1. Click on the "Remote Configuration" icon via taskbar: "Start/ ANT-20/Remote Configuration" to edit the remote.bat file.
2. Follow the on-screen instructions.

1.1.2 Module selection

The remote control interface of the ANT-20 supports multiple internal measuring modules. The module selection provides a mechanism to select one of these measuring modules for remote control.

Keyword	Parameter form	Notes
MODule:SELect	<module_name>[1]	[no query]
1 <module_name>: BASIC | JITTER | JITT16		

Table I-1 Module selection

This command selects the measuring module specified by <module_name> for remote control and deselects all others. All subsequent commands (including commands in subsequent program messages) are passed to the selected measuring module. All other measuring modules are unavailable for programming until selected.

<module_name>:

BASIC: Selects BASIC Module
JITTER: Selects JITTER Module for bit rates up to STM-4/OC-12 (extension slot)
JITT16: Selects JITTER Module for bit rates of STM-16/OC-48 (extension slot)

Note:
- This command has no query form.
- After power-on, the BASIC measuring module is selected.
- If the MODule:SELect <module_name> command is required in a program message, it must be the first (or the only) command in that program message.

1.1.3 Monitor mode

A monitor function can be switched on or off in remote control mode. If it is switched on, the instrument displays all messages sent to and from the instrument, corresponding to each operating step performed.

1.1.4 LabWindows/CVI driver

A LabWindows/CVI instrument driver is available for each measuring module.

Instrument drivers reduce application program development time and simplify instrument control by eliminating the need to learn the complex programming commands for each measuring module.

1.2 GPIB Remote Control interface

This section describes the GPIB Remote Control interface for applications using the ANT-20 as a remote controlled instrument.

Other applications using the ANT-20 as a GPIB controller for controlling external instruments are also possible (e.g. running the WG CATS Test Executive BN 3045 on the ANT-20 to control the ANT-20 measurement hardware plus external instruments).

To allow both these mutually exclusive operating modes to be used, the GPIB Remote Control interface and installation comprises all the software required for both operating modes.

1.2.1 Items included

The Remote Control GPIB (PCMCIA) Option BN 3035/92.10 comprises:

ANT-20, ANT-20E with Windows 3.11:

- PCMCIA GPIB card including PCMCIA to GPIB cable (2 meters)
- CardWare User's Manual (Award Software Inc.)
- Distribution disk: CardWare Version 2.0 (Award Software Inc.)
- Installation disks: ANT-20 PCMCIA System (configured CardWare 2.0),
  ANT-20 GPIB Remote Control (includes NI-488.2)
- ANT-20 GPIB (NI-488.2) for Windows 3.x
- Operating Manual: Remote Control
- Brochure "SCPI and IEEE 488, Programmer's Introduction"

Windows 95:

- PCMCIA GPIB card including PCMCIA to GPIB cable (2 meters)
- Installation disks: ANT-20 GPIB Remote Control for Windows 95 (includes NI-488.2M)
- Operating Manual: Remote Control
- Brochure "SCPI and IEEE 488, Programmer's Introduction"

1.2.2 Installation

1.2.2.1 Overview

The PCMCIA GPIB interface from National Instruments Corp. (NI) is used with the NI-488.2/ NI-488.2M software for GPIB Remote Control.

For ANT-20 with Windows 3.11 only:

- The NI-488.2 software requires standardized PCMCIA system software with Socket and Card Services (version 2.0 or higher) to be installed.
- A software called CardWare (written by Award Software Inc.) is used as PCMCIA system software. It can also be used with a wide variety of other PCMCIA cards.
- The CardWare software contained on the installation disk is already configured for use with the ANT-20.

1.2.2.2 Software installation

Software installation under Windows 3.11

If you ordered the Remote Control GPIB Option BN 3035/92.10 together with your ANT-20, the required software packages are already installed on the ANT-20 and the icons “Remote”, “Remote Disable” and “Remote Configuration” are shown in the “ANT-20” group in the “Program Manager” window.

Note: A release code is required to enable the Remote Control GPIB Option.
For detailed information contact your nearest Wavetek Wandel Goltermann Service Center. The addresses are listed at the end of this manual.
When contacting the Service Center, always quote:
- The serial number of the ANT-20
- The version number of the ANT-20 software package

If you ordered the Remote Control GPIB Option BN 3035/92.10 separately, install the software packages as follows:

Installing the PCMCIA System software

1. Start or return to Windows.
2. Insert the ANT-20 PCMCIA System installation disk into drive A:.
3. Choose “Run ...” from the “File” menu in the “Program Manager” window and type the following command into the dialog box:
   A:\setup
   Confirm with “OK”.
4. After complete installation exit Windows, remove the installation disk from drive A:, and reboot the ANT-20.

Installing the GPIB Remote Control software

1. Start or return to Windows.
2. Insert the ANT-20 GPIB Remote Control installation disk into drive A:.

3. Choose “Run ...” from the “File” menu in the “Program Manager” window and type the following command into the dialog box:
   A:\setup
   Confirm with “OK”.
4. After complete installation exit Windows, remove the installation disk from drive A:, and reboot the ANT-20.

Installing the ANT-20 Remote Control software

1. Start or return to Windows
2. Choose “Run...” from the “File” menu in the “Program Manager” window and type the following command into the dialog box:
   C:\ANT20.SUP\DISK1\setup.exe
   Confirm with “OK”.
3. Follow the on-screen instructions to install the ANT-20 Remote Control.
4. After complete installation exit Windows, and reboot the ANT-20.

After this installation procedure, the ANT-20 can be set to remote control mode by double-clicking on the “Remote” icon in the “ANT-20” group in the “Program Manager” window.

Installing the GPIB (NI-488.2) for Windows 3.x

This software is required for applications that use the ANT-20 as a GPIB controller for controlling external instruments (e.g. for running the WG CATS Test Executive BN 3045 on the ANT-20 to control the ANT-20 measurement hardware plus external instruments).

1. Start or return to Windows.
2. Insert the installation disk ANT-20 GPIB (NI-488.2) for Windows 3.x into drive A:.
3. Choose “Run...” from the “File” menu in the “Program Manager” window and type the following command into the dialog box:
   A:\setup
   Confirm with “OK”.
4. Follow the on-screen instructions to complete the installation.
5. After complete installation exit Windows, remove the installation disk from drive A:, and reboot the ANT-20.

After this installation procedure, you can access the “NI-488.2 PCMCIA GPIB Software” group in the “Program Manager” window.

To view or modify the NI-488.2 software configuration, double-click the “GPIB” icon from the “Control Panel” in the “Main” group of the “Program Manager” window.

Software installation under Windows 95

If you ordered the Remote Control GPIB Option BN 3035/92.10 together with your ANT-20, the required software packages are already installed on the ANT-20 and the icons “Remote On”, “Remote Off” and “Remote Configuration” are shown in the Windows 95 file folder “ANT-20”.

Note: A release code is required to enable the Remote Control GPIB Option.
For detailed information contact your nearest Wavetek Wandel Goltermann Service Center. The addresses are listed at the end of this manual.
When contacting the Service Center, always quote:
- The serial number of the ANT-20
- The version number of the ANT-20 software package

Verify the PCMCIA GPIB card installation as described in the section “Verify the PCMCIA GPIB card installation” below.

If you ordered the Remote Control GPIB Option BN 3035/92.10 separately, install the software packages as follows:

Installing the GPIB Remote Control software

1. Start or return to Windows 95.
2. Insert the ANT-20 GPIB Remote Control for Windows 95 installation disk 1 into drive A:.
3. Click the Windows 95 “Start” button, choose “Run ...” and
   type the following command into the dialog box:
   A:\setup
   Confirm with “OK”.
4. Follow the on-screen instructions during the installation procedure and enter
   C:\Tmp\Gpib
   as GPIB distribution directory.
5. After completion, click the Windows 95 “Start” button, choose “Run...” and
   type the following command into the dialog box:
   C:\Tmp\Gpib\gpib9513.exe
   Confirm with “OK”.
6. Follow the on-screen instructions during the setup procedure and use the default selection for components to install (all components selected).
7. After complete installation:
   – Shut down the ANT-20.
   – Remove the installation disk from drive A:.
   – Insert the PCMCIA GPIB card into a free PCMCIA slot.
   – Reboot the ANT-20.

Enable support for DOS applications as described below (by default, DOS support is disabled):

1. Return to Windows 95, click the Windows 95 “Start” button, choose “Settings” and then choose “Control Panel” from the submenu.
   In the “Control Panel” window, double-click the “System” icon.
2. In the “Device Manager” tab of the “System Properties” window,
   choose “View devices by type”,
   click on the “National Instruments GPIB Interfaces” icon in the list and then
   click on the “Properties” button.
3. In the “General” tab in the “National Instruments GPIB Interfaces Properties” window select the checkbox “Enable Support for DOS GPIB Applications” and confirm with “OK”.
4. Reboot the ANT-20.

Verify the PCMCIA GPIB card installation

1. The PCMCIA GPIB card must be in the slot!
2. Click the Windows 95 “Start” button, choose “Settings” and then
   choose “Control Panel” from the submenu.
   In the “Control Panel” window, double-click the “System” icon.
3. In the “Device Manager” tab of the “System Properties” window,
   choose “View devices by type”,
   double-click the “National Instruments GPIB Interfaces” icon in the list and then
   double-click “PCMCIA GPIB” in the sublist.
4. In the “GPIB Settings” tab of the “PCMCIA GPIB Properties” window, the entry for “Interface Name” must be “GPIB0”. If it is not, change it to “GPIB0”.
5. Deactivate the “System Controller” checkbox.
   (All other parameters are properly set by starting the ANT-20 remote control mode after completion of the installation procedure.)
6. Confirm with “OK”.

Installing the ANT-20 Remote Control software

1. Start or return to Windows 95.
2. Click the Windows 95 “Start” button,
   choose “Run...” and type the following command into the dialog box:
   C:\ANT20.SUP\DISK1\setup.exe
   Confirm with “OK”.
3. Follow the on-screen instructions to install the ANT-20 Remote Control and select only the “Remote Control Software” as component to install.

The following patch installation described in steps 4, 5 and 6 is only required for ANT-20 software versions less or equal 7.0. It has no effect on versions greater than 7.0.

4. Insert the ANT-20 GPIB Remote Control for Windows 95 installation disk 3 into drive A:.
5. Click on the Windows 95 “Start” button, choose “Run...” and
   type the following command into the dialog box:
   A:\setup
   Confirm with “OK”.
6. Follow the on-screen instructions.
   After completion, remove the installation disk from drive A:.

Note: Only for ANT-20 software versions less or equal 7.0:
If there is any need to execute C:\ANT20.SUP\DISK1\setup.exe (with the component “Remote Control Software” selected) at a later time again, the above described patch installation (steps 4, 5 and 6) must also be executed again.

7. Exit Windows 95 and reboot the ANT-20.

After this installation procedure, you can enable the remote control mode by using the taskbar:

1. “Start/ANT-20/Remote On”.
2. Then double-click on the “ANT-20” icon on the desktop or
   use the taskbar: “Start/ANT-20/ANT-20”.

1.2.2.3 Hardware installation

1. Insert the PCMCIA GPIB card into a free PCMCIA socket the same way you insert a disk into a floppy drive.
   The PCMCIA GPIB has no jumpers or switches to set, and you do not need to power down the ANT-20 when you insert or remove the card.
2. Connect the PCMCIA GPIB cable to the PCMCIA GPIB card.

1.2.3 Connecting to GPIB

The GPIB Remote Control interface is equipped with a standard 24-way connector conforming to IEEE 488.1.

GPIB cables of various lengths are available for connecting the ANT-20 to other instruments and to the bus controller:

- 1.2 m long: Part number K 420
- 2.0 m long: Part number K 421

Note:
- The total length of GPIB cable must not exceed 2 meters x the number of instruments in the interface system.
- Up to 15 instruments can be connected to the interface system. The maximum cable run used to connect a group of instruments is 20 meters. For more information refer to the IEEE 488.1 standard.
- Longer distances can be bridged using interface couplers (2-wire or 4-wire connections, if necessary with suitable modems).

1.2.4 Device address

Each instrument in the interface system must have a unique address to allow the controller to access each one individually.

The ANT-20 address can be changed by editing the remote.bat batch file.
Any address in the range 0 to 30 can be selected.

ANT-20, ANT-20E with Windows 3.11:

1. Double-click on the “Remote Configuration” icon in the “ANT-20” group in the “Program Manager” window to edit the remote.bat file.
2. Follow the on-screen instructions.

Windows 95:

1. Click on the “Remote Configuration” icon via taskbar: “Start/ ANT-20/Remote Configuration” to edit the remote.bat file.
2. Follow the on-screen instructions.

Note: Make sure that a given address is used only once within the interface system. The controller address is reserved for the controller.

1.2.5 Interface functions

1.2.5.1 Overview

Interface function		Note
SH1	Source Handshake	Complete capability
AH1	Acceptor Handshake	Complete capability
T8	Talker	No Talk Only capability No Serial Poll capability
L4	Listener	No Listen Only capability
SR0	Service Request	No capability
RL0	Remote/Local	No capability
PP0	Parallel Poll	No capability
DC1	Device Clear	Complete capability
DT0	Device Trigger	No capability
C0	Controller	No capability

Table I-2 Interface functions conforming to the IEEE 488.1 standard

1.2.5.2 Device Clear

When the IEEE 488 interface message Device Clear (DCL) or Selected Device Clear (SDC) is sent to the ANT-20, a device clear message is routed to all internal measuring modules, regardless of whether they are selected or deselected.

The device clear message initializes remote control of the instrument and ensures that a subsequently sent program message will be accepted and processed.

No instrument initialization is performed by DCL or SDC. To initialize the instrument, select every measuring module and send the reset command
*RST (MODule:SELect <module_name>; *RST).

1.3 V.24/V.28 (RS 232) Remote Control interface

1.3.1 Items included

The Remote Control V.24/RS 232 Option BN 3035/91.01 consists of

- Remote Control Operating Manual
- Brochure “SCPI and IEEE 488, Programmer’s Introduction”

1.3.2 Installation

The built-in serial port (COM1) of the embedded PC-AT is used for remote control via RS 232.

1.3.2.1 Software installation

Software installation under Windows 3.11

If you ordered the Remote Control V.24/V.28 (RS 232) Option BN 3035/91.01 together with your ANT-20, the required software package is already installed on the ANT-20 and the icons “Remote”, “Remote Disable” and “Remote Configuration” are shown in the “ANT-20” group in the “Program Manager” window.

Note: A release code is required to enable the Remote Control V.24/V.28 (RS 232) Option. For detailed information contact your nearest Wavetek Wandel Goltermann Service Center. The addresses are listed at the end of this manual.
When contacting the Service Center, always quote:
- The serial number of the ANT-20
- The version number of the ANT-20 software package

If you ordered the Remote Control V.24/V.28 (RS 232) Option BN 3035/91.01 separately, install the software package as follows:

Installing the ANT-20 Remote Control software

1. Start or return to Windows
2. Choose “Run...” from the “File” menu in the “Program Manager” window and type the following command into the dialog box:
   C:\ANT20.SUP\DISK1\setup.exe
   Confirm with “OK”.
3. Follow the on-screen instructions to install the ANT-20 Remote Control.
4. After complete installation exit Windows, and reboot the ANT-20.

After this installation procedure, the ANT-20 can be set to remote control mode by double-clicking on the “Remote” icon in the “ANT-20” group in the “Program Manager” window.

Software installation under Windows 95

If you ordered the Remote Control V.24/V.28 (RS 232) Option BN 3035/91.01 together with your ANT-20, the required software package is already installed on the ANT-20 and the icons “Remote On”, “Remote Off” and “Remote Configuration” are shown in the Windows 95 file folder “ANT-20”.

Note: A release code is required to enable the Remote Control V.24/V.28 (RS 232) Option. For detailed information contact your nearest Wavetek Wandel Goltermann Service Center. The addresses are listed at the end of this manual.
When contacting the Service Center, always quote:
- The serial number of the ANT-20
- The version number of the ANT-20 software package

If you ordered the Remote Control V.24/V.28 (RS 232) Option BN 3035/91.01 separately, install the software package as follows:

Installing the ANT-20 Remote Control software

1. Start or return to Windows95.
2. Click the Windows95 “Start” button,
   choose “Run...” and type the following command into the dialog box:
   C:\ANT20.SUP\DISK1\setup.exe
   Confirm with “OK”.
3. Follow the on-screen instructions to install the ANT-20 Remote Control.
4. After complete installation exit Windows95, and reboot the ANT-20.

After this installation procedure, you can enable the remote control mode by using the taskbar:

1. “Start/ANT-20/Remote On”.
2. Then double-click on the “ANT-20” icon on the desktop or
   use the taskbar: “Start/ANT-20/ANT-20”.

1.3.3 Connecting to V.24/V.28 (RS 232)

The interface connector (serial port COM1) is a 9-way SUB-D male connector.

Pin	ITU-T V.24	DIN 66 020	EIA/TIA RS 232	Description ITU-T V.24 (RS 232)		Input (I) or Output (O)
3	103	D1	BA	TXD	Transmitted data	O
2	104	D2	BB	RXD	Received data	I
7	105	S2	CA	RTS	Request to send	O
8	106	M2	CB	CTS	Ready for sending/Clear to send	I
6	107	M1	CC	DSR	Data set ready	I
5	102	E2	AB	SGND	Signal ground or common return	-
1	109	M5	CF	DCD	Data channel received line signal detector/Data carrier detect	I
4	108.2	S1.2	CD	DTR	Data terminal ready	O
9	125	M3	CE	RI	Calling indicator/Ring indicator	I

Table I-3 Pinning and signal description

The connection of an ANT-20 to a PC is shown below. Both the ANT-20 and the PC function as Data Terminal Equipment (DTE):

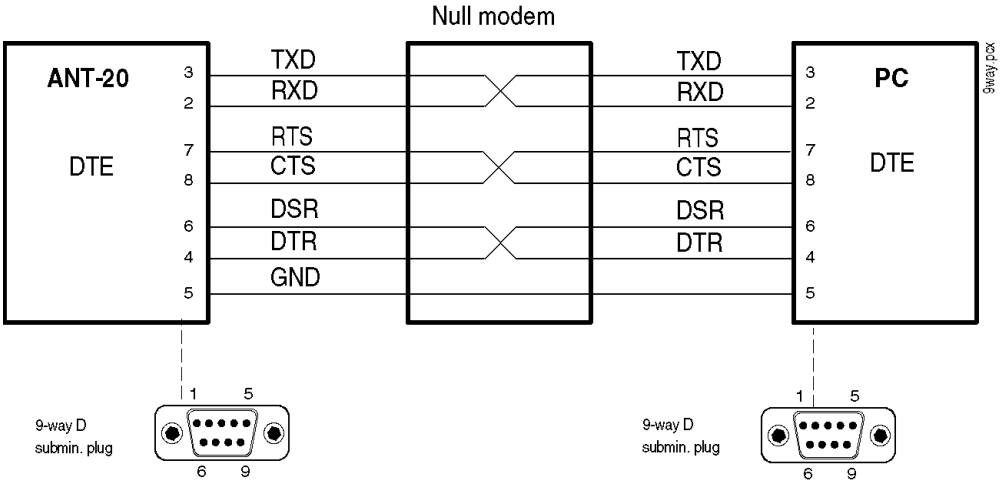

Fig. I-1 9-way connection

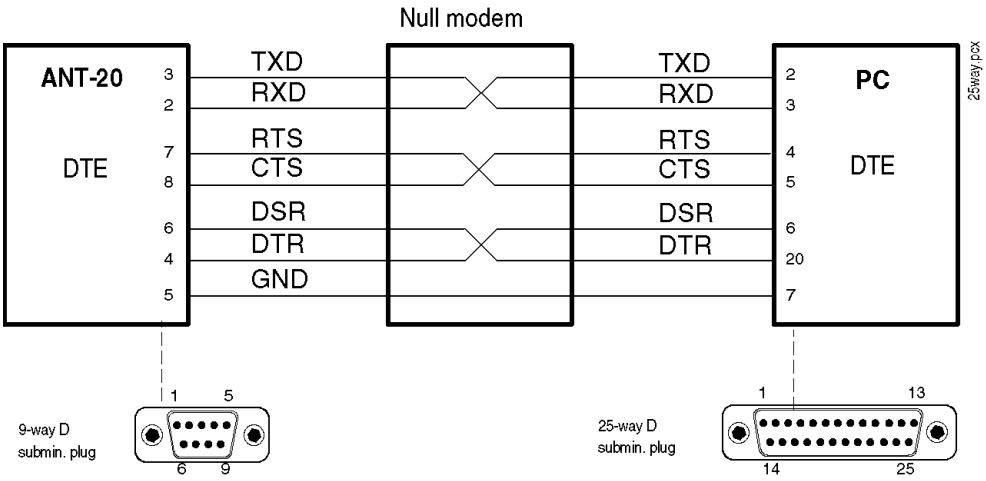

Fig. I-2 25-way connection

An appropriate cable with both 9-way and 25-way SUB-D female connectors on each end is available:

Part number K 764 (3.0 m long)

1.3.4 Transmission parameters

The **baud rate** can be changed by editing the remote.bat batch file.

ANT-20, ANT-20E with Windows 3.11:

1. Double-click on the “Remote Configuration” icon in the “ANT-20” group in the “Program Manager” window to edit the remote.bat file.
2. Follow the on-screen instructions.

Windows 95:

1. Click on the “Remote Configuration” icon via taskbar: “Start/ ANT-20/Remote Configuration” to edit the remote.bat file.
2. Follow the on-screen instructions.

The following baud rates can be selected:

- 1200 bit/s
- 2400 bit/s
- 4800 bit/s
- 9600 bit/s
- 19200 bit/s
- 38400 bit/s
- 57600 bit/s

The interface operates in full-duplex (FDX) mode.

The other transmission parameters are fixed and cannot be changed:

Parameter	Setting
Parity	None
Number of stop bits per character	1
Number of data bits per character	8
Flow control	Hardware handshake by control lines RTS/CTS

Table I-4 Fixed V.24/RS-232 Transmission parameters

1.3.5 Interface functions

1.3.5.1 Overview

There is no functional equivalence to the GPIB interface functions Service Request and Serial Poll.

However, the GPIB interface function Device Clear is simulated by a BREAK signal (see Sec. 1.3.5.2, Page I-14).

1.3.5.2 Device Clear

When the BREAK signal is sent to the ANT-20, a device clear message is routed to all internal measuring modules, regardless of whether they are selected or deselected.

BREAK is detected when the RXD input is at positive voltage (i.e. logical 0 or SPACE) for the entire character frame including the stop bit.

The device clear message initializes remote control of the instrument and ensures that a subsequently sent program message will be accepted and processed.

No instrument initialization is performed by the device clear message.

To initialize the instrument, select every measuring module and send the reset command *RST (MODule:SELect <module_name>; *RST).

2 DominoCOM ANT-20

2.1 General information

2.1.1 Items included

The delivery includes the following items relating to remote control:

- PCMCIA GPIB card including PCMCIA to GPIB cable (2 meters)
- Configuration disk: DominoCOM ANT-20 Remote Control
- Remote Control Operating Manual
- Brochure “SCPI and IEEE 488, Programmer‘s Introduction”

For DominoCOM ANT-20 with Windows 3.11 only:

- CardWare User´s Manual (Award Software Inc.)
- Distribution disk: CardWare Version 2.0 (Award Software Inc.)

2.1.2 Overview

The DominoCOM ANT-20 can be remotely controlled using the

- IEEE 488 (IEC 625) interface, often referred to as GPIB

– or –

- V.24/V.28 (RS 232) interface

The programming commands are identical, regardless of the type of remote control interface that is used.

From the viewpoint of remote control, each measuring module in the DominoCOM ANT-20 is a fully remote-controllable instrument with its own SCPI command tree, status reporting system and common command set.

The measuring module to be controlled is selected using the command MODule:SELect <module_name> (see Sec. 2.1.5, Page I-17).

Factory-set configuration:	Interface type	V.24/V.28 (RS-232)
	Baud rate	9600 bit/s

Refer to Sec. 2.1.3, Page I-15 for changing the type of remote control interface and/or its accompanying configuration parameters.

DominoCOM ANT-20 can operate in the ANT-20 mode with the use of an external monitor, keyboard and mouse. Refer to Sec. 2.1.4, Page I-16, for detailed information.

2.1.3 Changing the configuration

To change the type of remote control interface and/or its accompanying configuration parameters, follow these steps

1. Edit the remote.bat batch file (on the configuration disk) by using an external PC. Refer to the readme.txt file (on the configuration disk) for detailed editing information.
2. Insert the configuration disk into drive A: of the DominoCOM ANT-20 and reboot the DominoCOM ANT-20 (switch power off, then power on).

2.1.4 ANT-20 mode

By connecting an external monitor, keyboard and mouse to the embedded PC-AT, the DominoCOM ANT-20 can be operated in the same way as an ANT-20.

The display shows which measuring modules exist and which one is selected for remote control.

A monitor function can be switched on for debugging purposes during remote control mode that displays all messages sent to and from the DominoCOM ANT-20, corresponding to each operating step performed.

Edit the remote.bat batch file (for changing the type of the remote control interface and/or its accompanying configuration parameters) as follows:

DominoCOM ANT-20 with Windows 3.11:

1. Double-click on the “Remote Configuration” icon in the “ANT-20” group in the “Program Manager” window.
2. Follow the on-screen instructions.

Windows 95:

1. Click on the “Remote Configuration” icon via taskbar: “Start/ ANT-20/Remote Configuration”.
2. Follow the on-screen instructions.

To leave remote control mode and enter normal manual control, follow these steps

DominoCOM ANT-20 with Windows 3.11:

⇒ Double-click on the “Remote Disable” icon in the “ANT-20” group in the “Program Manager” window.

Windows 95:

1. Disable remote mode using the taskbar: “Start/ANT-20/Remote Off”.
2. Then double-click on the “ANT-20” icon on the desktop or use the taskbar: “Start/ANT-20/ANT-20”.

To switch back to remote control mode, follow these steps

DominoCOM ANT-20 with Windows 3.11:

⇒ Double-click on the “Remote” icon in the “ANT-20” group in the “Program Manager” window.

Windows 95:

1. Enable remote mode using the taskbar: “Start/ANT-20/Remote On”.
2. Then double-click on the “ANT-20” icon on the desktop or use the taskbar: “Start/ANT-20/ANT-20”.

2.1.5 Module selection

The remote control interface of the DominoCOM ANT-20 supports multiple internal measuring modules. The module selection provides a mechanism to select one of these measuring modules for remote control.

Keyword	Parameter form	Notes
MODule:SELect	<module_name>[1]	[no query]
1 <module_name>: BASIC | JITTER | JITT16		

Table I-5 Module selection

This command selects the measuring module specified by <module_name> for remote control and deselects all others. All subsequent commands (including commands in subsequent program messages) are passed to the selected measuring module. All other measuring modules are unavailable for programming until selected.

<module_name>:

BASIC: Selects BASIC Module
JITTER: Selects JITTER Module for bit rates up to STM-4/OC-12 (extension slot)
JITT16: Selects JITTER Module for bit rates of STM-16/OC-48 (extension slot)

Note:
- This command has no query form.
- After power-on, the BASIC measuring module is selected.
- If MODule:SELect <module_name> command is required in a program message, it must be the first (or the only) command in that program message.

2.1.6 LabWindows/CVI driver

A LabWindows/CVI instrument driver is available for each measuring module.

Instrument drivers reduce application program development time and simplify instrument control by eliminating the need to learn the complex programming commands for each measuring module.

2.2 GPIB Remote Control interface

This section describes the GPIB Remote Control interface for applications using the DominoCOM ANT-20 as a remote controlled instrument.

Applications using the DominoCOM ANT-20 as a GPIB Controller for controlling external instruments are also possible (e.g. running the WG CATS Test Executive BN 3045 on the DominoCOM ANT-20 to control the DominoCOM ANT-20 measurement hardware plus external instruments).

To allow both these mutually exclusive operating modes to be used, the GPIB Remote Control interface and installation comprises all the software required for both operating modes.

2.2.1 Installation

2.2.1.1 Overview

The PCMCIA GPIB interface from National Instruments Corp. (NI) is used with the NI-488.2/ NI-488.2M software for GPIB Remote Control. This software is already installed on the DominoCOM ANT-20.

For DominoCOM ANT-20 with Windows 3.11 only:

- The NI-488.2 software requires standardized PCMCIA system software with Socket and Card Services (version 2.0 or higher) to be installed.
- A software called CardWare (written by Award Software Inc.) is used as PCMCIA system software. It can also be used with a wide variety of other PCMCIA cards.
- The CardWare software is already installed on the DominoCOM ANT-20 and suitably configured.

2.2.1.2 Configuration for GPIB

Set the configuration parameters:

- Interface type GPIB
- Device address

by editing the remote.bat batch file.
Refer to Sec. 2.1.3, Page I-15, for detailed information.

Each instrument in the interface system must have an unique address to allow the controller to access each one individually.

Any address in the range 0 to 30 can be selected.

Note: Make sure that a given address is used only once within the interface system. The controller address is reserved for the controller.

2.2.1.3 Hardware installation

1. Insert the PCMCIA GPIB card into a free PCMCIA socket the same way you insert a disk into a floppy drive.
   The PCMCIA GPIB has no jumpers or switches to set, and you do not need to power down the DominoCOM ANT-20 when you insert or remove the card.
2. Connect the PCMCIA GPIB cable to the PCMCIA GPIB card.

2.2.2 Connecting to GPIB

The GPIB Remote Control interface is equipped with a standard 24-way connector conforming to IEEE 488.1.

GPIB cables of various lengths are available for connecting the DominoCOM ANT-20 to other instruments and to the bus controller:

- 1.2 m long: Part number K 420
- 2.0 m long: Part number K 421

Note:
- The total length of GPIB cable must not exceed 2 meters x the number of instruments in the interface system.
- Up to 15 instruments can be connected to the interface system. The maximum cable run used to connect a group of instruments is 20 meters. For more information refer to the IEEE 488.1 standard.
- Longer distances can be bridged using interface couplers (2-wire or 4-wire connections, if necessary with suitable modems).

2.2.3 Interface functions

2.2.3.1 Overview

Interface function		Note
SH1	Source Handshake	Complete capability
AH1	Acceptor Handshake	Complete capability
T8	Talker	No Talk Only capability No Serial Poll capability
L4	Listener	No Listen Only capability
SR0	Service Request	No capability
RL0	Remote/Local	No capability
PP0	Parallel Poll	No capability
DC1	Device Clear	Complete capability
DT0	Device Trigger	No capability
C0	Controller	No capability

Table I-6 Interface functions conforming to the IEEE 488.1 standard

2.2.3.2 Device Clear

When the IEEE 488 interface message Device Clear (DCL) or Selected Device Clear (SDC) is sent to the DominoCOM ANT-20, a device clear message is routed to all internal measuring modules, regardless of whether they are selected or deselected.

The device clear message initializes remote control of the instrument and ensures that a subsequently sent program message will be accepted and processed.

No instrument initialization is performed by DCL or SDC.

To initialize the instrument, select every measuring module and send the reset command *RST (MODule:SELect <module_name>; *RST).

2.3 V.24/V.28 (RS 232) Remote Control interface

2.3.1 Installation

2.3.1.1 Overview

The built-in serial port (COM1) of the embedded PC-AT is used for remote control via RS 232.

2.3.1.2 Configuration for V.24/V.28 (RS 232)

Set the configuration parameters:

- Interface type V.24/V.28 (RS 232)
- Baud rate

by editing the remote.bat batch file.
Refer to Sec. 2.1.3, Page I-15.

The following baud rates can be selected:

- 1200 bit/s
- 2400 bit/s
- 4800 bit/s
- 9600 bit/s
- 19200 bit/s
- 38400 bit/s
- 57600 bit/s

The interface operates in full-duplex (FDX) mode.

The other transmission parameters are fixed and cannot be changed:

Parameter	Setting
Parity	None
Number of stop bits per character	1
Number of data bits per character	8
Flow control	Hardware handshake by control lines RTS/CTS

Table I-7 Fixed V.24/RS 232 Transmission parameters

2.3.2 Connecting to V.24/V.28 (RS 232)

The interface connector (serial port COM1) is a 9-way SUB-D male connector.

Pin	ITU-T V.24	DIN 66 020	EIA/TIA RS 232	Description ITU-T V.24 (RS 232)		Input (I) or Output (O)
3	103	D1	BA	TXD	Transmitted data	O
2	104	D2	BB	RXD	Received data	I
7	105	S2	CA	RTS	Request to send	O
8	106	M2	CB	CTS	Ready for sending/Clear to send	I
6	107	M1	CC	DSR	Data set ready	I
5	102	E2	AB	SGND	Signal ground or common return	-
1	109	M5	CF	DCD	Data channel received line signal detector/Data carrier detect	I
4	108.2	S1.2	CD	DTR	Data terminal ready	O
9	125	M3	CE	RI	Calling indicator/Ring indicator	I

Table I-8 Pinning and signal description

The connection of a DominoCOM ANT-20 to a PC is shown below.
Both the DominoCOM ANT-20 and the PC function as Data Terminal Equipment (DTE):

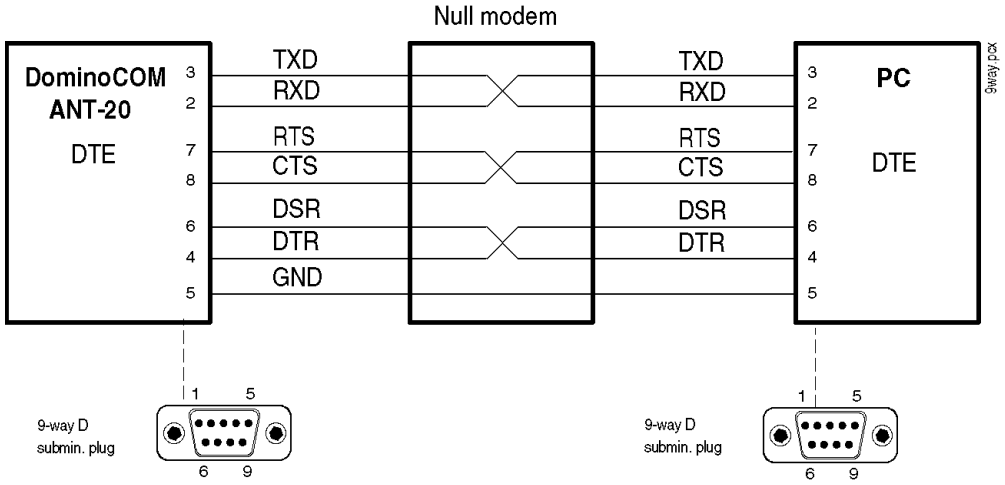

Fig. I-3 9-way connection

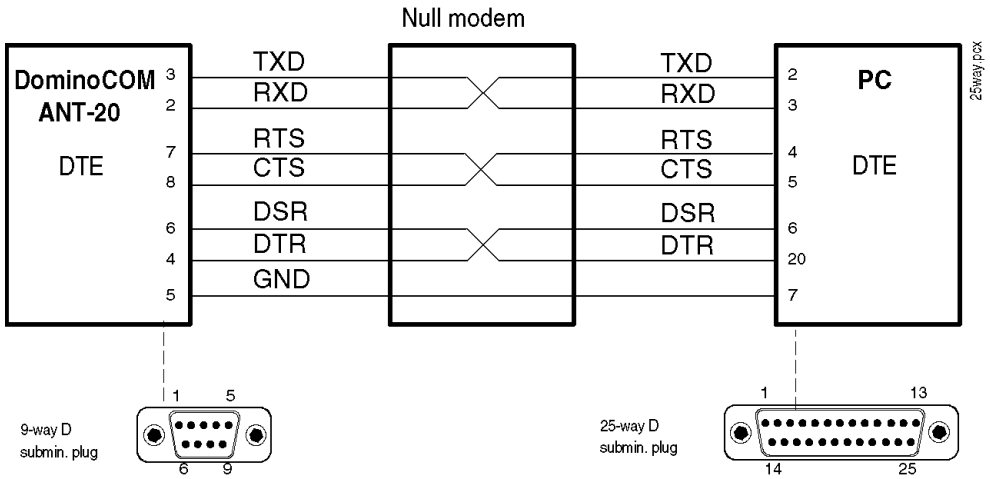

Fig. I-4 25-way connection

An appropriate cable with both 9-way and 25-way SUB-D female connectors on each end is available:

Part number K 764 (3.0 m long)

2.3.3 Interface functions

2.3.3.1 Overview

There is no functional equivalence to the GPIB interface functions Service Request and Serial Poll.

However, the GPIB interface function Device Clear is simulated by a BREAK signal (see Sec. 2.3.3.2).

2.3.3.2 Device Clear

When the BREAK signal is sent to the DominoCOM ANT-20, a device clear message is routed to all internal measuring modules, regardless of whether they are selected or deselected.

BREAK is detected when the RXD input is at positive voltage (i.e. logical 0 or SPACE) for the entire character frame including the stop bit.

The device clear message initializes remote control of the instrument and ensures that a subsequently sent program message will be accepted and processed.

No instrument initialization is performed by the device clear message.

To initialize the instrument, select every measuring module and send the reset command *RST (MODule:SELect <module_name>; *RST).

3 TX/RX SCPI block diagram

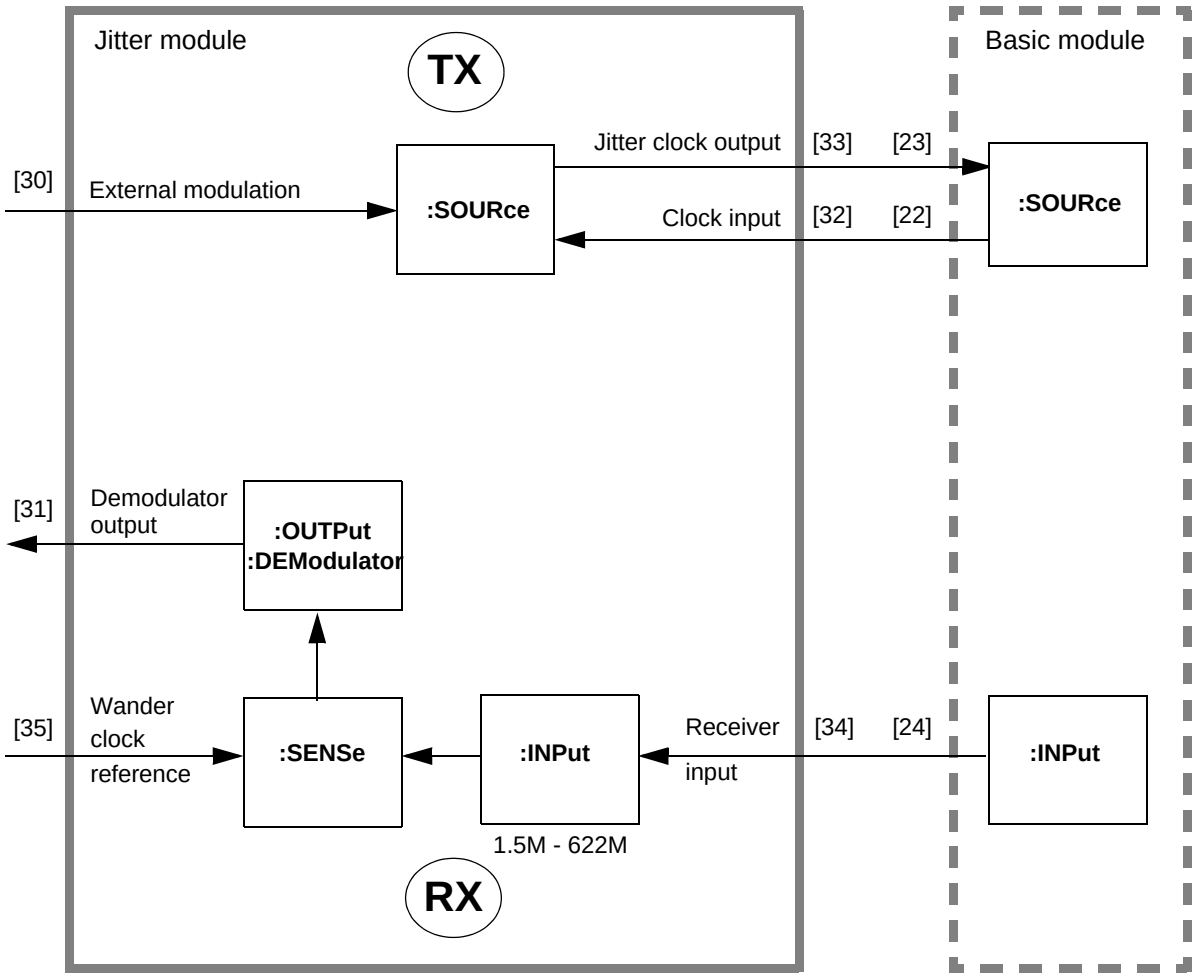

Fig. I-5 TX/RX SCPI block diagram

4 Operating information

This chapter gives the programmer some basic information which should make it easier to program this device.

- Program messages are executed in the order they are received from the controller. However, the execution of any command does not start before the PMT (Program Message Terminator <NL>) or any other sequential command is received. This gives full flexibility in controlling the device without the need to worry about the dependencies between individual commands, because the settings of coupled commands received within a single message are checked after the whole message is received.
- Commands are treated as “overlapped commands” except where otherwise noted. Overlapped commands allow the next command to be executed before the preceding command has finished execution. This gives better performance and makes it possible to change some settings while a measurement is running, for example. You can use the common command *WAI to force sequential operation whenever you need to.
- Any error detected within a program message is written into the error queue. You can read entries out of the error queue using the SYST:ERR? command. Any program message is read from the input buffer and parsed as far as possible to detect potential errors. Nevertheless, the device setting may be undefined after any error.
- Queries are not allowed to have side effects. Thus, queries of commands set in the same program message will return the old command setting.
- Note that using the SCPI short form of the commands (capital letters) will reduce operational overhead and can increase your system performance.
- The input buffer size is 4096 bytes (4 kB).
- The output buffer size is 8192 bytes (8 kB). Requesting a response with more than 8192 bytes would cause a query error.

5 Command hierarchy

5.1 Introduction

This section is intended to give programmers an overview of the hierarchical relationships between the commands.

Each command is independent. However, since the parameters are related, each parameter has a priority between 1 and 4, with 1 being the highest and 4 the lowest.

If a higher-priority parameter is modified, lower-priority parameters may be automatically modified as well. This automatic mechanism assures logically consistent instrument settings that comply with standards, thereby avoiding error messages. It also simplifies programming since many settings are made automatically and do not need to be programmed.

The priorities come into play when individual commands are sent to the instrument. However, if multiple commands are grouped in a command sequence, the priorities are inactive within the command sequence.

Note: Send individual commands in order of decreasing priority so that settings are not overwritten by subsequent commands.

If you transmit command sequences, be careful to provide consistent data since the instrument does not make automatic corrections in this case.

5.2 Command hierarchy table

Remote Command	Priority
*RST on page R-5	1
:SOUR:DATA[:TEL]:RATE on page R-26	2
:SOUR:JITT:FREQ on page R-27	3
[:SENS]:DATA[:TEL]:RATE on page R-48	2
[:SENS]:JITT:FREQ on page R-60	3
all other commands	4

Table I-9 Command hierarchy table

6 Programming examples

This chapter contains some short sample programs to help you get familiar with the remote control operation of this device.

6.1 Notation

The sample programs are written in C programming language style using the functions “clear”, “write”, “wait” and “read” as placeholders for the different functions used by programmers depending on their programing language.

Note: A “NOEND” as the second parameter of the function “write” indicates that the same program message is continued in the next line without sending a program message terminator (PMT). An “END” indicates that a program message terminator (PMT) should be sent.
Multiple commands can be appended into one “big” program message using NOEND. Checking of coupled parameters and the execution of all commands starts after the PMT or any sequential command is received.

6.2 Example 1 (Peak to peak jitter measurement)

This sample program performs a simple 34 Mbit/s jitter measurement. Note that the default device setting after a *RST command is a 2 Mbit/s framed PDH signal.
This sample program sets the device receiver and transmitter in the same way.

```
      // Select Basic Module to talk to (only required for ANT-20 and
      // not for the ANX VXI modules).
write (“MOD:SEL BASIC”,END);
      // Clear status register and error queue.
write (“*CLS”, END);
      // Reset device to standard setting.
      // TX and RX set to 2 Mbit/s framed signal.
write (“*RST”, END);

      // Set transmitter to 34 Mbit/s unframed signal.
write (“:SOUR:MODE PDH;” ,NOEND);
write (“:SOUR:DATA:PDH:RATE M34,M34;”,NOEND);
write (“:SOUR:DATA:PDH:FRAM UNFR;”,NOEND);
write (“:OUTP:LINE:CODE HDB3;”,END);

      // Set receiver to 34 Mbit/s unframed signal.
write (“:SENS:MODE PDH;” ,NOEND);
write (“:SENS:DATA:PDH:RATE M34,M34;”,NOEND);
write (“:SENS:DATA:PDH:FRAM UNFR;”,NOEND);
write (“:INP:LINE:CODE HDB3;”,END);
      // Select Jitter Module to talk to (only required for ANT-20 and
      // not for the ANX VXI modules).
write (“MOD:SEL JITTER”,END);
      // Clear status register and error queue.
write (“*CLS”, END);
      // Reset device to standard setting.
      // TX and RX set to 2 Mbit/s signal.
write (“*RST”, END);
```

```
      // Set jitter generator.
      // Bit rate 34 Mbit/s
write (":SOUR:DATA:RATE M34;",NOEND);
      // Jitter amplitude 1 UI
write (":SOUR:JITT:AMPL 1;",NOEND);
      // Jitter frequency 1000Hz
write (":SOUR:JITT:FREQ 1000;",NOEND);
      // Switch jitter generator on
write (":SOUR:JITT ON;",END);

      // AGAIN select Basic Module to talk to (only required for
      // ANT-20 and not for the ANX VXI modules).
write ("MOD:SEL BASIC",END);
      // NOW route signal clock connection of Basic Module to the
      // Jitter Module. Enables transmitter jitter capabilities.
write (":INP:CLOC:JITT ON",END;

      // AGAIN select Jitter Module to talk to (only required for
      // ANT-20 and not for the ANX VXI modules).
write ("MOD:SEL JITTER",END);
      // Set jitter receiver.
      // Bit rate 34 Mbit/s
write (":SENS:DATA:RATE M34;",NOEND);
      // Select jitter peak to peak value as requested result.
write ("SENS:FUNC:ON 'JITT:PPE'",END);
      // Wait until the device settling time has finished.
wait(10);
      // place results into the output queue.
write ("SENS:DATA:ACT?",END);
      // Read response from the Jitter Module.
read();
      // The response can look like this: 54,0.98
      // indicating a valid result id (54)
      // and a current jitter peak to peak value of 0.98UI
```

6.3 Example 2 (wander measurement)

This sample program sets the receiver for a 622 Mbit/s (**STM-4 / OC-12**) wander measurement. Note that the default device setting after a *RST command is a 2 Mbit/s framed PDH signal.

Note: If measuring **wander** (O.171 and O.172 module) and **jitter (new O.172 module only)** at 622 Mbit/s (**STM-4 / OC-12**):
:OUTP:CLOC:DIV:STAT **ON**; must be transmitted to the **Basic Module (Mainframe)**.
For all other bit rates use the default setting :OUTP:CLOC:DIV:STAT **OFF**.

```
      // Select Basic Module to talk to (only required for ANT-20 and
      // not for the ANX VXI modules).
write ("MOD:SEL BASIC",END);
      // Clear status register and error queue.
write ("*CLS", END);
      // Reset device to standard setting.
      // TX and RX set to 2 Mbit/s framed signal.
write ("*RST", END);

      // Set receiver to 622 Mbit/s optical SDH signal.
write (":SENS:MODE SDH;" ,NOEND);
write (":SENS:DATA:SDH:RATE STM4;",NOEND);
write (":SENS:DATA:SENS OPT;",NOEND);
      // Activate clock divider.
      // This setting is required for STM4 wander measurements and
      // should be set to OFF for all other bit rates.
write (":OUTP:CLOC:DIV:STAT ON;",END);

      // Select Jitter Module to talk to (only required for ANT-20 and
      // not for the ANX VXI modules).
write ("MOD:SEL JITTER",END);
      // Clear status register and error queue.
write ("*CLS", END);
      // Reset device to standard setting.
      // TX and RX set to 2 Mbit/s signal.
write ("*RST", END);

      // Set wander receiver.
      // Bit rate 622 Mbit/s
write (":SENS:DATA:RATE STM4;",NOEND);
      // Select wander mode
write (":SENS:MODE WAND;",NOEND);
      // Select wander time interval error value as requested result.
write ("SENS:FUNC:ON 'WAND:TIE'",END);
      // Set measurement duration to 10 seconds.
write ("SENS:SWE:TIME 10", END);
      // start measurement.
write ("INIT", END);
      // Wait until measurement has finished and
      // place results into the output queue.
write ("*WAI;SENS:DATA:FIN?",END);
      // Read response from device.
read();
      // The response can look like this: 101,1.5E-6
      // indicating a valid result id (101)
      // and a current wander value of 1.5E-6 seconds.
```

7 Release notes

This section contains a summary of all additions included from software release **V7.0** onwards.

Measuring Wander

Note: If measuring and using [:SENS]:MODE on page R-66 then for **options O.171 90.67 or O.172 90.86:**

- If [:SENS]:MODE = **WAND** and [:SENS]:DATA[:TEL]:RATE = **STM4** the command :OUTP:CLOC:DIV:STAT **ON** must be transmitted to the **Basic Module (Mainframe)**.
- **For all other bit rates** transmit the following command (which is the default after *RST) :OUTP:CLOC:DIV:STAT **OFF**.

Measuring Jitter

Note: If measuring and using [:SENS]:MODE on page R-66 then for **options O.171 90.67 or O.172 90.86:**

- If [:SENS]:MODE = **WAND** and [:SENS]:DATA[:TEL]:RATE = **STM4** the command :OUTP:CLOC:DIV:STAT **ON** must be transmitted to the **Basic Module (Mainframe)**.
- **For all other bit rates** transmit the following command (which is the default after *RST) :OUTP:CLOC:DIV:STAT **OFF**.

7.1 New commands

:SOUR:CLOC:FOFF:OFFS on page R-25

:SOUR:MODE on page R-30

:SOUR:WAND:AFAC on page R-31
:SOUR:WAND:AMPL on page R-32
:SOUR:WAND:FREQ on page R-33
:SOUR:WAND[:STAT] on page R-34

[:SENS]:JITT:FREQ on page R-60
[:SENS]:JITT:MODE on page R-61
[:SENS]:JITT:RMS:INT:PER on page R-63

[:SENS]:WAND:RCL:DATA on page R-69
[:SENS]:WAND:RCL:INP on page R-70
[:SENS]:WAND:RCL:MODE on page R-71
[:SENS]:WAND:SAMP:RATE on page R-72

New commands for V7.1

:SOUR:WAND:STOP on page R-35 for “Maximum Tolerable Wander (MTW)” measurement

7.2 Changed commands

[:SENS]:FILT:HPAS:FREQ on page R-49: <frequency> **0.1 Hz** added.
[:SENS]:FILT[:LPAS]:FREQ on page R-54: <frequency> **1000 Hz** added.

[:SENS]:JITT:RANG[:UPP] on page R-62: <range> **1.6, 200 (STM-1) | 6.4, 80, 800 (STM-4)** added.

[:SENS]:JITT:THR[:UPP] on page R-64: <range> **0.8, 100 (STM-1) | 3.2, 40, 400 (STM-4)** added.
[:SENS]:JITT:THR:LOW on page R-65: <range> **0.8, 100 (STM-1) | 3.2, 40, 400 (STM-4)** added.

[:SENS]:WAND:RCL[:CLOC] on page R-68: last optional node [:CLOCk] added.

- Codes for the event memory on page R-46: **“SVALue:WANDer:TIE”** added.
- Alarm bit field “CSTatus”/“HSTatus” on page R-47: **“bit position 6 LOS”** added.
- Result IDs for :SENS:DATA and :SENS:FUNC commands on page R-58 ff.: **“JITT:RMS”** added.

Changed commands for V7.1

:STAT:OPER:ENAB? on page R-13 **bit position 8** added (represents the state :SOUR:WAND[:STAT]? = ON|OFF)

Command reference

1 Common commands

Instrument behavior is based on:

IEEE Standard Codes, Formats, ANSI/IEEE Std 488.2-1992.

The common commands that are implemented are given below in alphabetical order.

*CAL?

Instrument calibration query.

Parameter: None

Comments: Requests the instrument to perform an internal self calibration and to return the result. The response indicates whether or not the instrument completed the calibration without error. A value of 0 indicates that the calibration has been completed successfully.
The instrument signals the need for calibration using bit 8 of the “questionable status register” (see Status register structure on page R-11).

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Note: The instrument is set to the reset state (as set by a *RST command) after a *CAL? command.

Response:

0:	Calibration has been completed successfully
-1:	Calibration failed
-2:	Calibration failed (warm-up time not reached
-3:	Calibration failed (EEPROM write error)
-10:	Calibration failed (calibration currently not possible)

Example:
*CAL?
Response: 0

Related commands: None

*CLS

Clear Status Command.

Parameter: None

Comments: Clears the data accumulated in the registers. Causes a partial initialization of remote control. The masks contained in the registers (ENABLE Register) are not altered (see also SCPI Syntax and Style Section 4.1.3.2).

The following actions take place:

- Clearing of all EVENT registers in the status register structure.
- Clearing of the error queue and all other queues which affect the status register structure.
- Interruption of an *OPC synchronization possibly underway, without a 1 being entered into bit 0 of the standard event status register.
- Interruption of an *OPC? synchronization possibly underway, without a 1 being entered into the output queue.

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example: *CLS

Related commands: *RST on page R-5

*ESE

*ESE <mask> Standard Event Status Enable Command.

Parameter

Name	Type	Range	Default
mask	numeric	#H00 - #HFF or #B00000000 - #B11111111 or 0 - 255	0

Comments: Sets the mask for the ESR register.

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example: *ESE 32

Related commands: *ESR? on page R-3
*ESE? on page R-3

*ESE?

Standard Event Status Enable Query.

Parameter: None

Comments: Reads the mask for the ESR register.

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example:
*ESE?
Response: 64

Related commands:
*ESR? on page R-3
*ESE on page R-2

*ESR?

Standard Event Status Register Query.

Parameter: None

Comments: Reads out the status register ESR. Range from 0 - 255.

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example:
*ESR?
Response: 64

Related commands:
*ESE on page R-2

*IDN?

Identification Query.

Parameter: None

Comments: Reads out the instrument identification consisting of 4 fields, separated by ",":
<Manufacturer>,<Instrument name>,<Serial no.>,<Firmware level>
<Manufacturer>:WANDEL&GOLTERMANN
<Instrument name>:ANT-20 / <Keycode no.>
<Serial no.>: A-0050
<Firmware level>:<Software version>/<Product no.>/<Version>/
<VXI code(HEX)>/<Card ID(HEX)>

Example: *IDN?
Response: WANDEL&GOLTERMANN,ANT-20/0A1234500000,B-0078,6.00/3035/01/0C03/0255<NL>

Related commands: None

Note: This command must always be the last query in a programming command (see also IEEE 488.2 Section 10.14.2.2). The response is always terminated with a <NL> (0A HEX).

*OPC

Operation Complete Command.

Parameter: None

Comments: Sets the OPC bit in the standard event status register ESR as soon as the instrument has assumed the idle state. Used to synchronize overlapping commands.
Use of this command makes sense only in conjunction with a service request (SRQ).

See also "WG SCPI and IEEE488 Programmer's Introduction" for more details.

Note: Execution of this command is started after all previously received commands (sequential command).

Example: *OPC

Related commands: *OPC? on page R-5
*WAI on page R-7

*OPC?

Operation Complete Query.

Parameter: None

Comments: Outputs an ASCII “1” to the output buffer of the instrument as soon as it is in the idle state.
As soon as all settings in the instrument are complete, a “1” is written to the output buffer. Used to synchronize the user and instrument for overlapping commands.

Example: *OPC?

Related commands: *OPC on page R-4
*WAI on page R-7

*OPT?

Option Identification Query.

Parameter: None

Comments: Outputs a list of the options available in the instrument.

Note: This command must always be the last query in a programming command (see also IEEE 488.2 Section 10.20.2.2). The response is always terminated with a <NL> (0A HEX).

Example: *OPT?
Response: 3035/90.67 with wander analyzer option.

Related commands: None

*RST

Reset Command.

Parameter: None

Comments: Instrument initialization.
The instrument goes to the STOP state and sets itself to defined default settings. The result memory, event FIFO and list of desired results formed with :SENS:FUNC are cleared! “*RST” does not include the initialization operations which are executed with “*CLS”!

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Note: Execution of this command is started after all previously received commands (sequential command).

Example: *RST

Related commands: *CLS on page R-2

*SRE

*SRE <mask> Service Request Enable Command.

Parameter

Name	Type	Range	Default
mask	numeric	#H00 - #HFF or #B00000000 - #B11111111 or 0 - 255	0

Comments

Sets the mask for service request (SRQ).

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details

Note: Bit number 6 (MSS) cannot be set and is ignored.

Example

*SRE 128

Related commands

*SRE? on page R-6
*STB? on page R-7

*SRE?

Service Request Enable Query.

Parameter

None

Comments

Reads out the bit mask (0 - 191) for forming the service request (SRQ).

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Note: Bit number 6 (MSS) cannot be set and is always read as 0.

Example

*SRE?
Response: 128

Related commands

*SRE on page R-6
*STB? on page R-7

*STB?

Read Status Byte Query.

Parameter: None

Comments: Reads out the status byte register (0 - 255).

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details

Example:
*STB?
Response: 128

Related commands:
*SRE on page R-6
STATUS subsystem on page R-11 ff.

*TST?

Self Test Query.

Parameter: None

Comments: Reads out the result of the power-on self-test.

0 = test completed without errors
1 = test found errors

Example:
*TST?
Response: 0

Related commands: None

*WAI

Wait to Continue Command.

Parameter: None

Comments: Waits until all previously started commands have finished.

See also “WG SCPI and IEEE488 Programmer’s Introduction” for more details

Note: This command is started after all previously received commands are executed (sequential command).

Example: *WAI

Related commands:
*OPC on page R-4
*OPC? on page R-5

Notes:

2 SYSTEM subsystem

:SYST:DATE

:SYSTem:DATE <year>, <month>, <day> sets the current date in the instrument.

Parameter

Name	Type	Range	Default
year	numeric	1970 - 2037	1970
month	numeric	1 - 12	1
day	numeric	1 - 31	1

Note: The setting is synchronized to the next, device-internal complete second. As a result, erroneous values can be read if you do a read-out immediately after a previous setting.
The setting is not changed by a *RST command.

Dependencies None

Example SYST:DATE 1995,5,1 sets the date to May 1, 1995.

Related commands :SYST:TIME on page R-10

:SYST:DATE?

:SYSTem:DATE? provides the current date in the instrument.

Example :SYST:DATE?
Response: 1995,5,1

:SYST:ERR[:NEXT]?

:SYSTem:ERRor[:NEXT]? reads the oldest entry out of the SCPI error queue.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example :SYST:ERR?
Response: 0,“No error” if error queue is empty.

:SYST:TIME

:SYSTem:TIME <hour>, <minute>, <second> sets the current time of day of the instrument.

Parameter

Name	Type	Range	Default
hour	numeric	0 - 23	0
minute	numeric	0 - 59	0
second	numeric	0 - 59	0

Note: The setting is synchronized to the next, device-internal complete second. As a result, erroneous values can be read if you do a read-out immediately after a previous setting.
The setting is not changed by a *RST command.

Dependencies None

Example SYST:TIME 12,10,0 sets the time of day to 12:10:0.

Related commands :SYST:DATE on page R-9

:SYST:TIME?

:SYSTem:TIME? provides the current time of day of the instrument.

Example
:SYST:TIME?
Response: 23,50,59

:SYST:VERS?

:SYSTem:VERSion? provides the SCPI version number on which this instrument is based.

Example
:SYST:VERS?
Response: 1996.0 for version 1996 release 0.

3 STATUS subsystem

3.1 Status register structure

The status register structure is oriented towards the one issued by the SCPI. The following figure shows the status register structure:

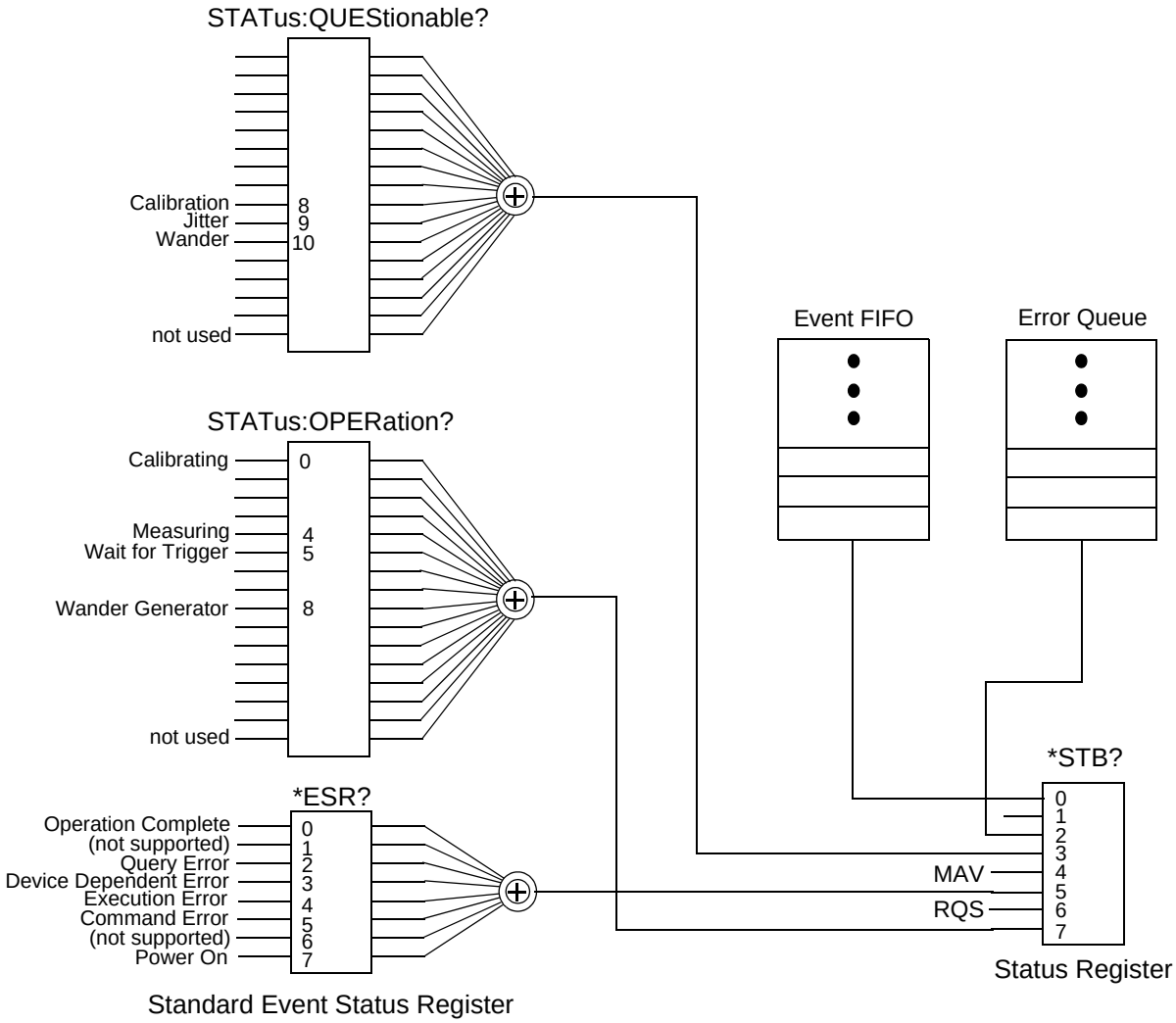

Fig. R-1 Status register structure

3.2 STATUS commands

:STATus:OPERation register

The OPERation status register contains conditions which are part of the instruments's normal operation.

:STAT:OPER:COND?

:STATus:OPERation:CONDition? provides the current value of the condition register.

Comments

Bit position	Meaning
0	If this bit is set the instrument is currently performing a calibration.
4	If this bit is set the instrument is currently measuring.
5	If this bit is set the instrument is in a "wait for trigger" state of the trigger model (e.g. waiting for the start time during a timer controlled measurement).
8	With firmware release **7.1** or later: If this bit is set :SOUR:WAND[:STAT]? = ON; if not: :SOUR:WAND[:STAT]? = OFF. Behavior see :SOUR:WAND[:STAT] on page R-34.

See SCPI handbook "Command Reference"
or "WG SCPI and IEEE488 Programmer's Introduction" for more details.

Example

:STAT:OPER:COND?
Response: 0

:STAT:OPER:ENAB

:STATus:OPERation:ENABle <value> specifies the value of the enable register.

See SCPI handbook "Command Reference"
or "WG SCPI and IEEE488 Programmer's Introduction" for more details.

Parameter

Name	Type	Range	Default
value	numeric	#H0000 - #H7FFF or #B0000000000000000 - #B0111111111111111 or 0 - 32767	#H0

Note: Bit 15 cannot be set.

Example

:STAT:OPER:ENAB 16

:STAT:OPER:ENAB?

:STATus:OPERation:ENABle? provides the current setting of the enable register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example
:STAT:OPER:ENAB?
Response: 0

:STAT:OPER[:EVEN]?

:STATus:OPERation[:EVENt]? reads the event register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Note: Reading the event register clears its content.

Example
:STAT:OPER?
Response: 16 if a measuring event was detected.

:STAT:OPER:NTR

:STATus:OPERation:NTRansition <value> specifies the value of the negative transition register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Parameter

Name	Type	Range	Default
value	numeric	#H0000 - #H7FFF or #B0000000000000000 - #B0111111111111111 or 0 - 32767	#H0

Note: Bit 15 cannot be set.

Example
:STAT:OPER:NTR 16

:STAT:OPER:NTR?

:STATus:OPERation:NTRansition? provides the current setting of the negative transition register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example
:STAT:OPER:NTR?
Response: 0

:STAT:OPER:PTR

:STATus:OPERation:PTRansition <value> specifies the value of the positive transition register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Parameter

Name	Type	Range	Default
value	numeric	#H0000 - #H7FFF or #B0000000000000000 - #B0111111111111111 or 0 - 32767	#H0

Note: Bit 15 cannot be set.

Example :STAT:OPER:PTR 16

:STAT:OPER:PTR?

:STATus:OPERation:PTRansition? provides the current setting of the positive transition register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example :STAT:OPER:PTR?
Response: 0

:STAT:PRES

:STATus:PRESet presets the status register structure.

See SCPI handbook “Command Reference” for more details.

Parameter None

Comments The following actions are taken:
- :STAT:OPER:ENAB is set to all zeros.
- :STAT:QUES:ENAB is set to all zeros.
- all positive transition registers (...:PTR) are set to all ones.

Example :STAT:PRES

:STATus:QUEStionable register

The QUEStionable status register set contains bits which give an indication of the quality of various aspects of the signal.

:STAT:QUES:COND?

:STATus:QUEStionable:CONDition? provides the current value of the questionable status register.

Comments

Bit position	Meaning
8	If this bit is set results can be questionable because the module needs a calibration (use the *CAL? query to initiate a calibration).
9	If this bit is set jitter results cannot be taken and are set to invalid (PLL not locked).
10	If this bit is set wander results cannot be taken and are set to invalid (PLL not locked).

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example

:STAT:QUES:COND?
Response: 0

:STAT:QUES:ENAB

:STATus:QUEStionable:ENABle <value> specifies the value of the enable register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Parameter

Name	Type	Range	Default
value	numeric	#H0000 - #H7FFF or #B0000000000000000 - #B0111111111111111 or 0 - 32767	#H0

Note: Bit 15 cannot be set.

Example

:STAT:QUES:ENAB 16

:STAT:QUES:ENAB?

:STATus:QUEStionable:ENABle? provides the current setting of the enable register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example
:STAT:QUES:ENAB?
Response: 0

:STAT:QUES[:EVEN]?

:STATus:QUEStionable[:EVENt]? reads the event register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Note: Reading the event register clears its content.

Example
:STAT:QUES?
Response: 16 if a measuring event was detected.

:STAT:QUES:NTR

:STATus:QUEStionable:NTRansition <value> specifies the value of the negative transition register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Parameter

Name	Type	Range	Default
value	numeric	#H0000 - #H7FFF or #B0000000000000000 - #B0111111111111111 or 0 - 32767	#H0

Note: Bit 15 cannot be set.

Example
:STAT:QUES:NTR 16

:STAT:QUES:NTR?

:STATus:QUEStionable:NTRansition? provides the current setting of the negative transition register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example
:STAT:QUES:NTR?
Response: 0

:STAT:QUES:PTR

:STATus:QUEStionable:PTRansition <value> specifies the value of the positive transition register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Parameter

Name	Type	Range	Default
value	numeric	#H0000 - #H7FFF or #B0000000000000000 - #B0111111111111111 or 0 - 32767	#H0

Note: Bit 15 cannot be set.

Example :STAT:QUES:PTR 16

:STAT:QUES:PTR?

:STATus:QUEStionable:PTRansition? provides the current setting of the positive transition register.

See SCPI handbook “Command Reference”
or “WG SCPI and IEEE488 Programmer’s Introduction” for more details.

Example :STAT:QUES:PTR?
Response: 0

Notes:

4 TRIGGER subsystem

The Trigger subsystem is used for Start/Stop control of measurements (see also [:SENS]:SWE on page R-67)

:ABOR

:ABORt halts a measurement in progress or a timer sequence.

Parameter None

Dependencies This command works only if a measurement has been previously activated using:INIT[:IMM][:ALL]

Example :ABOR

Related commands :INIT[:IMM][:ALL] on page R-19
:TRIG[:SEQ]:SOUR on page R-20
:TRIG[:SEQ]:STIM on page R-21

:INIT[:IMM][:ALL]

:INITiate[:IMMediate][:ALL] starts the measurement on the next trigger.

Parameter None

Dependencies None

Comments The measurement is started on the next trigger. This can be when the next full second is reached or, under timer control, by reaching the time preset with :TRIG[:SEQ]:STIM on page R-21. The trigger condition to be fulfilled is specified using :TRIG[:SEQ]:SOUR on page R-20.

Example :INIT

Related commands :ABOR on page R-19
:TRIG[:SEQ]:SOUR on page R-20
:TRIG[:SEQ]:STIM on page R-21

:TRIG[:SEQ]:SOUR

:TRIGger[:SEQuence]:SOURce <source> specifies the trigger source for the TRIGGER subsystem.

Parameter

Name	Type	Range	Default
source	discrete	AINTernal | STIMe | IMMediate	AINT

Dependencies None

Comments
- AINTernal: The trigger condition is satisfied when the next complete second is reached.
- STIMe: The trigger condition is satisfied when the start time set with :TRIG[:SEQ]:STIM on page R-21 is reached.
- IMMediate: The trigger condition is satisfied in an asynchronous manner, i.e. at the next possible point in time.

Example :TRIG:SOUR TIM for the timer as a trigger source.

Related commands
:INIT[:IMM][:ALL] on page R-19
:ABOR on page R-19
:TRIG[:SEQ]:STIM on page R-21

:TRIG[:SEQ]:SOUR?

This query provides the current trigger source setting.

Example
:TRIG[:SEQuence]:SOUR?
Response: AINT
if internal triggering on the next complete second is activated.

:TRIG[:SEQ]:STIM

:TRIGger[:SEQuence]:STIMe <year>,<month>,<day>,<hour>,<minute>,second>
specifies the starting time of a timer-based measurement.

Parameter

Name	Type	Range	Default
year	numeric	1994 - 2037	none
month	numeric	1 - 12	none
day	numeric	1 - 31	none
hour	numeric	0 - 23	none
minute	numeric	0 - 59	none
second	numeric	0 - 59	none

Dependencies Effective only if :TRIG[:SEQ]:SOUR = STIM.

Comments This command is used to set the point in time at which a timer-based measurement is to start.

Example :TRIG:STIM 1996,6,3,18,30,00 sets the measurement start to June 3, 1996 at 18:30:00.

Related commands
:INIT[:IMM][:ALL] on page R-19
:ABOR on page R-19
:TRIG[:SEQ]:SOUR on page R-20

:TRIG[:SEQ]:STIM?

provides the current setting of the measurement start time.

Example
:TRIG:STIM?
Response: 1995,12,31,23,30,20
for measurement start on December, 31, 1995 at 23:30:20.

Notes:

5 OUTPUT subsystem

:OUTP:DEM[:STAT]

:OUTPut:DEModulator[:STATe] <state> switches the demodulator output of the jitter receiver on or off.

Parameter

Name	Type	Range	Default
state	boolean	ON | OFF | 0 | 1	OFF

Dependencies Requires option BN 3035/90.65 or BN 3035/90.66.

Comments
ON | 1: Output switched on
OFF | 0: Output switched off

Example :OUTP:DEM ON switches the output on.

Related commands None

:OUTP:DEM[:STAT]?

This query provides the status of the demodulator output.

Example
:OUTP:DEM?
Response: 1 if the demodulator output is switched on.

Notes:

6 SOURCE subsystem

Note: For clarity, options have been shown in abbreviated form in this chapter, e.g. "**90.xx**" instead of "**BN 3035/90.xx**".

This subsystem is used to set the Jitter and Wander Generator up to **STM-4 and** the **Wander** Generator for **STM-16**.

Note: For signals up to **STM-1**, Jitter Generator **option 90.60** is required, and **option 90.61** is required for **STM-4** if **no** option is specified (firmware release **earlier** than **7.0**).

:SOUR:CLOC:FOFF:OFFS

:SOURce:CLOCk:FOFFset:OFFSet <value> determines the frequency offset of the output signal in ppb [parts per billion, i.e. 1/1000 ppm (parts per million)].

Parameter

Name	Range	Type	Default
value	numeric	-500000 to +500000[1)]	0

Dependencies

Firmware release **7.0** or later is required.

Must be set to the **same** value **x** as transmitted to the **Basic Module (Mainframe)** SOUR:CLOC:FOFF:OFFS **x**;
Valid only if on **Basic Module** SOUR:CLOC:FOFF:[STAT] = **ON**.

[1)] Only 50000 maximum is allowed for STM-16 wander generation.
See :SOUR:WAND:AFAC on page R-31

Note: To ensure correct function of the jitter generator, this "FrequencyOFFset" from the standard frequencies must be communicated to the Jitter Module.

Comments

Setting is in ppb (parts per billion, i.e. 1/1000 ppm).

Example

:SOUR:CLOC:FOFF:OFFS -3000
specifies the frequency shift as -3 ppm.

Related commands

:SOUR:WAND:AFAC on page R-31
On **Basic Module:**
:SOUR:CLOC:FOFF:OFFS
:SOUR:CLOC:FOFF:[STAT]

:SOUR:CLOC:FOFF:OFFS?

:SOURce:CLOCk:FOFFset:OFFSet? provides the current value of the frequency offset.

Example

:SOUR:CLOC:FOFF:OFFS?
Response: -50000 for frequency offset = -50 ppm.

:SOUR:DATA[:TEL]:RATE

:SOURce:DATA[:TELecom:RATE <bitrate> sets the bit rate of the generator.

Parameter

Name	Type	Range	Default
bitrate	discrete	M2 | M8 | M34 | M140 | DS1 | DS2 | DS3 | STM0 | STM1 | STM4[1)]	M2

Dependencies

[1)] STM-4 requires option 90.61 or 90.81 and 90.83 for O.172 Jitter and 90.81, 90.83 and 90.85 for Wander or 90.63 for all O.172 options

SOUR:DATA:RATE **x** must be set to the **same output** bit rate x as transmitted to the **Basic Module (Mainframe)** :SOUR:DATA:SDH:RATE **x**; (except **STM16**), or :SOUR:DATA:PDH:RATE **x,<inputrate>**;

There is a close relationship between the bit rate set by this command and the maximum values of jitter frequency and amplitude. If a conflict occurs, the jitter frequency is limited to the maximum possible value for this bit rate. A second step limits the jitter amplitude to the maximum value.

Comments

M2:	2.048 Mbit/s
M8:	8.442 Mbit/s
M34:	34.368 Mbit/s
M140:	139.264 Mbit/s
DS1:	1.544 Mbit/s
DS2:	6.312 Mbit/s
DS3	44.738 Mbit/s
STM0:	51.84 Mbit/s
STM1:	155.52 Mbit/s; strongly required for **STM-16 wander**
STM4:	622.08 Mbit/s

Example

:SOUR:DATA:RATE STM1
sets the bit rate to 155 Mbit/s.

Related commands

On **Basic Module:**
:SOUR:MODE SDH **|** PDH; and
:SOUR:DATA:SDH:RATE **|** :SOUR:DATA:PDH:RATE

:SOUR:DATA[:TEL]:RATE?

:SOURce:DATA[:TELecom]:RATE? provides the current setting of the generator bit rate.

Example

:SOUR:DATA:RATE?
Response: M2

:SOUR:JITT:AMPL

:SOURce:JITTer:AMPLitude <value> sets the jitter amplitude of the generator.

Parameter

Name	Type	Range	Default
value	numeric	0.008 - 256 (STM-4) 0.002 - 64 (other bit rates)	0.1

Dependencies The maximum jitter amplitude depends on the jitter frequency set by :SOUR:JITT:FREQ on page R-27. See Jitter Module specifications for more details. The jitter amplitude will be limited to a non-conflicting value when the jitter frequency is set.

Comments All values in UI (Unit Interval).
The step size is 0.001 UI.

Example :SOUR:JITT:AMPL 1
sets the jitter amplitude to 1 UI.

Related commands :SOUR:JITT:FREQ on page R-27
:SOUR:JITT[:STAT] on page R-29

:SOUR:JITT:AMPL?

provides the current setting of the jitter amplitude.

Example :SOUR:JITT:AMPL?
Response: 3E-3 for 0.003 UI

:SOUR:JITT:FREQ

:SOURce:JITTer:FREQuency <value> sets the jitter frequency of the generator.

Parameter

Name	Type	Range	Default
value	numeric	0.1 - 5000000	1000

Dependencies The maximum jitter frequency depends on the jitter amplitude set by :SOUR:JITT:AMPL on page R-27. See the Jitter Module specifications for more details.
The jitter frequency will be limited to a non-conflicting value when the generator data rate is set.

Comments All values in Hz.
IEEE 488.2 suffix units (HZ | KHZ | MHZ) are supported.

Example :SOUR:JITT:FREQ 2 KHZ
sets the jitter frequency to 2000 Hz.

Related commands :SOUR:JITT:AMPL on page R-27
:SOUR:JITT[:STAT] on page R-29
[:SENS]:JITT:FREQ on page R-60

:SOUR:JITT:FREQ?

provides the current setting of the jitter frequency.

Example :SOUR:JITT:FREQ?
Response: 1000 for 1000 Hz

:SOUR:JITT:SOUR

:SOURce:JITTer:SOURce <source> determines the signal source for the jitter modulator.

Parameter

Name	Type	Range	Default
source	discrete	INTernal | EXTernal	INT

Dependencies None

Comments
INTernal: Internal jitter modulation as set by the :SOUR:JITT:AMPL on page R-27 and :SOUR:JITT:FREQ on page R-27 command
EXTernal: External jitter modulation using the signal from port [30]

Example :SOUR:JITT:SOUR INT
selects internal modulation.

Related commands :SOUR:JITT[:STAT] on page R-29

:SOUR:JITT:SOUR?

provides the current setting of the signal source for the jitter modulator.

Example :SOUR:JITT:SOUR?
Response: INT

:SOUR:JITT[:STAT]

:SOURce:JITTer[:STATe] <state> activates / deactivates jitter generation.

Parameter

Name	Type	Range	Default
state	boolean	ON | OFF | 0 | 1	OFF

Dependencies

For signals up to **STM-1, option 90.60 or (for O.172) 90.81 and** firmware release **7.0** or later is required to activate the jitter generator.
For **STM-4, option 90.60, 90.61 or (for O.172) 90.81, 90.83** and firmware release **7.0** or later is required to activate the jitter generator.

For jitter generation up to STM-4:
First the commands :SOUR:JITT:AMPL <value>; FREQ <value>; STAT ON; and :SOUR:DATA:RATE <bitrate>; are transmitted to the Jitter Module.
Then the commands :INP:CLOC:JITT ON; and :INP:CLOC:WAND OFF; (default) must be transmitted to the Basic Module (Mainframe).

Comments

ON | 1: Jitter generator switched on
OFF | 0: Jitter generator switched off

Example

:SOUR:JITT ON switches the Jitter generator on.

Related commands

:SOUR:JITT:AMPL on page R-27
:SOUR:JITT:FREQ on page R-27

On **Basic Module:**
:INP:CLOC:JITT
:INP:CLOC:WAND

:SOUR:JITT[:STAT]?

provides the jitter generator status.

Example

:SOUR:JITT? if jitter generation is activated.
Response: 1

:SOUR:MODE

:SOURce:MODE <mode> sets the mode of the generator (SOURce).

Parameter

Name	Type	Range	Default
mode	discrete	JITTer | WANDer	JITT

Dependencies This command requires firmware release **7.0** or later **and option 90.81** for jitter up to **STM-1** and **90.81, 90.83 for STM-4 jitter**.
For wander up to **STM-4, 90.81, 90.83** and **90.85** are required.
90.87 is additionally required for **STM-16 wander**.

Comments
JITT: **Option 90.81** is required for jitter up to **STM-1**.
Option 90.83 is additionally required for up to **STM-4**.
WAND: **Option 90.85** is additionally required for wander up to **STM-4**.
Option 90.87 is additionally required for wander up to **STM-16**.

Example :SOUR:MODE WAND activates wander signal generation.

Related commands
:SOUR:JITT[:STAT] on page R-29
:SOUR:WAND[:STAT] on page R-34

:SOUR:MODE?

:SOURce:MODE? provides the current mode of the generator (SOURce).

Example
:SOUR:MODE?
Response: WAND if wander generation is activated.

:SOUR:WAND:AFAC

:SOURce:WANDer:AFACactor <value> sets the wander Amplitude FACtor of the generator to set the correct **wander** amplitude for **STM-16**.

Parameter

Name	Type	Range	Default
value	numeric	1 | 16	1

Dependencies

This command requires firmware release **7.0** or later **and O.172 options 90.81, 90.83 and 90.85** for **up to STM-4. Option 90.87** is additionally required for **STM-16 wander.**

Note: This command with value 16 is only required if wander generation is required on the Jitter STM-16 Module.

For wander generation from the Jitter STM-16 module:
First the commands :SOUR:WAND:AFAC 16; AMPL <value>; FREQ <value>; STAT ON; and :SOUR:DATA:RATE STM1; are transmitted to the Jitter Module.
Then the commands :INP:CLOC:WAND ON; and :INP:CLOC:JITT ON; must be transmitted to the Basic Module (Mainframe).

Comments

:SOUR:WAND:AFAC 16 can **not** be set automatically if :SOUR:DATA:SDH:RATE **STM16**; is transmitted to the **Basic Module (Mainframe)**

Example

:SOUR:WAND:AFAC 16
sets the wander Amplitude FACtor to 16.

Related commands

:SOUR:CLOC:FOFF:OFFS on page R-25
:SOUR:DATA[:TEL]:RATE on page R-26
:SOUR:WAND:AMPL on page R-32
:SOUR:WAND:FREQ on page R-33
:SOUR:WAND[:STAT] on page R-34

:SOUR:WAND:AFAC?

provides the current setting of the wander Amplitude FACtor.

Example

:SOUR:WAND:AFAC?
Response: 1 for wander Amplitude FACtor = 1

:SOUR:WAND:AMPL

:SOURce:WANDer:AMPLitude <value> sets the wander amplitude of the generator.

Parameter

Name	Type	Range	Default
value	numeric	0.1 - 200000	0.1

Dependencies

This command requires firmware release **7.0** or later **and O.172 options 90.81, 90.83** and **90.85 for up to STM-4. Option 90.87** is additionally required for **STM-16 wander**.

The maximum wander amplitude depends on the wander frequency set by :SOUR:WAND:FREQ on page R-33. See Jitter Module specifications for more details.
The wander amplitude will be limited to a non-conflicting value when the wander frequency is set.

Comments

All values in UI (Unit Interval).
The step size is 0.1 UI.

Example

:SOUR:WAND:AMPL 155.5
sets the wander amplitude to 155.5 UI.

Related commands

:SOUR:WAND:AFAC on page R-31
:SOUR:WAND:FREQ on page R-33
:SOUR:WAND[:STAT] on page R-34

:SOUR:WAND:AMPL?

provides the current setting of the wander amplitude.

Example

:SOUR:WAND:AMPL?
Response: 200000 for 200000 UI

:SOUR:WAND:FREQ

:SOURce:WANDer:FREQuency <value> sets the wander frequency of the generator.

Parameter

Name	Type	Range	Default
value	numeric	0.00001 - 10.0	1

Dependencies

This command requires firmware release **7.0** or later **and O.172 options 90.81, 90.83** and **90.85 for up to STM-4. Option 90.87** is additionally required for **STM-16 wander**.

The maximum wander frequency depends on the wander amplitude set by :SOUR:WAND:AMPL on page R-32. See the Jitter Module specifications for more details.

Comments

All values in Hz. Minimum value is 10 uHz, a period of nearly 28 hours.
IEEE 488.2 suffix units (HZ | KHZ | MHZ) are supported.

Example

:SOUR:WAND:FREQ .00001 HZ
sets the wander frequency to 10 uHz.

Related commands

:SOUR:WAND:AFAC on page R-31
:SOUR:WAND:AMPL on page R-32
:SOUR:WAND[:STAT] on page R-34

:SOUR:WAND:FREQ?

provides the current setting of the wander frequency.

Example

:SOUR:WAND:FREQ?
Response: 0.1 for 0.1 Hz

:SOUR:WAND[:STAT]

:SOURce:WANDer[:STATe] <state> activates / deactivates wander generation.

Parameter

Name	Type	Range	Default
state	boolean	ON | OFF | 0 | 1	OFF

Dependencies

This command requires firmware release **7.0** or later **and O.172 options 90.81, 90.83** and **90.85 for up to STM-4.** **Option 90.87** is additionally required for **STM-16 wander**.

For wander generation up to STM-4:
First the commands :SOUR:WAND:AMPL <value>; FREQ <value>; STAT ON; and :SOUR:DATA:RATE <bitrate>; are transmitted to the Jitter Module. Then the commands :INP:CLOC:JITT ON; and :INP:CLOC:WAND:OFF; (default) must be transmitted to the Basic Module (Mainframe).

Comments

ON | 1: Wander generator switched on

With **firmware release 7.1** or later:
If :SOUR:WAND:STOP = IMM (default) was transmitted, wander is generated nonterminating (like with firmware release **7.0**) until :SOUR:WAND[:STAT] = OFF is transmitted.
See detailed behavior :SOUR:WAND:STOP on page R-35.

OFF | 0: Wander generator switched off

Note: The state :SOUR:WAND[:STAT]? = ON|OFF is represented in :STAT:OPER:ENAB? on page R-13 with bit position 8 = 1|0.

If **during** :SOUR:MODE? = **WAND and** :SOUR:WAND[:STAT]? = **ON** the command :SOUR:MODE = **JITT** is transmitted, necessarily wander generation is stopped immediately, but :SOUR:WAND[:STAT]? **remains ON** and :STAT:OPER:ENAB? **remains** set to **1**.
Then jitter generation starts with :SOUR:JITT:FREQ <value> and :SOUR:WAND:AMPL <value>, if :SOUR:JITT[:STAT] = **ON** (not, if OFF).
If then again :SOUR:MODE = **WAND** is transmitted, wander generation therefore starts again, because :SOUR:WAND[:STAT]? = **ON**!

Example

:SOUR:WAND ON switches the wander generator on.

Related commands

:SOUR:WAND:AFAC on page R-31
:SOUR:WAND:AMPL on page R-32
:SOUR:WAND:FREQ on page R-33
:SOUR:WAND:STOP on page R-35

On **Basic Module:**
:INP:CLOC:JITT
:INP:CLOC:WAND

:SOUR:WAND[:STAT]?

provides the wander generator status.

Example :SOUR:WAND?
Response: 1 if wander generation is activated.

:SOUR:WAND:STOP

:SOURce:WANDer:STOP <mode> sets the **stop** mode of the wander generator.

Parameter

Name	Type	Range	Default
mode	discrete	IMMediate | DELayed	IMM

Dependencies This command requires firmware release **7.1** or later **and O.172 options 90.81, 90.83** and **90.85 for up to STM-4. Option 90.87** is additionally required for **STM-16 wander**.

Comments IMMediate: **Normal operation:**

If :SOUR:WAND[:STAT] = ON is transmitted, wander is generated nonterminating until :SOUR:WAND[:STAT] = OFF is transmitted.

DELayed: **Is used for "Maximum Tolerable Wander (MTW)" measurement:**

If :SOUR:WAND[:STAT] = ON is transmitted, wander generation endures **only one** sinus-modulation-period;
so wander generator **stops automatically delayed** and then :SOUR:WAND[:STAT] is therefore set **automatically** to **OFF** (approximately at latest after 200 ms).

To **stop immediately** the wander generation **during** this **single** sinus-modulation-period (:SOUR:WAND[:STAT]? = **ON**) the command :SOUR:WAND[:STAT] = **OFF** can be transmitted.

Note: If it is necessary to change the wander amplitude, the frequency or the mode **during** the state :SOUR:WAND[:STAT]? = **ON and during** the mode :SOUR:WAND:STOP? = **DEL**, the command :SOUR:WAND[:STAT] = **OFF** should be transmitted **before** the following commands:

- a modified :SOUR:WAND:FREQ <value>
- a modified :SOUR:WAND:AMPL <value>
- :SOUR:WAND:STOP = IMM
- :SOUR:MODE = JITT

Example :SOUR:WAND:STOP DEL
activates the **stop** mode "delayed" of the wander generator.

Related commands :SOUR:WAND[:STAT] on page R-34

:SOUR:WAND:STOP?

provides the **stop** mode of the wander generator.

Example :SOUR:WAND:STOP?
Response: DEL if wander stop mode “delayed” is activated.

7 INPUT subsystem

:INP:CODE

:INPut:CODE <code> sets the code of the receiver input.

Parameter

Name	Type	Range	Default
code	discrete	AMI | CMI | HDB3 | B8ZS | B3ZS | CLOCk	HDB3

Dependencies

AMI code for bit rates up to 8 Mbit/s, with **O.172 option 90.82** up to 52 Mbit/s (STM0).
HDB3, B3ZS, B8ZS code for bit rates up to 52 Mbit/s (STM0).
CMI code for bit rates up to 155 Mbit/s (STM1).
CLOCk code for all optical bit rates, 51.155 Mbit/s or 622 Mbit/s (STM0, STM1 or STM4) only.

Comments

AMI: AMI line code.
CMI: CMI line code.
HDB3: HDB3 line code.
B8ZS: B8ZS line code.
B3ZS: B3ZS line code.
CLOCk: Deactivates receiver encoder. A simple clock signal is expected (mandatory for all optical input signals).

The code of the receiver input is automatically set according to common standards if the receiver bit rate changes.

Example

:INP:CODE CMI activates CMI code.

:INP:CODE?

This query supplies the current code setting.

Example

:INP:CODE?
Response: CMI if CMI code is activated.

Notes:

8 SENSE subsystem

Note: For clarity, options have been shown in abbreviated form in this chapter, e.g. “**90.xx**” instead of “**BN 3035/90.xx**”.

This subsystem is used to set the Jitter and Wander Receivers, to configure measurements and to query results.

Note: For signals up to **STM-1**, Jitter Receiver **option 90.65** is required and **option 90.66** for **STM-4** or Wander Receiver **option 90.67** for up to **STM-4** if **no** option is specified (firmware release **earlier** than **7.0**).

[:SENS]:AVER[:STAT]

[:SENSe]:AVERage[:STATe] <state> switches the averaging mechanism of the jitter receiver on or off.

Parameter

Name	Type	Range	Default
state	boolean	ON | OFF | 0 | 1	OFF

Dependencies None

Comments ON | 1: Averaging switched on
OFF | 0: Averaging switched off

Example :AVER ON switches averaging on.

Related commands [:SENS]:AVER:TIME on page R-40

[:SENS]:AVER[:STAT]?

This query provides the status of the averaging mechanism of the jitter receiver.

Example :AVER?
Response: 1 if the averaging mechanism is switched on.

[:SENS]:AVER:TIME

[:SENSe]:AVERage:TIME <duration> determines the averaging period of a jitter measurement.

Parameter

Name	Type	Range	Default
duration	numeric	1 - 5	1

Dependencies Only valid if [:SENS]:AVER[:STAT] = ON.

Comments The current measurement results are averaged over the time period (in seconds) set by this command.

Example :AVER:TIME 1 sets period to 1 second.

Related commands [:SENS]:AVER[:STAT] on page R-39

[:SENS]:AVER:TIME?

provides the current setting of the averaging period of a measurement.

Example :AVER:TIME?
Response: 5 5 seconds averaging period.

[:SENS]:DATA:ACT?

[:SENSe]:DATA:ACTual? [<id>{[, <id>]}*] reads **current** results.

Parameter

Name	Type	Range	Default
id	string	e.g. “JITT:POS:PEAK” for maximum positive jitter value	none

Dependencies

Coupled with: [:SENS]:FUNC[:ON].
Valid results are only available if a measurement was previously initiated (except status results (“CST”) or other results which are continuously taken).

Comments

The result(s) designated with <id>s are read out, or (if there is no <id> parameter) all results which were previously selected with [:SENS]:FUNC[:ON] on page R-57. The list of available results is found under Result IDs for :SENS:DATA and :SENS:FUNC commands on page R-58.

Note: Current and final results are identical once the measurement has finished. If a result is **invalid** for any reason, the corresponding response code is **negative** and the result value is set to **NAN** (not a number = 9.91E37).

Example

see [:SENS]:DATA:FIN? on page R-42.
DATA:ACT? “CST”
Response: 40,2

Meaning:

40:	response code “CST”
2:	value of the Alarm bit field “CSTatus”/“HSTatus” indicating LTI (loss of timing information) jitter. PLL unlocked.

Related commands

Result IDs for :SENS:DATA and :SENS:FUNC commands on page R-58
[:SENS]:FUNC[:ON] on page R-57
[:SENS]:DATA:FIN? on page R-42
:INIT[:IMM][:ALL] on page R-19

[:SENS]:DATA:FIN?

[:SENSe]:DATA:FINal? [<id>{[, <id>]}*] reads **final** measurement results.

Parameter

Name	Type	Range	Default
id	string	e.g. “JITT:PPE:MAX” for maximum peak-peak jitter value	none

Comments

The result(s) designated with <id>s are read out, or (if there is no <id> parameter) all results which were previously selected with [:SENS]:FUNC[:ON] on page R-57. The list of available results is found under Result IDs for :SENS:DATA and :SENS:FUNC commands on page R-58.

Dependencies

Coupled with: [:SENS]:FUNC[:ON]
Valid final results are only available if a measurement was previously initiated and has finished.
Valid final results are not available for results taken continuously.

Response

The table below shows the response if multiple results are selected.

Response name	Response type
response code (1st result)	numeric response code ID
result value (1st result)	response type as described in Result IDs for :SENS:DATA and :SENS:FUNC commands on page R-58
response code (2nd result)	numeric response code ID
result value (2nd result)	response type 2nd result
…	…
response code (last result)	numeric response code ID
result value (last result)	response type last result

Note: If a result is **invalid** for any reason, the corresponding response code is **negative** and the result value is set to **NAN** (not a number = 9.91E37).

Example

If positive and negative peak jitter value measurement was previously selected using [:SENS]:FUNC[:ON] “JITT:POS:PEAK:MAX”,“JITT:NEG:PEAK:MAX”, a result given by
:DATA:FIN? can look like this:

51,0.12,53,0.023
Meaning:

51	response code “JITT:POS:PEAK:MAX”
0.12	positive peak jitter result = 0.12 UI
53	response code “JITT:NEG:PEAK:MAX”
0.023	negative peak jitter result = 0.023 UI

or:
-51,9.91E37,-53,9.91E37

-51	response code “JITT:POS:PEAK:MAX” **invalid**
9.91E37	positive peak jitter result is **not valid**, NAN (not a number) is returned
-53	response code “JITT:NEG:PEAK:MAX” **invalid**
9.91E37	negative peak jitter result is **not valid**, NAN (not a number) is returned

Related commands

Result IDs for :SENS:DATA and :SENS:FUNC commands on page R-58
[:SENS]:FUNC[:ON] on page R-57
[:SENS]:SWE:TIME on page R-67
[:SENS]:DATA:ACT? on page R-41
:INIT[:IMM][:ALL] on page R-19
:ABOR on page R-19

[:SENS]:DATA:EVEN?

[:SENSe]:DATA:EVENt? <number> reads the “number” of accumulated events from the event FIFO. The event FIFO is only used currently for “wander TIE values” or “positive/negative/peak-peak jitter values” or “RMS values” that are continuously taken every second during a jitter/wander measurement (as set by [:SENS]:MODE on page R-66). Within this sequence, changes of the alarm status (Alarm bit field “CSTatus”/“HSTatus” on page R-47) will also force an entry in the event FIFO with a corresponding time stamp. This FIFO thus allows the device programmer to obtain equidistant samples in an asynchronous manner.

Parameter

Name	Type	Range	Default
number	numeric	1 - 200	1

Dependencies

FIFO entries are only available if a jitter/wander measurement was previously initiated.

Comments

Jitter/Wander samples and events are stored in an event FIFO (First In First Out), where they can be extracted with this command.
The data are extracted as in a normal FIFO structure, i.e. the oldest entry first, then the second oldest, etc.
You can determine whether an event has occurred by monitoring the status register (Status register structure on page R-11).
The FIFO content is cleared by initiating a new measurement or by a *RST command.

Each event (error, alarm or sample) causes at least 2 entries in the FIFO:

1st entry:	Time stamp (response code = 10)
2nd entry:	Jitter PPEak sample (response code = 1052) or an alarm entry (response code = 1000) or another jitter sample.
	For wander TIE see Example 2 below.

If more than one event occurs between 2 time stamps, the first entry contains the time stamp and following entries contain the events pertaining to the same time stamp.

If at least one event entry is available, bit 0 of the status byte is set (see also STATUS subsystem on page R-11 ff.).

Note: The FIFO can contain up to **2000** entries. If the FIFO is not read in time, an overflow entry (response code = 1) is appended to the FIFO.

Response

Each entry in the FIFO has the following structure:

Response name	Response type
response code	numeric (the response code)
value	numerical value

Example 1

:DATA:EVEN? 2 supplies 2 events out of the FIFO.
Response: 10,0.1930400E7,1052,1.478

Meaning:

10	ID 1st event (the time stamp)
0.1930400E7	ms since 1970/1/1
1052	ID 2nd event (jitter PPEak value).
1.478	The jitter PPEak value measured at the above time stamp was 1.478 UI.

For wander TIE p.e. with 30 samples per second 10 times the following "*definite length arbitrary block response data*" (IEEE Std 488-2) with corrensponding time stamps and IDs are emitted:
#216 [=following 16 bytes with 2 * int16 and 3 * reals]
with the "Swapped IEEE Std 754" formats (least significant byte first):
#216 [SINT16=2 bytes] [SINT16=2 bytes] [SFP32=4 bytes] [SFP32=4 bytes] [SFP32=4 bytes]

So the 1st 100 ms of the second:
#216 [number of samples=3] [offset=0] [sample 1] [sample 2] [sample 3]

The 2nd 100 ms of the second:
#216 [number of samples=3] [offset=0] [sample 4] [sample 5] [sample 6]

and 7 times so on to:
The 10th (last) 100 ms of the second:
#216 [number of samples=3] [offset=0] [sample 28] [sample 29] [sample 30]

Example 2

:DATA:EVEN? 21 supplies 21 events out of the FIFO
Response: 10,0.2598600E7,1100,0.345E-9,1101,#216[16 bytes],10,0.2598700E7, #216[16 bytes], { and 7 times so on to } 10,0.2599500E7,#216[16 bytes]

Meaning:

10	ID 1st event (the time stamp)
0.2598600E7	ms since 1970/1/1
1100	ID 2nd event (wander TIE value)
0.345E-9	The wander TIE value measured at the above time stamp was 0.345E-9 seconds
1101	ID 3rd event (wander TIE sample block data)
#216 [16 bytes]	"*definite length arbitrary block response data*"

The 2nd 100 ms:

10	ID 4th event (the time stamp)
0.2598700E7	ms since 1970/1/1
1101	ID 5th event (wander TIE sample block data)
#216 [16 bytes]	"*definite length arbitrary block response data*"

and 7 times so on to:

The 10th 100 ms:

10	ID 20th event (the time stamp)
0.2599500E7	ms since 1970/1/1
1101	ID 21th event (wander TIE sample block data)
#216 [16 bytes]	"*definite length arbitrary block response data*"

For wander TIE p.e. with 300 samples per second 10 times the following "*definite length arbitrary block response data*" with corrensponding time stamps and IDs are emitted:
#3124 [=following 124 bytes with 2 * int16 and 30 * reals] with the same formats.

Related commands

[:SENS]:DATA:EVEN:NUMB? on page R-46

[:SENS]:DATA:EVEN:NUMB?

[:SENSe]:DATA:EVENt:NUMBer? supplies the number of entries available in the event FIFO.

Parameter None

Example :DATA:EVEN:NUMB?
Response: 88 if 88 events are available.

Related commands [:SENS]:DATA:EVEN? on page R-43

Codes for the event memory

Note: The alarm alternation events are collected into bit fields (32 bits) where each individual alarm can be found at a specified bit position. A logical “1” at the respective bit position indicates an active alarm, and a logical “0” an inactive alarm. For a description of these bit fields, see: Alarm bit field “CSTatus”/ “HSTatus” on page R-47.

Name	Response code	Response type	Event description
NOEVent	0	count = 0	No event available
OVERflow	1	count = 0	Overflow of internal event memory
Time stamp	10	real (NR3)	Time stamp of events in milliseconds since 1970/1/1
AEVent:CST	1000	boolean (NR1) (compressed)	Event in the signal alarm bit field (see also Alarm bit field “CSTatus”/ “HSTatus” on page R-47)
CVALue:JITter:POSitive:PEAK	1050	real (NR3)	Current positive peak jitter value (UI).
CVALue:JITter:NEGative:PEAK	1051	real (NR3)	Current negative peak jitter value (UI).
CVALue:JITter:PPEak	1052	real (NR3)	Current peak to peak jitter value (UI).
CVALue:WANDer:TIE	1100	real (NR3)	Current wander TIE value in seconds. Only valid if [:SENS]:MODE = WAND.
SVALue:WANDer:TIE	1101	“*definite length arbitrary block response data*”, beginning with # and followed by the number of digits of the byte count, plus the number of data bytes that follow. See [:SENS]:DATA:EVEN? on page R-43, Example 2	Current wander TIE **sample** values in seconds; [:SENS]:WAND:SAMP:RATE on page R-72 determines the number of samples per second. The 1 to 300 samples must be polled from the event queue every second using [:SENS]:DATA:EVEN? <number>; otherwise overflow will occur. This requires firmware release **7.0** or later **and options 90.82**, **90.84 and Wander 90.86**. Only valid if [:SENS]:MODE = WAND.

Table R-1 General event IDs for the event memory

Alarm bit field “CSTatus”/“HSTatus”

Bit position	Alarm name
0 (LSB)	External modulation overflow
1	LTI (loss of timing information) jitter. PLL unlocked
2	LTI (loss of timing information) wander. PLL unlocked
3	Jitter measurement positive overflow
4	Jitter measurement negative overflow
5	Power failed
6	LOS (loss of signal)
7 … 31	Reserved

Table R-2 Alarm field “CSTatus”

[:SENS]:DATA[:TEL]:RATE

[:SENSe]:DATA[:TELecom:RATE <bitrate> sets the bit rate of the receiver.

Parameter

Name	Type	Range	Default
bitrate	discrete	M2 | M8 | M34 | M140 | DS1 | DS2 | DS3 | STM0 | STM1 | STM4	M2

Dependencies

SENS:DATA:RATE **x**; must be set to the **same input** bit rate **x** as sent to the **Basic Module (Mainframe)** :SENS:DATA:SDH:RATE **x**; (except **STM-16**),
or :SENS:DATA:PDH:RATE **x,<outputrate>**;
The input bit rate parameter **STM4** requires **option 90.66 or 90.84 for O.172.**

Comments

M2:	2.048 Mbit/s
M8:	8.442 Mbit/s
M34:	34.368 Mbit/s
M140:	139.264 Mbit/s
DS1:	1.544 Mbit/s
DS2:	6.312 Mbit/s
DS3:	44.738 Mbit/s
STM0:	51.84 Mbit/s
STM1:	155.52 Mbit/s
STM4:	622.08 Mbit/s

:DATA:RATE STM1
sets the bit rate to 155 Mbit/s.

Related commands

Basic Module:
:SENS:MODE SDH
:SENS:MODE PDH
:SENS:DATA:SDH:RATE
:SENS:DATA:PDH:RATE

[:SENS]:DATA[:TEL]:RATE?

[:SENSe]:DATA[:TELecom]:RATE? provides the current setting of the receiver bit rate.

Example

:DATA:RATE?
Response: M2

[:SENS]:FILT:HPAS:FREQ

[:SENSe]:FILTer:HPASs:FREQuency <frequency> determines the frequency of the high-pass weighting filters.

Parameter

Name	Type	Range	Default
frequency	numeric	**0.1** | 2 | 4 | 10 | 20 | 40 | 100 | 200 | 400 | 500 | 700 | 1000 | 3000 | 8000 | 10000 | 12000 | 18000 | 20000 | 30000 | 65000 | 80000 | 250000	20

Dependencies

0.1 Hz requires firmware release **7.0** or later **and**
Jitter Rx **O.172 option 90.82** for up to **STM-1** and **90.84 for STM-4**.

With these O.172 options the following three restrictions no longer apply:
18 kHz is not allowed for [:SENS]:DATA[:TEL]:RATE = STM0 (52 Mbit/s).
20 kHz is allowed for all bit rates except STM0 (52 Mbit/s).
2 Hz or 4 Hz are not allowed for [:SENS]:DATA[:TEL]:RATE = STM4 (622 Mbit/s).

Values greater than 30 kHz are not allowed for [:SENS]:DATA[:TEL]:RATE = DS1 | DS2.
Values greater than 80 kHz are not allowed for [:SENS]:DATA[:TEL]:RATE = M2.
The high-pass frequency must always be less than or equal to the low-pass frequency set by [:SENS]:FILT[:LPAS]:FREQ on page R-54.

Comments

All values in Hz.

IEEE 488.2 suffix units (HZ | KHZ) are supported.
This setting can be set automatically using the command [:SENS]:FILT:HPAS:FREQ:AUTO on page R-50.

Example

:FILT:HPAS:FREQ 1 KHZ activates the 1000 Hz filter.

Related commands

[:SENS]:FILT:HPAS:FREQ:AUTO on page R-50

[:SENS]:FILT:HPAS:FREQ?

provides the current frequency setting of the high-pass weighting filters.

Example

:FILT:HPAS:FREQ?
Response: 250000 if 250 kHz filter is selected.

[:SENS]:FILT:HPAS:FREQ:AUTO

[:SENSe]:FILTer:HPASs:FREQuency:AUTO <state> determines the state of automatic frequency setting of the high-pass filter frequency.

Parameter

Name	Type	Range	Default
state	auto	0 | OFF | 1 | ON | ONCE	1

Dependencies None

Comments <state>:

ON | 1: Turns on automatic high-pass frequency setting.

OFF | 0: Turns off automatic high-pass frequency setting.

ONCE: The high-pass frequency set by [:SENS]:FILT:HPAS:FREQ on page R-49 is calculated once. The <state> is then set to 0.

The automatic setting is switched to OFF if [:SENS]:FILT:HPAS:FREQ is set directly by a command.

The high-pass frequency settings conform to ITU-T O.171.

Bit rate	**High-pass frequency / Hz**
M2	20
M8	20
M34	100
M140	200
DS1	10
DS2	10
DS3	10
STM0	100
STM1	500
STM4	1000

Table R-3 ITU-T high-pass weighting frequencies

Example :FILT:HPAS:FREQ:AUTO 0 deactivates automatic high-pass frequency setting.

Related commands [:SENS]:FILT:HPAS:FREQ on page R-49

[:SENS]:FILT:HPAS:FREQ:AUTO?

provides the current automatic frequency setting for the high-pass filter.

Comments ONCE: is a volatile state and cannot be read.

Example :FILT:HPAS:FREQ:AUTO?
Response: 0 if automatic setting is deactivated.

[:SENS]:FILT:LED1[:STAT]

[:SENSe]:FILTer:LED1[:STATe] <state> switches the VXI module front panel FILTER 1 LED on or off.

Parameter

Name	Type	Range	Default
state	boolean	ON | OFF | 0 | 1	OFF

Dependencies Only available for the VXI jitter modules.
Note: The state of the LED is freely programmable and does not correspond directly to any setting of the high-pass or low-pass filters.

Comments ON | 1: LED switched on
OFF | 0: LED switched off

Example :FILT:LED1 ON switches FILTER 1 LED on.

Related commands [:SENS]:FILT:LED2[:STAT] on page R-52
[:SENS]:FILT:LED3[:STAT] on page R-53

[:SENS]:FILT:LED1[:STAT]?

This query provides the status of the FILTER 1 LED.

Example :FILT:LED1?
Response: 1 if the LED is switched on.

[:SENS]:FILT:LED2[:STAT]

[:SENSe]:FILTer:LED2[:STATe] <state> switches the VXI module front panel FILTER 2 LED on or off.

Parameter

Name	Type	Range	Default
state	boolean	ON | OFF | 0 | 1	OFF

Dependencies
Only available for the VXI jitter modules.
Note: The state of the LED is freely programmable and does not correspond directly to any setting of the high-pass or low-pass filters.

Comments
ON | 1: LED switched on
OFF | 0: LED switched off

Example
:FILT:LED2 ON switches FILTER 2 LED on.

Related commands
[:SENS]:FILT:LED1[:STAT] on page R-51
[:SENS]:FILT:LED3[:STAT] on page R-53

[:SENS]:FILT:LED2[:STAT]?

This query provides the status of the FILTER 2 LED.

Example
:FILT:LED2?
Response: 1 if the LED is switched on.

[:SENS]:FILT:LED3[:STAT]

[:SENSe]:FILTer:LED3[:STATe] <state> switches the VXI module front panel FILTER 3 LED on or off.

Parameter

Name	Type	Range	Default
state	boolean	ON | OFF | 0 | 1	OFF

Dependencies Only available for the VXI jitter modules.
Note: The state of the LED is freely programmable and does not correspond directly to any setting of the high-pass or low-pass filters.

Comments ON | 1: LED switched on
OFF | 0: LED switched off

Example :FILT:LED3 ON switches FILTER 3 LED on.

Related commands [:SENS]:FILT:LED1[:STAT] on page R-51
[:SENS]:FILT:LED2[:STAT] on page R-52

[:SENS]:FILT:LED3[:STAT]?

This query provides the status of the FILTER 3 LED.

Example :FILT:LED3?
Response: 1 if the LED is switched on.

[:SENS]:FILT[:LPAS]:FREQ

[:SENSe]:FILTer[:LPASs]:FREQuency <frequency> determines the frequency of the low-pass weighting filters.

Parameter

Name	Type	Range	Default
frequency	numeric	**1000** | 40000 | 60000 | 10000 | 400000 | 800000 | 1300000 | 3500000 | 5000000	100000

Dependencies

1000 Hz requires firmware release **7.0** or later **and**
Jitter Rx **O.172 option 90.82** for up to **STM-1** and **90.84** for **STM-4** and is **only possible** and is set automatically in the highest UI jitter range (STM1 | STM4) of [:SENS]:JITT:RANG[:UPP] = **200 | 800**.

It is preferable to put these two commands in **one** string for transmission:
":JITT:RANG 200; :FILT:FREQ 1000;"

For the maximum low-pass frequencies for each bit rate, refer to the following table:

Bit rate	**Low-pass frequency / Hz**
M2	100 k
M8	400 k
M34	800 k
M140	3500 k
DS1	40 k
DS2	60 k
DS3	400 k
STM0	400 k
STM1	1300 k
STM4	5000 k

Table R-4 Maximum low-pass weighting frequencies

The **low-pass** frequency must always be **greater than or equal** to the **high-pass frequency** set by [:SENS]:FILT:HPAS:FREQ on page R-49.

Comments

All values in Hz.
IEEE 488.2 suffix units (HZ | KHZ | MAHZ | MHZ) are supported.
This setting can be set automatically using the command [:SENS]:FILT[:LPAS]:FREQ:AUTO on page R-55.

Example

:FILT:FREQ 5 MHZ activates the 5 MHz filter.

Related commands

[:SENS]:FILT[:LPAS]:FREQ:AUTO on page R-55

[:SENS]:FILT[:LPAS]:FREQ?

provides the current low-pass weighting filter frequency setting.

Example :FILT:FREQ?
Response: 250000 if the 250 kHz filter is selected.

[:SENS]:FILT[:LPAS]:FREQ:AUTO

[:SENSe]:FILTer[:LPASs]:FREQuency:AUTO <state> determines the state of automatic frequency setting of the low-pass filter frequency.

Parameter

Name	Type	Range	Default
state	auto	0 | OFF | 1 | ON | ONCE	1

Dependencies None

Comments <state>:
ON | 1: Turns on automatic low-pass frequency setting.
OFF | 0: Turns off automatic low-pass frequency setting
ONCE: The low-pass frequency set by [:SENS]:FILT[:LPAS]:FREQ on page R-54 is calculated once. The <state> is then set to 0.

The automatic setting is switched to OFF if [:SENS]:FILT[:LPAS]:FREQ is set directly by a command.
The low-pass frequency settings conform to ITU-T O.171:

Bit rate	**Low-pass frequency / Hz**
M2	100 k
M8	400 k
M34	800 k
M140	3500 k
DS1	40 k
DS2	60 k
DS3	400 k
STM0	400 k
STM1	1300 k
STM4	5000 k

Table R-5 ITU-T low-pass weighting frequencies

Comments :FILT:FREQ:AUTO 0 deactivates automatic the low-pass frequency setting.

Related commands [:SENS]:FILT[:LPAS]:FREQ on page R-54

[:SENS]:FILT[:LPAS]:FREQ:AUTO?

provides the current automatic frequency setting for the low-pass filter.

Comments ONCE: is a volatile state and cannot be read.

Example :FILT:FREQ:AUTO?
Response: 0 if automatic setting is deactivated.

[:SENS]:FUNC:OFF

[:SENSe]:FUNCtion:OFF <id>{[, <id>]}* deletes one or more result elements from the list of results to be determined.

For the entire list of results, see Result IDs for :SENS:DATA and :SENS:FUNC commands on page R-58.

Parameter

Name	Type	Range	Default
id	string	e.g. “JITT:POS:PEAK:MAX” for positive peak maximum jitter value	none

Dependencies None

Example :FUNC:OFF “JITT:POS:PEAK:MAX”
positive peak jitter value is not to be determined.

Related commands [:SENS]:DATA:FIN? on page R-42
[:SENS]:FUNC[:ON] on page R-57
[:SENS]:FUNC:OFF:ALL on page R-56

[:SENS]:FUNC:OFF:ALL

[:SENSe]:FUNCtion:OFF:ALL deletes all result elements from the list of results to be determined.

Parameter None

Dependencies None

Comments There is no query for this command.

Example :FUNC:OFF:ALL deletes the entire list.

Related commands [:SENS]:DATA:FIN? on page R-42
[:SENS]:FUNC[:ON] on page R-57
[:SENS]:FUNC:OFF on page R-56

[:SENS]:FUNC[:ON]

[:SENSe]:FUNCtion[:ON] <id>{[, <id>]}* specifies the list of results to be determined.

Parameter

For the entire list of results, see Result IDs for :SENS:DATA and :SENS:FUNC commands on page R-58.

Name	Type	Range	Default
id	string	e.g. “JITT:PPE:MAX” for maximum peak-peak jitter value	no result selected

Dependencies

Only results previously activated with this command can be read by [:SENS]:DATA:FIN? or [:SENS]:DATA:ACT?
(except results continuously taken).

Comments

The list of results to be determined can be very long (parameters separated by a blank). The complete list does not have to be specified in a single command; several successive commands can be used.
The results can then be read with [:SENS]:DATA:FIN? on page R-42 or [:SENS]:DATA:ACT? on page R-41.

Example

:FUNC “JITT:NEG:PEAK:MAX”, “JITT:POS:PEAK:MAX”
positive and negative maximum jitter values are to be determined.

Related commands

[:SENS]:DATA:FIN? on page R-42
[:SENS]:DATA:ACT? on page R-41
[:SENS]:FUNC:OFF on page R-56
[:SENS]:FUNC:OFF:ALL on page R-56

[:SENS]:FUNC[:ON]?

[:SENSe]:FUNCtion[:ON]? provides the list of all interval end results that are currently selected.

Example

:FUNC?
Response: “JITT:NEG:PEAK:MAX”, “JITT:POS:PEAK:MAX”

Result IDs for :SENS:DATA and :SENS:FUNC commands

The result IDs listed below are used to identify results requested for the following commands:
[:SENS]:FUNC[:ON] on page R-57
[:SENS]:FUNC:OFF on page R-56
[:SENS]:DATA:FIN? on page R-42
[:SENS]:DATA:ACT? on page R-41

Note: The ID strings listed below show the ID names in a long form. This simplifies understanding of the command syntax.
The device only accepts SCPI **short form upper case (capital letter)** commands to speed up the response time of the device (e.g. “CSTATUS” is not accepted, use “CST” instead).
The SCPI short form is indicated by the capital letters in the commands below.

ID string	Response code	Response type	Response description	Unit
ATIMe	20	count[1]	Actual time of day in milliseconds since 1/1/1970	ms
ETIMe	21	count	Milliseconds since measurement start	ms
STIMe	22	count	Starting time of measurement in milliseconds since 1/1/1970	ms
CSTatus	40	bit field[1]	Current status of the signal as a bit field (Alarm bit field “CSTatus”/ “HSTatus” on page R-47)	none
HSTatus	45	bit field	History status of the signal as a bit field (Alarm bit field “CSTatus”/“HSTatus” on page R-47). This result provides all the alarms which were detected since the start of the last measurement.	none

1 These results are taken continuously and are not available using the [:SENS]:DATA:FIN? command.

Table R-6 Result IDs for general results

ID string	Response code	Response type	Response description	Unit
JITTer:POSitive:PEAK	50	count[1] (NR3)	Current positive peak jitter value. The value is set to a **negative** value if there is a range overflow.	UI (unit interval)
JITTer:POSitive:PEAK:MAXimum	51	count[2] (NR3)	Maximum positive jitter value during the current measurement. The value is set to a **negative** value if there is a range overflow.	UI (unit interval)
JITTer:NEGative:PEAK	52	count[1] (NR3)	Current negative peak jitter value The value is set to a **negative** value if there is a range overflow.	UI (unit interval)
JITTer:NEGative:PEAK:MAXimum	53	count[2] (NR3)	Maximum negative jitter value during the current measurement The value is set to a **negative** value if there is a range overflow.	UI (unit interval)
JITTer:PPEak	54	count[1] (NR3)	Current peak to peak jitter value The value is set to a **negative** value if there is a range overflow.	UI (unit interval)
JITTer:PPEak:MAXimum	55	count[2] (NR3)	Maximum peak to peak jitter value during the current measurement The value is set to a **negative** value if there is a range overflow.	UI (unit interval)
JITTer:POSitive:PHIT	56	count[2, 3] (NR3)	Number of transgressions (phase hits) of the lower limit set by [:SENS]:JITT:THR[:UPP] on page R-64.	UI (unit interval)
JITTer:NEGative:PHIT	57	count[2, 3] (NR3)	Number of transgressions (phase hits) of the lower limit set by [:SENS]:JITT:THR:LOW on page R-65.	UI (unit interval)
JITTer:RMS	58	count[1] (NR3)	Current jitter RMS value The value is set to a **negative** value if there is a range overflow. [:SENS]:JITT:RMS:INT:PER on page R-63 = Integration time The alarms “Jitter measurement positive/ negative overflow”, “LTI jitter” and “LOS” of Alarm bit field “CSTatus”/ “HSTatus” on page R-47 are only enabled if also the result ID “JITT:PPE”, or “JIT:POS/NEG:PEAK” is activated.	UI (unit interval)

1 These results are taken continuously and are not available using the [:SENS]:DATA:FIN? command.
2 A measurement must be initiated for valid results.
3 Note that the max. counter frequency for phase hit counting is limited. See jitter module specification for more details

Table R-7 Result IDs for jitter results

ID string	Response code	Response type	Response description	Unit
WANDer:TIE	100	count[2] (NR3)	Current wander time interval error[1]	s
WANDer:MTIE	101	count[2] (NR3)	Maximum wander time interval error during the current measurement[1]	s

1 For wander results firmware release 3.0 or later and option 90.67 or firmware release 7.0 or later and O.172 options 90.82, 90.84 and 90.86 are required.
2 A measurement must be initiated for valid results.

Table R-8 Result IDs for wander results

[:SENS]:JITT:FREQ

[:SENSe]:JITTer:FREQuency <value> sets the jitter measurement frequency of the receiver.

Parameter

Name	Type	Range	Default
value	numeric	10 - 5000000	1000

Dependencies Command requires firmware release **7.0** or later **and**
Jitter Rx **O.172 option 90.82** for up to **STM-1** and **90.84** for **STM-4**.

:SOUR:JITT:FREQ on page R-27 must have the **same** frequency (this is set automatically) but **< 10 Hz is not possible.**
Only valid if [:SENS]:JITT:MODE = **SEL**.

Comments All values in Hz.
IEEE 488.2 suffix units (HZ | KHZ | MHZ) are supported.

Example :JITT:FREQ 2 KHZ sets the jitter measurement frequency to 2000 Hz.

Related commands :SOUR:JITT:FREQ on page R-27
[:SENS]:JITT:MODE on page R-61

[:SENS]:JITT:FREQ?

provides the current setting of the jitter measurement frequency.

Example :JITT:FREQ?
Response: 1000 for 1000 Hz

[:SENS]:JITT:MODE

[:SENSe]:JITTer:MODE <mode> sets the jitter measurement mode of the receiver.

Parameter

Name	Type	Range	Default
mode	discrete	BROadband | **SELective**	BRO

Dependencies Command requires firmware release **7.0** or later **and**
SEL requires Jitter Rx **O.172 option 90.82** for up to **STM-1** and **90.84** for **STM-4** and is **only allowed** for the measuring ranges **1.6 | 20** (STM1) or **6.4 | 80** (STM4) of [:SENS]:JITT:RANG[:UPP] on page R-62.

Comments
BROadband: Broadband measurement
SELective: Selective measurement used for JTF (jitter transfer function)

Example :JITT:MODE SEL sets the jitter selective measurement mode.

Related commands
[:SENS]:JITT:FREQ on page R-60
[:SENS]:JITT:RANG[:UPP] on page R-62
:SOUR:JITT:FREQ on page R-27

[:SENS]:JITT:MODE?

provides the current setting of the jitter measurement mode.

Example
:JITT:MODE?
Response: SEL

[:SENS]:JITT:RANG[:UPP]

[:SENSe]:JITTer:RANGe[:UPPer] <range> determines the **peak to peak** jitter measurement range.

Parameter

Name	Type	Range	Default
range	numeric	2 | 20 (STM-1 or STM-4) **1.6 | 20 | 200** (STM-1) **6.4 | 80 | 800** (STM-4)	2 1.6

Dependencies

2 | 20 requires Jitter Rx option 90.65 for up to STM-1 and 90.66 for STM-4.

The following require firmware release **7.0** or later:
1.6 | 20 | 200 requires Jitter Rx **O.172 option 90.82** for up to **STM-1.**
6.4 | 80 | 800 requires Jitter Rx **O.172 option 90.84** for **STM-4.**

200 | 800 see [:SENS]:FILT[:LPAS]:FREQ on page R-54, and [:SENS]:FILT[:LPAS]:FREQ:AUTO on page R-55 = ON

Comments

All values in UI (Unit Interval).
A range overflow is indicated in the Alarm bit field “CSTatus”/ “HSTatus” on page R-47.

Example

:JITT:RANG 20 sets range to 20 UI.

Related commands

[:SENS]:FILT[:LPAS]:FREQ on page R-54
[:SENS]:JITT:FREQ on page R-60

[:SENS]:JITT:RANG[:UPP]?

provides the current setting of the jitter measurement range.

Example

:JITT:RANG?
Response: 20

[:SENS]:JITT:RMS:INT:PER

[:SENSe]:JITTer:RMS:INTegration:PERiod <time> determines the RMS jitter measurement integration time.

Parameter

Name	Type	Range	Default
time	numeric	1 | 2 | 5 | 10 | 20 | 40 | 80	1

Dependencies

Command requires firmware release **7.0** or later **and**
Jitter Rx **O.172 option 90.82** for signals up to **STM-1 and**
Jitter Rx **O.172 option 90.84** for **STM-4.**

In Start/Stop measurement mode, the measurement time [:SENS]:SWE:TIME must be set to a value **greater** than the RMS integration time.

Comments

All values in seconds.
Jitter RMS values are measured only if the corresponding result has been selected ([:SENS]:FUNC[:ON] “JITT:RMS”).

Example

:JITT:RMS:INT:PER 5 sets range to 5 s.

Related commands

[:SENS]:DATA:ACT? on page R-41
[:SENS]:FUNC[:ON] on page R-57 with ID-string “JITT:RMS“
[:SENS]:SWE:TIME on page R-67

[:SENS]:JITT:RMS:INT:PER?

provides the current setting of the RMS jitter measurement integration time.

Example

:JITT:RMS:INT:PER?
Response: 5

[:SENS]:JITT:THR[:UPP]

[:SENSe]:JITTer:THReshold[:UPPer] <range> determines the upper phase hit threshold.

Parameter

Name	Type	Range	Default
range	numeric	0.1 - 1.0 (STM-1 or STM-4) | 0.1 - 10.0 **0.1 - 0.8** (STM-1) | **0.1 - 10.0** | **0.1 - 100.0** **0.1 - 3.2** (STM-4) | **0.1 - 40.0** | **0.1 - 400.0**	0.5

Dependencies

0.1 - 1.0 and 0.1 - 10.0 require Jitter Rx option 90.65 for up to STM-1 and 90.66 for STM-4.

The following require firmware release **7.0** or later:
0.1 - 0.8 | 0.1 - 10.0 | 0.1 - 100.0 requires Jitter Rx **O.172 option 90.82** for up to **STM-1.**
0.1 - 3.2 | 0.1 - 40.0 | 0.1 - 400.0 requires Jitter Rx **O.172 option 90.84** for **STM-4.**

If [:SENS]:JITT:RANG[:UPP] = 2 the maximum value is limited to 1.0.
The other ranges are equivalent :JITT:RANG = 800 -> max :JITT:THR = 400.

If [:SENS]:JITT:RANG[:UPP] = 20 | 80, then [:SENS]:JITT:THR[:UPP] is set to 5.0.
If [:SENS]:JITT:RANG[:UPP] = 200 | 800, then [:SENS]:JITT:THR[:UPP] is 50.0.

Comments

All values in UI (Unit Interval).
This command sets the positive limit for phase hits.
Phase hits are measured only if the corresponding result has been selected (:SENS:FUNC:ON “JITT:POS:PHIT”).
A phase hit is counted whenever the **positive** jitter actually measured exceeds the limit set by this command.

Example

:JITT:THR:UPP 1.5 sets threshold to 1.5 UI.

Related commands

[:SENS]:JITT:THR:LOW on page R-65
[:SENS]:JITT:RANG[:UPP] on page R-62

[:SENS]:JITT:THR[:UPP]?

provides the current setting of the upper phase hit threshold.

Example

:JITT:THR:UPP?
Response: 0.25

[:SENS]:JITT:THR:LOW

[:SENSe]:JITTer:THReshold:LOWer <range> determines the lower phase hit threshold.

Parameter

Name	Type	Range	Default
range	numeric	0.1 - 1.0 (STM-1 or STM-4) | 0.1 - 10.0 **0.1 - 0.8** (STM-1) | **0.1 - 10.0** | **0.1 - 100.0** **0.1 - 3.2** (STM-4) | **0.1 - 40.0** | **0.1 - 400.0**	0.5

Dependencies

0.1 - 1.0 and 0.1 - 10.0 require Jitter Rx option 90.65 for up to **STM-1** and 90.66 for **STM-4**.

The following require firmware release **7.0** or later:
0.1 - 0.8 | 0.1 - 10.0 | 0.1 - 100.0 requires Jitter Rx **O.172 option 90.82** for up to **STM-1.**
0.1 - 3.2 | 0.1 - 40.0 | 0.1 - 400.0 requires Jitter Rx **O.172 option 90.84** for **STM-4.**

If [:SENS]:JITT:FREQ = 2 the maximum value is limited to 1.0.
The other ranges are equivalent :JITT:RANG = 800 -> max :JITT:THR:LOW = 400.

If [:SENS]:JITT:RANG[:UPP] = 20 | 80, then [:SENS]:JITT:THR:LOW is set to 5.0.
If [:SENS]:JITT:RANG[:UPP] = 200 | 800, then [:SENS]:JITT:THR:LOW is 50.0.

Comments

All values in UI (Unit Interval).
This command sets the negative limit for phase hits.
Phase hits are measured only if the corresponding result has been selected (:SENS:FUNC:ON “JITT:NEG:PHIT”).
A phase hit is counted whenever the **negative** jitter actually measured exceeds the limit set by this command.

Example

:JITT:THR:LOW 1.5 sets threshold to 1.5 UI.

Related commands

[:SENS]:JITT:THR[:UPP] on page R-64
[:SENS]:JITT:RANG[:UPP] on page R-62

[:SENS]:JITT:THR:LOW?

provides the current setting of the lower phase hit threshold.

Example

:JITT:THR:LOW?
Response: 0.25

[:SENS]:MODE

[:SENSe]:MODE <mode> determines the receiver measuring mode.

Parameter

Name	Type	Range	Default
range	discrete	JITTer | WANDer	JITT

Dependencies

This command requires firmware release 3.0 or later.
For wander measurements a reference clock on input port [35] or [34] and option 90.67 or **for O.172 90.82, 90.84 and 90.86** are required.

Note: For **options 90.67 or O.172 90.86:**
If [:SENS]:MODE = **WAND** and [:SENS]:DATA[:TEL]:RATE = **STM4** the command :OUTP:CLOC:DIV:STAT **ON** must be transmitted to the **Basic Module (Mainframe)**.

NOT for option 90.67 but for **O.172 90.86 only:**
If [:SENS]:MODE = **JITT** and [:SENS]:DATA[:TEL]:RATE = **STM4**, the command :OUTP:CLOC:DIV:STAT **ON** must also be transmitted to the **Basic Module (Mainframe)**.

Comments

The corresponding results (jitter or wander) can **only** be valid if this parameter is properly set.
The reference frequency of wander measurements is set by [:SENS]:WAND:RCL[:CLOC] on page R-68.

Example

:MODE JITT activates jitter mode.

Related commands

[:SENS]:WAND:RCL[:CLOC] on page R-68
[:SENS]:DATA:EVEN? on page R-43
[:SENS]:DATA:EVEN:NUMB? on page R-46
[:SENS]:JITT:MODE on page R-61

[:SENS]:MODE?

provides the current setting of the receiver measuring mode.

Example

:MODE?
Response: JITT

[:SENS]:SWE

[:SENSe]:SWEep commands determine the type and duration of the measurement to be performed. Measurements are started using the TRIGGER subsystem on page R-19 ff.

[:SENS]:SWE:TIME

[:SENSe]:SWEep:TIME <duration><suffix> determines the duration of a measurement.

Parameter

Name	Type	Range	Default
duration	numeric	1 - 99	1
suffix	discrete	[s] | min | hr | d	hr

Dependencies None

Comments
<suffix> = s seconds (default)
<suffix> = min minutes
<suffix> = hr hours
<suffix> = d days
Measurement intervals can range from 1 second to 99 days.

Example :SWE:TIME 1 d measurement interval of 1 day.

Related commands TRIGGER subsystem on page R-19 ff

[:SENS]:SWE:TIME?

[:SENSe]:SWEep:TIME? provides the current setting of the measurement duration in seconds.

Example
:SWE:TIME?
Response: 180 180 seconds measurement interval duration (= 3 minutes)

[:SENS]:WAND:RCL[:CLOC]

[:SENSe]:WANDer:RCLock[:CLOCk] <frequency> determines the frequency of the wander reference clock that must be connected to port [35].

Parameter

Name	Type	Range	Default
frequency	numeric	1544000 | 2048000 | 5000000 | 10000000	2048000

Dependencies

Only valid if [:SENS]:MODE = WAND.

The last optional node **:CLOCk** of [:SENSe]:WANDer:RClock**[:CLOCk]** requires firmware release **7.0** or later.

Comments

All values in Hz
IEEE 488.2 suffix units (HZ | KHZ | MAHZ | MHZ) are supported.

Example

:WAND:RCL 10 MHZ sets reference clock to 10 MHz.

Related commands

[:SENS]:MODE on page R-66

[:SENS]:WAND:RCL[:CLOC]?

provides the current setting of the wander reference clock frequency.

Example

:WAND:RCL:?
Response: 10000000 if set to 10 MHz.

[:SENS]:WAND:RCL:DATA

[:SENSe]:WANDer:RClock:DATA <bitrate> determines the wander reference clock bit rate which must be connected to the **balanced** port [34].

Parameter

Name	Type	Range	Default
frequency	numeric	1544000 | 2048000	2048000

Dependencies
Command requires firmware release **7.0** or later **and** Wander **O.172 option 90.86**.

Only valid if [:SENS]:MODE = WAND.

Comments
All values in Hz or bps
IEEE 488.2 suffix units (HZ | KHZ | MAHZ | MHZ) are supported.

Example
:WAND:RCL:DATA 2048 kHzsets reference bit rate to 2048 kHz.

Related commands
[:SENS]:MODE on page R-66, [:SENS]:WAND:RCL:MODE on page R-71, [:SENS]:WAND:RCL:INP on page R-70

[:SENS]:WAND:RCL:DATA?

provides the current setting of the wander reference clock bit rate.

Example
:WAND:RCL:DATA?
Response: 2048000 if set to 2048 kHz.

[:SENS]:WAND:RCL:INP

[:SENSe]:WANDer:RClock:INPut <type> determines the wander reference clock input port [35] or [34].

Parameter

Name	Type	Range	Default
type	discrete	UNBalanced | **BAL**anced	UNB

Dependencies

Command requires firmware release **7.0** or later **and** **BAL Wander option 90.86**.

Only valid if [:SENS]:MODE = WAND.

BAL is only allowed if [:SENS]:WAND:RCL:MODE = DATA **or** if [:SENS]:WAND:RCL:MODE = CLOC **and** [:SENS]:WAND:RCL[:CLOC] = 1544000 | 2048000.

BAL is set **automatically** if [:SENS]:WAND:RCL:MODE = DATA **and** [:SENS]:WAND:RCL[:CLOC] = 1544000.

Comments

UNBalanced is port [35], **BAL**anced is port [34].

Example

:WAND:RCL:INP BAL sets reference clock input port to balanced mode.

Related commands

[:SENS]:MODE on page R-66, [:SENS]:WAND:RCL[:CLOC] on page R-68
[:SENS]:WAND:RCL:DATA on page R-69,
[:SENS]:WAND:RCL:MODE on page R-71

[:SENS]:WAND:RCL:INP?

provides the current setting of the wander reference clock input port.

Example

:WAND:RCL:INP?
Response: BAL if set to balanced mode.

[:SENS]:WAND:RCL:MODE

[:SENSe]:WANDer:RClock:MODE <mode> determines the wander reference clock mode.

Parameter

Name	Type	Range	Default
mode	discrete	CLOCk | **DATA**	CLOC

Dependencies Command requires firmware release **7.0** or later **and** **DATA Wander option 90.86**.
Only valid if [:SENS]:MODE = WAND.

Example :WAND:RCL:MODE DATA sets reference clock mode to data.

Related commands
[:SENS]:MODE on page R-66
[:SENS]:WAND:RCL:DATA on page R-69
[:SENS]:WAND:RCL:INP on page R-70

[:SENS]:WAND:RCL:MODE?

provides the current setting of the wander reference clock mode.

Example :WAND:RCL:MODE?
Response: DATA if set to data.

[:SENS]:WAND:SAMP:RATE

[:SENSe]:WANDer:SAMPle:RATE <rate> determines the wander measurement sample rate and hence the number of result events per second.

Parameter

Name	Type	Range	Default
rate	numeric	1 **| 30 | 60 | 300**	1

Dependencies
Command requires firmware release **7.0** or later **and**
Wander **O.172 option 90.86 for 30 | 60 | 300**.
Only valid if [:SENS]:MODE = WAND.

Comments

Samples per second:	Low pass filter / Hz:
1	0.1
30	10
60	20
300	100

Example
:WAND:SAMP:RATE 30 sets sample rate to 30 samples per second.

Related commands
[:SENS]:DATA:EVEN? on page R-43
[:SENS]:FUNC[:ON] on page R-57

[:SENS]:WAND:SAMP:RATE?

provides the current setting of the wander measurement sample rate.

Example
:WAND:SAMP:RATE?
Response: 30 if set to 30 samples per second.