Agilent Technologies 8960 Series 10 E5515B Wireless Communications Test Set
Agilent Technologies E1960A GSM Mobile Test Application

Reference Manual

Test Application Revision A.03

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Revison G

http://www.agilent.com/find/8960support/

Agilent Technologies
Innovating the HP Way

Notice

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Legal Information

Manufacturer’s Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive, from 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB(A).

- Sound Pressure Lp < 70 dB(A).
- At Operator Position.
- Normal Operation.
- According to ISO 7779:1988/EN 27779:1991 (Type Test).

Herstellerbescheinigung

- Schalldruckpegel Lp < 70 dB(A).
- Diese Information steht im Zusammenhang mit den Anforderungen der Maschinenlärminformationsverordnung vom 18 Januar 1991.
- Am Arbeitsplatz.
- Normaler Betrieb.
- Nach ISO 7779:1988/EN 27779:1991 (Typprüfung).

Safety Considerations

GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

This product has been designed and tested in accordance with *IEC Publication 1010*, "Safety Requirements for Electronic Measuring Apparatus," and has been supplied in a safe condition. This instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

SAFETY EARTH GROUND

A uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set.

SAFETY SYMBOLS

Indicates instrument damage can occur if indicated operating limits are exceeded.

Indicates hazardous voltages.

Indicates earth (ground) terminal

WARNING **A WARNING note denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.**

CAUTION A CAUTION note denotes a hazard. It calls attention to an operation procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond an CAUTION note until the indicated conditions are fully understood and met.

WARNING **This product is a Safety Class I instrument (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.**

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an autotransformer (for voltage reduction), make sure the common terminal is connected to the earth terminal of the power source.

If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

No operator serviceable parts in this product. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

Servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the product from all voltage sources while it is being opened.

The power cord is connected to internal capacitors that my remain live for 5 seconds after disconnecting the plug from its power supply.

For Continued protection against fire hazard, replace the line fuse(s) only with 250 V fuse(s) or the same current rating and type (for example, normal blow or time delay). Do not use repaired fuses or short circuited fuseholders.

Always use the three-prong ac power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage.

This product is designed for use in Installation Category II and Pollution Degree 2 per *IEC 1010* and *IEC 664* respectively. FOR INDOOR USE ONLY.

This product has autoranging line voltage input, be sure the supply voltage is within the specified range.

To prevent electrical shock, disconnect instrument from mains (line) before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

Ventilation Requirements: When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4° C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

Product Markings

CE - the CE mark is a registered trademark of the European Community. A CE mark accompanied by a year indicated the year the design was proven.

CSA - the CSA mark is a registered trademark of the Canadian Standards Association.

CERTIFICATION

Agilent Technologies, Inc. certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members

WARRANTY

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Agilent Technologies, Inc. will at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Agilent. Buyer shall prepay shipping charges to Agilent and Agilent shall pay shipping charges, duties, and taxes for products returned to Agilent from another country.

Agilent warrants that its software and firmware designated by Agilent for use with an instrument will execute its programming instructions when properly installed on that instrument. Agilent does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. AGILENT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

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Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products. For any assistance, contact your nearest Agilent Technologies Sales and Service Office.

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	**Agilent Technologies Inc.**
Manufacturer's Address:	**24001 E. Mission Avenue** **Liberty Lake, Washington 99019-9599** **USA**

declares that the product

Product Name:	Agilent Technologies 8960 Series 10 Wireless Communications Test Set
Model Number:	Agilent Technologies E5515B
Product Options:	This declaration covers all options of the above product.

conforms to the following Product specifications:

Safety: IEC 1010-1:1990+A1+A2 / EN 61010-1:1993

EMC: CISPR 11:1990/EN 55011:1991- Group 1, Class A
EN 50082-1 : 1992
IEC 801-2:1991 - 4kV CD,8kV AD
IEC 801-3:1984 3V/m
IEC 801-4:1988 0.5 kV Sig. Lines, 1 kV Power Lines

Supplementary Information:

This product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC
and carries the CE-marking accordingly.

Spokane, Washington USA November 20,1998

Vince Roland
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Establishing an Active Link with the Mobile Station

Making a Base Station Originated Call

The process for making a base station originated call is to:

1. If necessary, configure the traffic channel parameters for the call assignment. See "CALL:TCHannel" on page 280.
2. If necessary, set the IMSI state. See "CALL:PAGing:IMSI" on page 262.

   Example 1.

   ```
   OUTPUT 714;"CALL:PAGING:IMSI ""01012345678901"""
   ```

   would set the paging IMSI to 01012345678901.

3. If necessary, set the repeat paging state. See "CALL:PAGing:REPeat[:STATe]" on page 263.

   Example 2.

   ```
   OUTPUT 714;"CALL:PAGING:REPEAT ON"
   ```

   would turn on repeat paging.

4. Configure the necessary call processing connect/disconnect synchronization conditions. See "Call Processing State Synchronization" on page 34.
5. Page the mobile station by sending the call originate command to the test set.

   Example 3.

   ```
   OUTPUT 714;"CALL:ORIGINATE"
   ```

   would start the process of making a base station originated call.

IMPORTANT To verify that the origination is successfully completed, see "Call Processing State Synchronization" on page 34

Making a Mobile Station Originated Call

The process for making a mobile station originated call is to:

1. If necessary, configure the necessary traffic channel parameters for the call assignment. See "CALL:TCHannel" on page 280.
2. Configure the necessary call processing connect/disconnect synchronization conditions. See "Call Processing State Synchronization" on page 34.
3. Initiate a call from the mobile station.

NOTE There is no facility in the test set to initiate a call from the mobile station. This must be accomplished manually or through a test bus built-in to the mobile station.

IMPORTANT To verify that the origination is successfully completed, see "Call Processing State Synchronization" on page 34

Operating Considerations

The test set must be in active cell operating mode. The correct frequency band must be selected.

Call Processing Event Synchronization

December 1, 1999

Description

Synchronizing the test set with an external controller ensures that neither device does something before it is supposed to, which can cause errors, or does something well after it could have, which wastes time.

The following table of call processing subsystem commands are overlapped (see "Sequential versus overlapped commands" on page 41).

Using the "Call Processing Subsystem Overlapped Command Synchronization Commands" on page 31, the user can query the test set to find out when an overlapped command operation is done (:DONE?, :OPC?), force the test set to not execute any more commands until an overlapped command operation has completed (:WAIT), or simply force an overlapped command to behave as a sequential command (:SEQ).

Pending Operation Flags

Associated with each overlapped command, the test set maintains a binary indicator known as a pending operation flag. A pending operation flag is set true when the operation started by the overlapped command is executing, and is set false when the operation is no longer executing.

NOTE In addition to the call processing subsystem overlapped commands, the test set also provides the measurement-related INITiate <measurement> overlapped commands. These commands, however, do not use the "Call Processing Subsystem Overlapped Command Synchronization Commands" on page 31. Refer to "Measurement Event Synchronization" on page 133

Call Processing Subsystem Overlapped Commands

Table 1 of 2

Call Processing Command	**Purpose Of Command**	**Pending Operation Flag (POF) is false when**
CALL:ORIGinate See “CALL:ORIGinate” on page 261.	Performs a base station call origination.	The call processing state leaves the Idle state (when the operating mode is active cell), or The test set has noted this parameter change (when the operating mode is test mode).
CALL:END See “CALL:END” on page 241.	Performs a base station call termination.	The call processing state reaches the Idle state (when the operating mode is active cell), or The test set has noted this parameter change (when the operating mode is test mode).
CALL[:CELL[1]]:BCHannel[:ARFCn][:SELected] See “CALL[:CELL]:BCHannel[:ARFCn][:SELected]” on page 229.	Sets the BCH ARFCN for currently selected broadcast band.	The downlink signal is transmitting on the new broadcast channel.
CALL[:CELL[1]]:BCHannel[:ARFCn]:<broadcast band> See “CALL:BCHannel” on page 229.	Sets the BCH ARFCN for a broadcast band not currently selected.	The test set has noted this parameter change.

Table 2 of 2

<table>
<tr><th>Call Processing Command</th><th>Purpose Of Command</th><th>Pending Operation Flag (POF) is false when</th></tr>
<tr><td>CALL:TCHannel[:ARFCn][:SELected]
See “CALL:TCHannel[:ARFCn][:SELected]” on page 281.</td><td>Sets the TCH ARFCN for currently selected traffic band.</td><td rowspan="6">At least one of the following conditions has been met for all occurrences of these call processing commands that have begun execution:
The channel assignment has been successfully completed (when a call is established), or
The test set has noted this parameter change (no call established), or
The test set has noted this parameter change (not currently selected band), or
An error message was generated.</td></tr>
<tr><td>CALL:TCHannel[:ARFCn]:<traffic band>
See “CALL:TCHannel” on page 280.</td><td>Sets the TCH ARFCN for a traffic band not currently selected.</td></tr>
<tr><td>CALL:TCHannel:TSLot
See “CALL:TCHannel:TSLot” on page 285.</td><td>Sets the TCH timeslot.</td></tr>
<tr><td>CALL:MS:TADVance
See “CALL:MS:TADVance” on page 256.</td><td>Sets the mobile station timing advance.</td></tr>
<tr><td>CALL:MS:TXLevel[:SELected]
See “CALL:MS:TXLevel[:SELected]” on page 256.</td><td>Sets the mobile station transmit level for currently selected band.</td></tr>
<tr><td>CALL:MS:TXLevel:<traffic band>.</td><td>Sets the mobile station transmit level for a traffic band not currently selected.</td></tr>
<tr><td>CALL:CONNected:ARM[:IMMediate]
See “CALL:CONNected:ARM[:IMMediate]” on page 234.</td><td>Arms the call control status change detector.</td><td>The call control status change detector has been disarmed.
See “Connected/Idle Query” on page 35.</td></tr>
</table>

Call Processing Subsystem Overlapped Command Synchronization Commands

Table 1 of 2

Command	Purpose Of Command	Example

:DONE?	Returns a 0 if the associated command's pending operation flag is true, or a 1 if it is false.	`10 OUTPUT 714;"CALL:TCH 65"`
		`20 OUTPUT 714;"SETUP:TXP:CONT OFF"`
		`30 OUTPUT 714;"SETUP:PFER:CONT OFF"`
		`40 REPEAT`
		`50 OUTPUT 714;"CALL:TCH:DONE?"`
		`60 ENTER 714;Process_done`
		`70 UNTIL Process_done`
		`80 OUTPUT 714;INIT:TXP;PFER"`
		`90 END`
		Commands the test set to perform a traffic channel handover and execute two setup commands. After the two setup commands have finished, the :DONE? command is used to find out if the handover is finished

:SEQuential	Forces an overlapped command to execute in a sequential manner. No subsequent commands will be executed until the pending operation flag for this operation is false.	`OUTPUT 714;"CALL:TCH:SEQ 65"` Commands the test set to perform a traffic channel handover and to not execute any more commands until the pending operation flag associated with the CALL:TCH command is false.

Table 2 of 2

Command	Purpose Of Command	Example

:WAIT	Forces the test set to wait until the associated command’s pending operation flag is false before executing any more commands.	`10 OUTPUT 714;”CALL:TCH 65”`
		`20 OUTPUT 714;”SETUP:TXP:CONT OFF”`
		`30 OUTPUT 714;”SETUP:PFER:CONT OFF”`
		`40 OUTPUT 714;”CALL:TCH:WAIT”`
		`50 OUTPUT 714;”INIT:TXP;PFER”`
		`60 END`
		Commands the test set to perform a traffic channel handover and execute two setup commands. After the two setup commands have finished, the :WAIT command is sent to prevent the test set from executing the INIT command until the handover is finished.

:OPComplete?	Places a 1 in the test set’s output queue when the associated command’s pending operation flag goes false. Controlling program hangs on this query until the 1 is retrieved.	`10 OUTPUT 714;”CALL:TCH 65”`
		`20 OUTPUT 714;”SETUP:TXP:CONT OFF”`
		`30 OUTPUT 714;”SETUP:PFER:CONT OFF”`
		`40 OUTPUT 714;”CALL:TCH:OPC?”`
		`50 ENTER 714;Op_complete`
		`60 OUTPUT 714;”INIT:TXP;PFER”`
		`70 END`
		Commands the test set to perform a traffic channel handover and execute two setup commands. After the two setup commands have finished, the :OPC? command is sent to hang program execution until a 1 is put in the test set’s output queue, satisfying the ENTER statement and allowing program execution to continue with the INIT command.

Operating Considerations

When using the “Call Processing Subsystem Overlapped Command Synchronization Commands” on page 31, check the conditions that set the operation’s pending operation flag false to avoid unexpected results. These conditions are found in the table of “Call Processing Subsystem Overlapped Commands” on page 29.

For example, when using the CALL:ORIGinate command, the event that sets the pending operation flag false is the test set transitioning from the idle state, not arriving at the connected state. In many cases, you will want to synchronize to call processing state transitions by querying the call processing state directly (see “Direct Query of Call Processing State” on page 35) or by querying the call processing state using status bits (see “STATus:OPERation:CALL:GSM Status Register” on page 37).

Related Topics

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“Call Processing State Synchronization” on page 34

****

Call Processing State Synchronization

Description

Synchronizing the test set with an external controller ensures that neither device does something before it is supposed to, which can cause errors, or does something well after it could have, which wastes time.

There are six possible call processing states that the test set can be in.

- "IDLE" - Idle
- "SREQ" - Setup Request
- "PROC" - Proceeding
- "ALER" - Alerting
- "CONN" - Connected
- "DISC" - Disconnecting

The call processing states are shown in the Active Cell Status: window at the bottom of the test set's display.

Methods for Synchronizing to Call Processing States

Direct query of call processing state:

- CALL:STATUS:STATE (See "Direct Query of Call Processing State" on page 35.)

Connected/idle query:

- CALL:CONNECTED:STATE (See "Connected/Idle Query" on page 35.)
- CALL:CONNECTED:ARM (See "Call State Change Detector" on page 36.)
- CALL:CONNECTED:TIMEOUT (See "Call State Change Detector Timeout" on page 36.)

Status operation:

- STATUS:OPERATION:CALL (See "STATus:OPERation:CALL:GSM Status Register" on page 37)

Direct Query of Call Processing State

The CALL:STATUS:STATE query returns the current call processing state, see “Description” on page 34. See “CALL:STATus[:STATe]?” on page 277 for more detail about this query.

Query returns one of the following:

- “IDLE”
- “SREQ”
- “PROC”
- “ALER”
- “CONN”
- “DISC”

The following command returns the current state of a call:

```
OUTPUT 714;"CALL:STATUS:STATE?"
ENTER 714;Inst_state$
```

Connected/Idle Query

This query will determine if a call is connected or disconnected by returning an integer value. See “CALL:CONNected[:STATe]?” on page 233 for more details about this query.

Query returns one of the following:

- 0 = idle
- 1 = connected

If the call is in the setup request, proceeding, alerting, or disconnecting state, this command will not return a value until the call status proceeds to either connected or idle. See “Call State Connected/Idle Query Program Example” on page 38.

```
OUTPUT 714;"CALL:CONNECTED:STATE?"
```

Call State Change Detector

The test set also has a feature called the change detector that works in conjunction with the "Connected/Idle Query" on page 35. Arming the CALL:CONNECTED query provides a way for the test set to know when the call state change process is done. See "CALL:CONNected:ARM[:IMMediate]" on page 234 for more details about this command.

The call state change detector becomes *disarmed* when any of the following conditions have been met:

- the call processing state has progressed to either connected or idle

  or...

- the attempt to connect or disconnect a call failed and one of the test set's protocol timers timed out (see "Fixed Timer Messages" on page 552)

  or...

- no call processing state transitions occurred within the time period specified by the timeout timer (see "Call State Change Detector Timeout" on page 36)

The following command arms the call state change detector, but does not cause any call processing function to start:

```
OUTPUT 714;"CALL:CONNECTED:ARM[:IMMEDIATE]" !Used for mobile station originated calls.
```

See "Call State Change Detector Program Example" on page 37.

These commands automatically arm the call state change detector, and start the base station originated call processing functions:

```
OUTPUT 714;"CALL:ORIGINATE" !Used for base station originated call connect.
```

```
OUTPUT 714;"CALL:END" !Used for base station originated call disconnect (idle).
```

Call State Change Detector Timeout

If a state transition does not occur, the user needs a way to control how long to wait for the change detector. The change detector is disarmed by the timeout timer (see "CALL:CONNected:TIMeout" on page 235). After a timeout, the connected/idle query will return a 1 for connected or a 0 for idle. The timeout timer is user settable, but the user setting is only applied during mobile station originated call processing operations. For base station originated call processing operations, the timeout timer is automatically set to 60 seconds by the test set. See "Call State Change Detector Program Example" on page 37.

STATus:OPERation:CALL:GSM Status Register

The STATus subsystem provides a status register group that allows the user to query call processing states. Call processing state synchronization can be performed using the bit transitions of STATUS:OPERATION:CALL:GSM to generate interrupts to the external controller. Refer to "STATus:OPERation:CALL:GSM Condition Register Bit Assignment" on page 437 for status bit definitions and GPIB command syntax. See "Call State STATus:OPERation:CALL:GSM Program Example" on page 39.

Call State Change Detector Program Example

Example 4. Using the Change Detector - Mobile Station Originated Call

The following example illustrates the use of the call state change detector and connected/idle query for a mobile station originated call. This program prompts the operator to make a call from the mobile station being tested. When the CALL:CONNECTED:ARM command is sent, it causes the reply from the CALL:CONNECTED:STATE? query to be held-off temporarily until the connected or idle state is reached. The timeout is provided for cases where an expected call state change does not happen, for instance if the user does not make the call when prompted by the program.

```
10    OUTPUT 714;"CALL:CONNECTED:TIMEOUT 10S" ! Sets the time out
20                                              ! time to 10 seconds.
30    OUTPUT 714;"CALL:CONNECTED:ARM" ! Arm the change detector.
40    DISP "Make a mobile station orginated call. Continue when done."
50    PAUSE
60    OUTPUT 714;"CALL:CONNECTED:STATE?" ! The connected/idle query.
70    ENTER 714;Call_connected
80    IF Call_connected=1 THEN
90      DISP "Call is connected."
100     WAIT 2
110   ELSE
120     DISP "Call is not connected."
130     WAIT 2
140   END IF
150   END
```

Call State Connected/Idle Query Program Example

Example 5. Using the Connected/Idle Query - Base Station Originated Call

The following example illustrates the use of the call state change detector and connected/idle query for a base station originated call. This code originates a call, then waits for the connected/idle query to return a result.

Note that this code does not include the CALL:CONNECTED:TIME (timeout timer) or the CALL:CONNECTED:ARM (change detector arm) commands. These commands are unnecessary since the change detector is armed automatically by the CALL:ORIGINATE command, and the timeout timer value is never applicable since a base station originated call guarantees a state change.

```
10    OUTPUT 714;”CALL:ORIGINATE” ! Begin the BS originated call.
20    OUTPUT 714;”CALL:CONNECTED:STATE?” ! The connect/idle query.
30    ENTER 714;Call_connected ! Program will hang here until state
40                             ! change or protocol timer expires.
50    !*************************************************************
60    ! If mobile is not set to auto-answer, answer the call.
70    !*************************************************************
80    IF NOT Call_connected THEN
90      DISP “CALL NOT CONNECTED.”
100   ELSE
110     DISP “CALL IS CONNECTED.”
120   END IF
130   END
```

Call State STATus:OPERation:CALL:GSM Program Example

Example 6. Generating a Service Request (SRQ) Interrupt - Dropped Call

The following example illustrates the use of the status subsystem to generate a service request when a call has been dropped.

```
10  OUTPUT 714;"STATUS:OPERATION:CALL:GSM:PTR 0;NTR 4" !Enable negative transition
20                                                !filter on connected bit.
30  OUTPUT 714;"STATUS:OPERATION:CALL:GSM:ENABLE 4" !Enable the CONNECTED bit to
40                                             !generate a summary message.
45  OUTPUT 714;"STATUS:OPERATION:CALL:ENABLE 4" !Enable the GSM summary bit.
50  OUTPUT 714;"STATUS:OPERATION:ENABLE 1024" !Enable the CALL summary bit to
60                                           !generate a summary message.
70  OUTPUT 714;"*SRE 128" !Enable the service request enable register to generate SRQ.
80  OUTPUT 714;"*CLS" !Clear all status data structures.
90  ON INTR 7,15 CALL Error_handler !Define interrupt-initiated branch with a
100                                 !priority of 15 (highest)
110 ENABLE INTR 7;2 !Enable interrupt on interface card 7 with a bit mask
120                 !(for interface's interrupt-enable register) of 2.
130 OUTPUT 714;"CALL:ORIGINATE" !Make base station originated call.
140 !********************************************************************************
150 !Instead of a "dummy" loop, controlling application could be performing setups,
160 !making measurements, etc.
170 !********************************************************************************
175 LOOP
180 WAIT .1
190 DISP "Press the END key on the mobile station handset"
200 OUTPUT 714;"STATUS:OPERATION:CALL:GSM:EVENT?" !Query the event register.
210 ENTER 714;Eve
220 PRINT "The event bit is ";Eve !Display the content of the event register.
230 END LOOP
240 END
250 SUB Error handler
260 DISP "Call Dropped"
270 Clear_interrupt=SPOLL(714) !Clear the RQS message in the status byte register.
280 OUTPUT 714;"*CLS" !Clear all status data structures.
290 STOP
300 SUBEND
```

Related Topics

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"Call Processing Event Synchronization" on page 28

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Test System Synchronization Overview

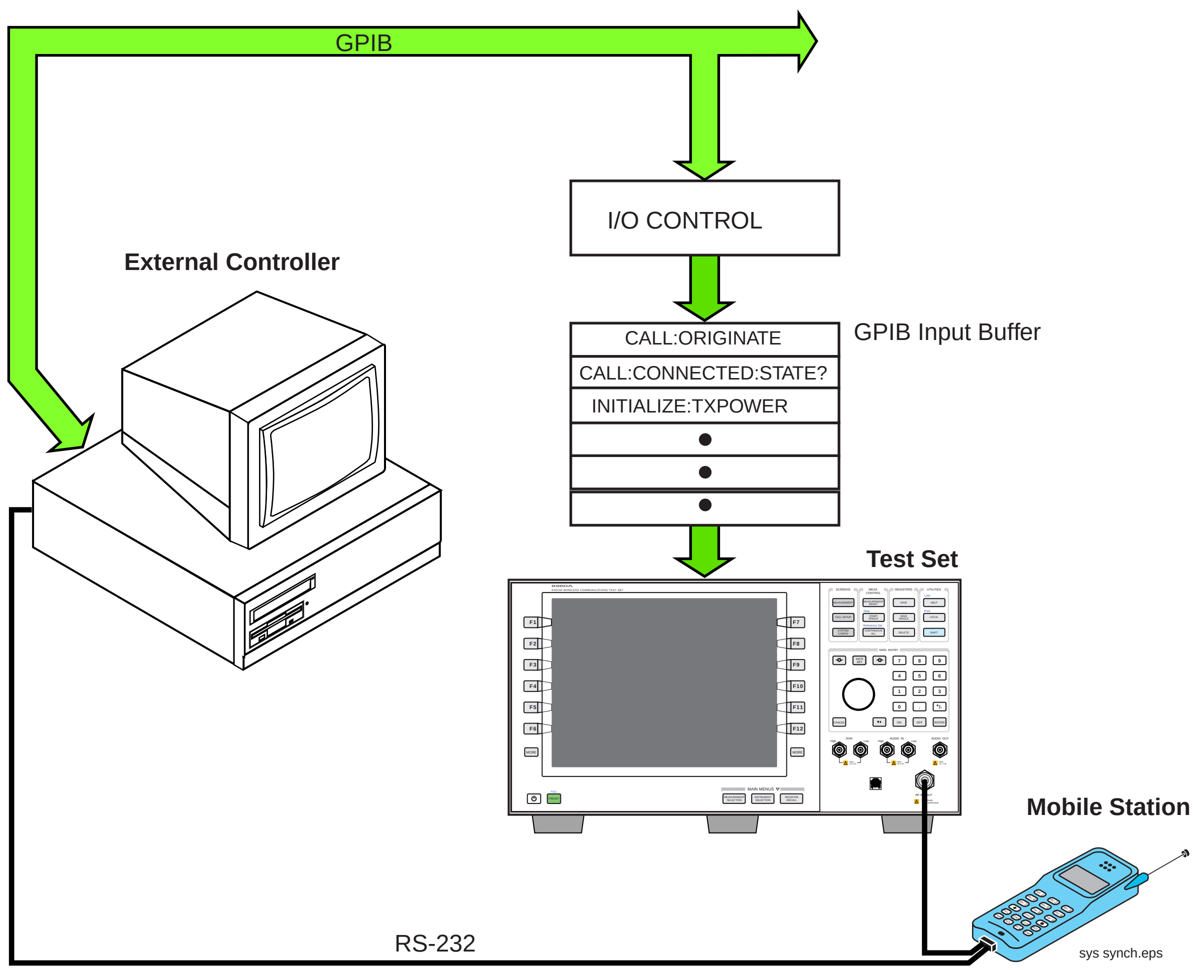
December 1, 1999

Description

Typical test systems include an external controller with a GPIB connection to the test set, an RF (and possible AF) connection between the test set and a mobile station under test, and a serial connection between the mobile station and the external controller (see "Test System" on page 40)

Synchronizing an external controller with the test set and a mobile station under test ensures that no device does something before it is supposed to, which can cause errors, or does something well after it could have, which wastes time.

Figure 1. Test System



Sequential versus overlapped commands

The test set uses both sequential and overlapped commands (see "Call Processing Subsystem Overlapped Commands" on page 29). Sequential commands are easiest to synchronize to because subsequent commands are not executed until the previous sequential command is finished. Once the test set has begun execution of an overlapped command, however, another command or commands may begin executing, allowing the test set to use its internal resources as efficiently as possible. Overlapped commands are more difficult to synchronize to because an overlapped operation that started several commands earlier may still be executing as subsequent commands are being parsed out from the input buffer and executed. This can present a problem unless the external controller is properly synchronized to the test set's execution of commands.

The test set's GPIB command set supports the following methods to achieve synchronization. In some cases, combinations of these methods will provide the best results:

Methods for synchronization

Methods one and two do not require the external controller to query the test set, nor to perform any branching or decision-making associated with information acquired from the test set.

1. Force the test set to execute overlapped commands sequentially.
2. Force the test set to wait until an overlapped command is done executing before executing any more commands.

Methods three through six rely on responses from the test set to an external controller, indicating that some event has occurred. The external controller can then make decisions based on these responses to control the flow of commands to the test set and other devices in the test system.

3. Query the test set to determine when a command has finished executing.
4. Query the test set to determine when all commands sent to it have at least begun executing.
5. Query the test set to determine the current call processing state.
6. Program the test set to generate a service request when an operation has completed or the test set is in a certain state

Commands used for synchronization:

- “CALL:STATus[:STATe]?” on page 277

  This command queries the test set’s current call processing state. This command supports synchronization method five. (See “Direct Query of Call Processing State” on page 35).

- “CALL:CONNected[:STATe]?” on page 233

  This command determines the connected/idle state of a call. A feature called the change detector provides the user with a way to hold off the response to this query until a call processing state transition has taken place. (See “Connected/Idle Query” on page 35). This command supports synchronization method five.

- :DONE? and :OPC?
  These specialized commands can be appended to call processing overlapped commands to support synchronization method three. (See “Call Processing Subsystem Overlapped Command Synchronization Commands” on page 31.)

- :WAIT
  This specialized command can be appended to call processing overlapped commands to support synchronization method two.
  (See “Call Processing Subsystem Overlapped Command Synchronization Commands” on page 31.)

- :SEQ
  This specialized command can be appended to call processing overlapped commands to support synchronization method one.
  (See “Call Processing Subsystem Overlapped Command Synchronization Commands” on page 31.)

- “INITiate:DONE?” on page 346
  This specialized command causes the test set to return a mnemonic indicating if a measurement is done. If not, the returned mnemonic will indicate if the measurement is still executing. This command supports synchronization method three.
  (See “INITiate:DONE?” on page 133.)

- STATUS:<register>
  Status bits in the “STATus:OPERation:CALL:GSM Condition Register Bit Assignment” on page 437 register are provided to indicate the test set’s call processing state. These bits support synchronization methods five and six.

  Status bits in the “STATus:OPERation:NMRReady:GSM Condition Register Bit Assignment” on page 440 register are provided to indicate when a measurement is ready to be fetched. These bits support synchronization method three and six.
  Many other status bits are provided in the GPIB status subsystem that are useful for synchronization. See“STATus Subsystem Description” on page 431.

- “SYSTem:SYNChronized” on page 474
  This specialized command puts a 1 in the test set’s output queue when the test set responds to the query by sending a 1 to the external controller, all prior sequential commands have completed and all prior overlapped commands have at least begun execution. This command supports synchronization method four.
- “SYSTem:SYNChronized” on page 474
  This specialized command causes a condition bit to be set then cleared when all prior sequential commands have completed and all prior overlapped commands have at least begun execution. (See “STATus:OPERation Condition Register Bit Assignment” on page 435). This command supports synchronization four and six.
- “*OPC” on page 476, “*OPC?” on page 476, and “*WAI” on page 477 (not recommended)

  Note: These commands look at all of the test set’s operations collectively. Because multiple processes are likely to be executing at the same time, it is recommended that the other commands above be used instead.

Related Topics

****

“Call Processing State Synchronization” on page 34

****

2 Measurements

Analog Audio Measurement Description

December 1, 1999

How is an analog audio measurement made?

Analog audio measurement response is measured from the mobile station's audio output, which also may be an acoustic coupler or electrical connection from the mobile station connected to the test set's AUDIO IN connector.

The expected voltage is the absolute peak audio input signal voltage at the front panel BNC. The expected voltage sets the analog audio clipping level and must be set. The expected voltage is peak voltage and the results are returned as rms, so a 1-volt rms input signal would need a 1.414 V_{peak} expected voltage value.

The trigger source for analog audio is always set to Immediate.

The test set has a tunable bandpass filter with a 100 Hz bandwidth that can be used to tune out ambient noise for making 217 Hz buzz or 8 kHz whine tests. The filter's range is from 200 Hz to 8.0 kHz.

The analog audio measurement returns the following measurement results:

- Audio Measurement Integrity Indicator
- Audio Measurement Result (0 V_{rms} to +20 V_{rms})
- Audio Multi-measurement Maximum (0 V_{rms} to +20 V_{rms}) when multi-measurement count is on.
- Audio Multi-measurement Minimum (0 V_{rms} to +20 V_{rms}) when multi-measurement count is on.
- Audio Multi-measurement Standard Deviation (0 V to +14.14214 V) when multi-measurement count is on.

None of the analog audio measurement results are affected by amplitude offset.

When making an audio measurement on a single port you should terminate the other audio port with either a 50 ohm load or a short. This improves the accuracy of the measurement by reducing sensitivity to stray signals at the unused port.

If noise is making your audio measurement difficult, use the 100 Hz bandwidth tunable band pass filter. This narrow band filter reduces the noise significantly. Refer to "SETup:AAUDio:FILTer[:SFRequency]" on page 373.

Trigger Source

Analog audio measurements are triggered immediately after being armed. Arming is not necessary if the trigger state is set to continuous.

Related Topics

****

"Programming an Analog Audio Measurement" on page 47

"Test Adherence to Standards" on page 112

****

Programming an Analog Audio Measurement

This section provides an example of how to make the analog audio (AAUDio) measurement via GPIB.

The following procedure assumes that an audio source is connected to the AUDIO IN connector. See "Analog Audio Measurement Description" on page 46.

1. Configure analog audio measurement parameters using the SETup subsystem.
2. Start the analog audio measurement using the INITiate subsystem.
3. Use the INITiate:DONE? command to find out if analog audio measurement results are available.
4. Use the FETCh? command to obtain analog audio measurement results.

Programming Example

```
10  OUTPUT 714;"SETUP:AAUDIO:CONTINUOUS OFF" !Configures the analog audio
20                                           !measurement to single trigger mode.
30  OUTPUT 714;"SETUP:AAUDIO:EXPECTED:VOLTAGE:PEAK 3" !Set the clipping level for
40                                                     !audio input.
50  OUTPUT 714;"SETUP:AAUDIO:FILTER:SFREQUENCY 8KHZ" !Specifies the tunable
60                                                  !bandpass filter frequency to
70                                                  !be 8 kHz and turns the filter
80                                                  !state ON.
90  OUTPUT 714;"INITIATE:AAUDIO"!Start the analog audio measurement.
100 REPEAT
110 OUTPUT 714;"INITIATE:DONE?"!Check to see if analog audio measurement is done.
120 ENTER 714;Meas_complete$
130 UNTIL Meas_complete$="AAUD"
140 OUTPUT 714;"FETCH:AAUDIO?"! Fetch analog audio measurement results.
150 ENTER 714;Integrity, Analog_audio
160 END
```

Returned Values

The measurements returned by this program are:

- `Integrity` returns the measurement "Integrity Indicator" on page 126 (0 means a successful measurement with no errors).
- `Analog_audio` returns the analog audio level in volts rms.

Related Topics

****

"Analog Audio Measurement Description" on page 46

"INITiate" on page 344

"SETup:AAUDio" on page 371

"FETCh:AAUDio" on page 290

"Comprehensive Program Example" on page 195

****

AAUDio Troubleshooting

Possible Setup Issues

During remote operation of the analog audio measurement the user should configure the trigger arm to single, see "SETup:AAUDio:CONTinuous" on page 372.

Failure to set trigger arm to single may result in the measurement never giving a result. When trigger arm is continuous the measurement rearms itself and starts another measurement cycle, during remote operation the fetch query may not be synchronized to the measurement cycle, see "Measurement States" on page 147.

The analog audio measurement results are rms values, the Expected Peak Audio Amplitude is a peak value.

Interpreting Integrity Indicator values

See "Integrity Indicator" on page 126.

If over range (5) is returned then the input level is greater than 3dB above the Expected Peak Audio Amplitude value or the maximum input level of 20 volts peak.

If under range (6) is returned then the input level is greater than 20dB below the Expected Peak Audio Amplitude value maximum value.

If the signal has both over range and under range conditions only the over range (5) will be indicated.

Bit Error Measurement Description

December 1, 1999

Bit Error Measurements versus Fast Bit Error Measurements

There are three commonly used types of bit error measurements in GSM:

- "BER with Frame Erasure" or "Residual BER" when the mobile station has been configured to loopback Type A.
- "BER without Frame Erasure" or "Non-residual BER" when the mobile station has been configured to loopback Type B.
- BER using burst-by-burst loopback when the mobile station has been configured to loopback Type C.

The test set allows the user to select between Loopback Type A or B, and the fast bit error measurement, which uses Loopback Type C. Refer also to "Fast Bit Error Measurement Description" on page 71.

NOTE If the test set has codeware version A.02.00 or above, unnecessary loopback commands and delays can be eliminated by taking advantage of enhancements available.

Previous versions of the test set required the user to set the loopback type, and did not have a feature that allowed time for the loop to close.

How is a bit error (BER) measurement made?

During BER measurements, the test set generates a downlink TCH with pseudo-random binary sequence, PRBS-15, data at a known level. The mobile station receives the data, loops it back to its transmitter, and returns the data to the test set. The test set compares data sent to data received, and BER is calculated.

SETup subsystem commands are sent to the test set to specify the time taken to close it's loopback path, whether to open or close a loop during downlink signaling operations (for example, channel assignment), the number of bits to test, measurement type, speech frames delay, measurements units, trigger arm, and measurement timeout values.

When a call is established on the TCH, the loopback type corresponding to one of the BER measurement types must be sent to the mobile station. The test set closes the loopback automatically and re-opens it when the measurement is closed (that is, when INITiate:BERRor is OFF).

The user must set the measurement type from one of the 6 measurement types available, (see "SETup:BERRor[:TYPE]" on page 379). If the user queries a residual result when a non-residual measurement is initiated, the test set returns 9.91 E+37 (NAN). Measurement type must be set before initiating a BER measurement. See "Measurements type" on page 51

The loop must be closed before a BER test can start, using the close loop signalling delay time feature allows time for the loop to close. See "SETup:BERRor:CLSDelay[:STIMe]" on page 378 for more details.

Each mobile station may have a different time delay between receiving a speech frame and re-sending it on the uplink. By default, the test set is configured to LDControl:AUTO:ON, and the amount of delay needed is determined automatically when the test set has, for two frames, correctly received 80% of the downlink bits back on the uplink. The test set can be queried for the speech frames delay value.

If necessary, the user may manually set the delay (see "SETup:BERRor:LDControl:AUTO" on page 380).

NOTE In case the test set is not able to correlate the data it transmits on the downlink with the data it receives on the uplink, a Measurement Timeout value should be set. If a timeout is not set and the test set is unable to correlate, the measurement will appear to "hang".

The BER measurement trigger source is always set to immediate. The BER measurement does not offer multi-measurement results. See "Statistical Measurement Results" on page 137

BER, FBER, and DAUDIO (uplink speech level) measurements are mutually exclusive measurements. Whichever of these measurements is activated last forces the others to become inactive.

Measurements type

Residual:

- Residual Type IA (50 bits per speech frame)
- Residual Type IB (132 bits per speech frame)
- Residual Type II (78 bits per speech frame)

Loopback Type A is sent to the mobile station when one of these residual measurement types is selected. A BER measurement with FE will return the frame erasure count or ratio results. The mobile station will indicate in the speech frame, if the downlink frame was received with CRC (cyclic redundancy check) errors the speech frames are erased. The mobile station sets all bits in the uplink speech frame to 0, indicating speech frames were erased.

Non-residual:

- Type IA (50 bits per speech frame)
- Type IB (132 bits per speech frame)
- Type II (78 bits per speech frame)

Loopback Type B is sent to the mobile station when one of these non-residual measurement types is selected. A BER measurement with CRC's (cyclic redundancy check) will return the CRC count or ratio results. The mobile station will not indicate if any speech frames in the downlink were erased.

BER measurement results

The results of a BER measurement can be displayed in two ways, (number of errors counted) or (the ratio bad bits (errors) to total bits counted). The manual user will need to select either Count or % from the Measurement Units field. For the remote user these results are available by using the FETCh command, see "FETCh:BERRor:COUNt[:BITS]?" on page 297 or "FETCh:BERRor:RATio[:BITS]?" on page 300. Alternatively the "FETCh:BERRor[:ALL]?" on page 296 or "FETCh:BERRor:FULL?" on page 299 can also be used to return the results.

Type A Residual Measurement Results

- Integrity Indicator
- Bit Error Ratio
- Bits Tested
- Bit Error Count
- Frame Erasure Ratio
- Frame Erasure Count

Type B Non-Residual Measurement Results

- Integrity Indicator
- Bit Error Ratio
- Bits Tested
- Bit Error Count
- CRC Ratio
- CRC Count

Related Topics

****

"Programming a Bit Error Measurement" on page 53

"Test Adherence to Standards" on page 112

"Fast Bit Error Measurement Description" on page 71

"Programming a Fast Bit Error Measurement" on page 74

"CALL:TCHannel:LOOPback" on page 285

"BERR Troubleshooting" on page 56

****

Programming a Bit Error Measurement

December 1, 1999

This section provides an example of how to make the bit error (BER) measurement via GPIB.

The following procedure assumes that an active link is established between the test set and the mobile station. See “Establishing an Active Link with the Mobile Station” on page 26.

1. Set the cell power to a good level.
2. Configure BER measurement parameters using the SETup subsystem.
3. Set the measurement type (either residual Type IA, Type IB, Type II, or non-residual Type IA, Type IB, Type II).
4. Set the cell power to a low level for BER measurement.
5. Use the INITiate command to begin a BER measurement.
6. Use the INITiate:DONE? command to find out if the BER measurement results are available.
7. Use the FETCh? command to obtain BER measurement results.
8. Set the cell power to a good level

Program Example

```
10    OUTPUT 714;"SETUP:BERROR:TIMEOUT:TIME 5" ! BER measurement times out after
20                                            ! 5 seconds.
30   OUTPUT 714;"CALL:CELL:POWER:AMPLITUDE -102 DBM" ! Sets the cell power level
40                                                    ! to a "low" level for the
50                                                    ! BER measurement.
60    OUTPUT 714;"SETUP:BERROR:CONTINUOUS OFF" ! Configures a BER measurement to
70                                              ! Single Trigger.
80    OUTPUT 714;"SETUP:BERROR:COUNT 10000" ! Sets the number of bits to measure
90                                           ! at 10,000.
100    OUTPUT 714;"SETUP:BERROR:CLSDELAY:STIME 500 MS" ! Sets the Close Loop Delay
110                                                     ! to 500 ms.
120   OUTPUT 714;"SETUP:BERROR:SLCONTROL ON" ! Sets the Signal Loop Control state to on.
130   OUTPUT 714;"SETUP:BERROR:TYPE TYPEIA" ! Sets the Measurement Type to IA.
140   OUTPUT 714;"SETUP:BERROR:LDCONTROL:AUTO OFF" ! Configure loopback delay
150                                                ! control to manual.
160   OUTPUT 714;"SETUP:BERROR:MANUAL:DELAY 6" ! Set frame delay to 6 frames in order
170                                            ! to correlate uplink and downlink bits.
180   OUTPUT 714;"INITIATE:BERROR"  ! Start a BER measurement.
190   REPEAT
200     OUTPUT 714;"INITIATE:DONE?"
210     ENTER 714;Meas_comp$
220     PRINT Meas_comp$
230   UNTIL Meas_comp$="BERR"
240   OUTPUT 714;"FETCH:BERROR?" ! BERR results.
250   ENTER 714;Integrity,Bits_tested,Bit_err_ratio,Bit_err_count
260   OUTPUT 714;"FETCH:BERROR:COUNT:CRC?" ! Query CRC Count results.
270   ENTER 714;Crc_count
280   OUTPUT 714;"CALL:CELL:POWER:AMPLITUDE -85 DBM" ! Sets the cell power level
290                                                   ! to a good level.
300   END
```

Alternatively, you could use the "FETCh:BERRor:FULL?" query to return the same results but for all bit types simultaneously.

Returned values

The measurements returned by this program are:

- Integrity Indicator returns the "Integrity Indicator" on page 126 (0 means a successful measurement with no errors).
- Bits_tested returns the number of bits tested.
- Bit_err_ratio returns the ratio of bit errors to total bits tested.
- Bit_err_count returns the number of bit errors.
- Crc_count returns the CRC count (cyclic redundancy check).

Related Topics

****

"Bit Error Measurement Description" on page 50

"SETup:BERRor" on page 376

"INITiate" on page 344

"FETCh:BERRor" on page 294

"Comprehensive Program Example" on page 195

"BERR Troubleshooting" on page 56

****

BERR Troubleshooting

December 1, 1999

Possible Setup Issues

During remote operation of the bit error measurement the user should configure the trigger arm to single, see “SETup:BERRor:CONTinuous” on page 379.

Failure to set trigger arm to single may result in the measurement never giving a result. When trigger arm is continuous the measurement rearms itself and starts another measurement cycle, during remote operation the fetch query may not be synchronized to the measurement cycle, see “Measurement States” on page 147.

If you have a BER measurement active and your mobile drops the call it may be that you have the “SETup:BERRor:SLControl” on page 381 command set to OFF. This is likely to occur with mobiles that do not respond to downlink signalling when loopback is closed. To solve this problem set the command to ON.

Interpreting Integrity Indicator values

See “Integrity Indicator” on page 126.

Decoded Audio Measurement Description

June 2, 1999

How is a decoded audio (DAUDIO) measurement made?

This measurement is also known as decoded audio or uplink speech level measurement. The DAUDIO measurement tests the ability of the mobile station to encode an audio signal onto the uplink traffic channel.

1. The audio signal originates from the test set's AUDIO OUT connector. The audio signal is connected to the mobile station (MS) by means of an audio frequency input connector, or acoustically through a speaker placed near the microphone of the mobile station. See "AFGenerator" on page 214 for set up commands for the test set's audio generator.
2. The mobile station digitizes and encodes the audio signal that is transmitted on the uplink TCH.
3. The uplink TCH is decoded with a bit accurate GSM RPE-LTP decoder to yield a block of 13-bit PCM samples within the DSP. As described in ETSI GSM 06.10.

NOTE The MS needs to be stimulated with a pulsed audio signal during a DAUDIO measurement. The audio signal must be pulsed at a 10 Hz rate with 50% duty cycle. See "AFGenerator:PULSe[:STATe]" on page 215.

The decoded audio measurement returns the rms value, in percent of full scale, of the speech signal present on the uplink (encoded) audio signal over a 100 ms (10 Hz) period of time.

The DAUDIO measurement performs an rms level measurement of a speech signal on the uplink TCH with optional bandpass filtering. Speech data can be filtered using a tunable 100 Hz bandpass filter prior to analysis. The center frequency of the 100 Hz bandpass filter may be tuned from 200 Hz to 3.6 kHz. Setting the frequency will activate the filter.

The trigger source for a DAUDIO measurement is always set to Immediate.

The DAUDIO measurement, BER and Fast BER measurements are mutually exclusive. Whichever of these measurements is activated last forces the other to become inactive.

Single or Multi-Measurements

The DAUDIO measurement can return single or averaged measurements defined by the multi-measurement count. A single measurement (multi-measurement count off) returns an estimate of the rms value of the decoded speech signal after removal of any dc component. The measurement units are in percent of full scale (%FS), ranging from 0 to 100%. Values greater than 70.70% may only result from non-sinusoidal signals. Multiple measurements (multi-measurement count >1) provide average, minimum, maximum, and standard deviation results. An integrity indicator is returned for both multi-measurement states. None of the results are affected by amplitude offset.

Trigger Source

DAUDIO measurement does not support any trigger source other than immediate.

Related Topics

****

“Programming a Decoded Audio Measurement” on page 59

“Test Adherence to Standards” on page 112

****

Programming a Decoded Audio Measurement

June 2, 1999

This section provides an example of how to make a Decoded Audio (DAUDio) measurement. The following procedure assumes that an active link is established between the test set and the mobile station. See "Establishing an Active Link with the Mobile Station" on page 26.

1. Configure decoded audio measurement parameters using the SETup subsystem.
2. Setup the audio source to stimulate the MS with a pulsed audio signal.
3. Start the decoded audio measurement using the INITiate subsystem.
4. Use the INITiate:DONE? command to find out if decoded audio measurement results are available.
5. Use the FETCh? command to obtain decoded audio measurement results.

Programming Example

```
10     OUTPUT 714;"SETUP:DAUDIO:CONTINUOUS OFF"         ! Configures the decoded audio
20                                                      ! measurement to single trigger mode.
30     OUTPUT 714;"AFGENERATOR:PULSE:STATE ON"          ! Audio signal must be pulsed.
40     OUTPUT 714;"AFGENERATOR:VOLTAGE:SAMPLITUDE 100MV"
50     OUTPUT 714;"AFGENERATOR:FREQUENCY 2.1KHZ"
60     OUTPUT 714;"SETUP:DAUDIO:FILTER:SFREQUENCY 2.1KHZ"! Specifies the tunable
70                                                       ! bandpass filter frequency
80                                                       ! and set the filter state to on.
90     OUTPUT 714;"INITIATE:DAUDIO"
100    REPEAT
110      OUTPUT 714;"INITIATE:DONE?"                     ! Check to see if measurement done.
120      ENTER 714;Meas_complete$
130    UNTIL Meas_complete$="DAUD"
140    OUTPUT 714;"FETCH:DAUDIO?"                        ! Fetch the decoded audio results.
150    ENTER 714;Ingerity,Decoded_audio
160    END
```

Returned Values

The measurements returned by this program are:

- `Integrity` returns the measurement "Integrity Indicator" on page 126 (0 means a successful measurement with no errors).
- `Decoded_audio` returns the decoded audio measurement results in percent (%).

Related Topics

****

"Decoded Audio Measurement Description" on page 57

"SETup:DAUDio" on page 390

"INITiate" on page 344

"FETCh:DAUDio" on page 302

"Comprehensive Program Example" on page 195

****

Decoded Audio (DAUDio) Troubleshooting

December 1, 1999

Possible Setup Issues

During remote operation of the analog audio measurement the user should configure the trigger arm to single, see “SETup:DAUDio:CONTinuous” on page 391.

Failure to set trigger arm to single may result in the measurement never giving a result. When trigger arm is continuous the measurement rearms itself and starts another measurement cycle, during remote operation the fetch query may not be synchronized to the measurement cycle, see “Measurement States” on page 147.

The audio signal expected by the DAUDio measurement is, pulsed at a 10 Hz rate and has a 50% duty cycle. The device under test should have echo cancellation disabled.

The signal measured is whatever is coming back in the speech frames, this includes any electrical or acoustical coupling from the downlink signal, earpiece or any noise coupled from the microphone of the MS.

Interpreting Integrity Indicator values

See “Integrity Indicator” on page 126.

If PCM Full Scale Warning (14) is returned the measurement is accurate, however the user may want to reduce the signal level applied to the test set to achieve an integrity indicator of zero.

If the DAUDio measurement is active when the channel mode is set to EFRSpeech (see “CALL:TCHannel:CMODe” on page 284), Questionable Result Due To Channel Mode (16) is returned. This is because the DAUDio measurement is not supported in this channel mode.

Dynamic Power Measurement Description

How is a Dynamic Power Measurement Made?

The Dynamic Power measurement performs a series of rapid power measurements on a mobile station returning a power measurement and an integrity value for each burst measured. Dynamic Power is only available via the test set's remote user interface.

Dynamic Power is not an ETSI specified measurement.

The signal is measured at the RF IN/OUT port.

Single or Multi Measurements

The Dynamic Power measurement does not use the multi-measurement state parameter. Instead, you specify the number of bursts that you want to measure using the Number of Bursts parameter (see "SETup:DPOWer:COUNt:NUMBer" on page 397).

Types of Signals Dynamic Power can Measure

Dynamic Power measurements can be made on these types of input signals:

- Normal GSM TCH burst with mobile station in active cell mode.
- Normal GSM TCH burst with mobile station in test mode (no protocol).

Input Signal Requirements

The Dynamic Power measurement will complete and meet its measurement accuracy specifications when the signal meets the following input signal conditions.

- Input signal level is between -20 dBm and +43 dBm.
- Input signal level is within +3 dB and -3 dB of the expected input level.
- Input signal is within 100 kHz of the measurement frequency.
- The measurement frequency is within the currently selected band.

Trigger Source

The only trigger source that the Dynamic Power measurement supports is RF Rise.

Related Topics

****

"SETup:DPOWer" on page 396

"FETCh:DPOWer" on page 306

"Test Adherence to Standards" on page 112

****

I/Q Tuning Measurement Description

How is an I/Q Tuning Measurement Made?

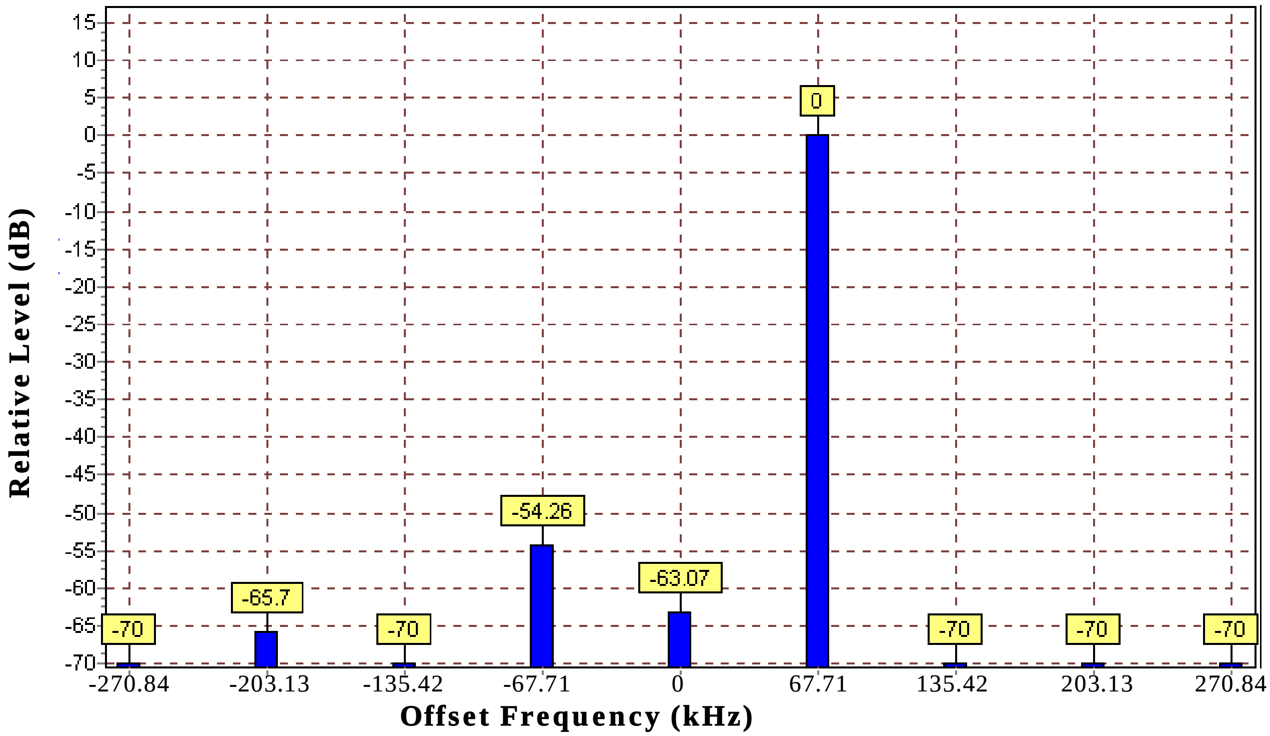
The I/Q Tuning measurement is used in the production process (normally at mobile pre-test) where the I/Q modulator of the mobile is being calibrated. The measurement is normally performed with the mobile station in test mode and transmitting a GMSK modulated sequence of all 0s or all 1s. The mobile can be transmitting either a bursted signal or a continuous wave signal. I/Q Tuning is not an ETSI specified measurement.

The carrier frequency is shifted up or down 67.7083 kHz by transmitting a sequence of all 0s (+67.7083 kHz) or all 1s (-67.7083 kHz). The accuracy of the mobile's I/Q modulator is determined by measuring the level of spurious signals relative to the desired signal (the desired signal being the carrier frequency ±67.7083 kHz). The signals the test set measures are: the carrier frequency (Fc); Fc±67.7083 kHz; Fc±135.417 kHz; Fc±203.125 kHz and Fc±270.833 kHz. These signals are measured at the RF IN/OUT port.

The figure below shows a typical spectrum generated by a mobile transmitting a sequence of all 0s. The peak at the +67.7083 kHz offset is the one used as the reference.

The I/Q Tuning measurement also allows you to make an additional relative power measurement at any frequency you want between -13.0 MHz to -1.0 MHz and +1.0 MHz to +13.0 MHz relative to the carrier frequency.

Figure 2. Spectrum of a mobile transmitting a sequence of all 0s



Single or Multi Measurements

The I/Q Tuning measurement can return either single or averaged measurement results.

- If you set the multi-measurement state OFF then only a single measurement is made at each offset.
- If you set the multi-measurement state ON, and the multi-measurement count number to a value greater than one, then multiple measurements are made at each offset. The returned results are an average of these measurements.

Types of Signals I/Q Tuning can Measure

I/Q Tuning measurements can be made on these types of input signals.

- Normal GSM TCH burst without a midamble.
- CW signal.

I/Q Tuning Input Signal Requirements

The I/Q Tuning measurement will complete and meet its measurement accuracy specifications under the following input signal conditions.

- Input signal level is between -15 dBm and +43 dBm.
- Input signal level is within +3 dB and -10 dB of the expected input level.
- Signal must be within 500 kHz of expected frequency for RF Rise triggering to function.

Trigger Source

The trigger source depends on the type of input signal.

Recommended Trigger Source Settings

Input Signal Type	Recommended Trigger Source
Normal GSM TCH burst without a midamble	RF Rise
CW signal	Immediate

Related Topics

****

“Programming an I/Q Tuning Measurement” on page 67

“Test Adherence to Standards” on page 112

****

Programming an I/Q Tuning Measurement

This section provides an example of how to make an I/Q Tuning measurement via the GPIB.

1. Ensure that the mobile is in test mode and is transmitting all 1s or all 0s.
2. Ensure that the expected frequency, expected power level and trigger are appropriately set.
3. Configure the I/Q Tuning measurement parameters using the SETup subsystem.
4. Start the I/Q Tuning measurement using the INITiate subsystem.
5. Use the INITiate:DONE? command to determine if I/Q Tuning measurement results are available.
6. Use the FETCh? command to obtain I/Q Tuning measurement results.

Program Example

The following program shows how to make an I/Q Tuning measurement on a normal GSM TCH burst. If you want to test a CW signal all you need to change in this program is the trigger type, which should be set to Immediate, rather than RF Rise.

```
10     PRINT “Ensure your mobile is transmitting:” !On-screen prompts.
20     PRINT “-all 1s or all 0s.”
30     PRINT “-on ARFCN 30.”
40     PRINT “-a power level of 10 dBm.”
50     PRINT “                         ”
60     PRINT “Press any key to continue.”
70     LOOP
80       ON KBD GOTO Key_exit
90     END LOOP
100 Key_exit: !
110    OUTPUT 714;”RFANALYZER:MANUAL:CHANNEL:SELECTED 30” !Configures the
120                       !test set to expect a transmission on ARFCN 30.
130    OUTPUT 714;”RFANALYZER:EXPECTED:POWER:SELECTED 10 DBM” !Configures
140                      !the test set to expect a power level of 10 dBm.
150    OUTPUT 714;”SETUP:IQTUNING:CONTINUOUS OFF”  !Configures trigger
160                        !mode to single for an I/Q Tuning measurement.
170    OUTPUT 714;”SETUP:IQTUNING:COUNT:SNUMBER 50”  !Configures the
180    OUTPUT 714;”SETUP:IQTUNING:SPUR:STATE ON”  !Configures spur on.
190    OUTPUT 714;”SETUP:IQTUNING:SPUR:FREQUENCY 10MHZ” !Configures a
200    !power measurement at 10MHz from the carrier.
210    !multi_measurement state to ON with a measurement count value
220    !of 50.
230    OUTPUT 714;”SETUP:IQTUNING:TRIGGER:SOURCE RISE” !Configures the
240                                            !trigger source to RF RISE.
250    OUTPUT 714;”SETUP:IQTUNING:REFERENCE:FREQUENCY AUTO” !Sets the
260    !set to choose which offset frequency is to be used as the ref.
270    OUTPUT 714;”INITIATE:IQTUNING” !Start I/Q Tuning measurement.
280    REPEAT
290      OUTPUT 714;”INITIATE:DONE?”!Check to see if I/Q Tuning
300      !measurement complete.
310      ENTER 714;Meas_complete$
```

```
320   UNTIL Meas_complete$=”IQT”
330   OUTPUT 714;”FETCH:IQTUNING:ALL?”!Fetches the measurement integrity
340   !value and the relative power levels at the offset frequencies.
350   ENTER 714;Integrity,N270,N203,N135,N67,Carrier,P67,P135,P203,P270,Sr
360   PRINT “I/Q Tuning Measurement Results”
370   PRINT “Integrity = “;Integrity
380   PRINT “Spur Power = “;Sr
390   PRINT “Offset (kHz)       Level (dB)”
400   PRINT “------------       ----------”
410   PRINT “-270.334          “;N270
420   PRINT “-203.125          “;N203
430   PRINT “-135.417          “;N135
440   PRINT “-67.708           “;N67
450   PRINT “0.000             “;Carrier
460   PRINT “+67.708           “;P67
470   PRINT “+135.417          “;P135
480   PRINT “+203.125          “;P203
490   PRINT “+270.334          “;P270
500   END
```

Returned Values

The measurements returned by this program are:

- Integrity returns the measurement "Integrity Indicator" on page 126 (0 means a successful measurement with no errors).
- The signal level of the following offsets are measured relative to the signal level at the reference offset (either Fc + 67.7083 kHz for all 0s or Fc -67.7083 kHz for all 1s). Note, if the TX I/Q Tuning measurement multi-measurement command is set to ON the average of all the individual results at each offset are returned.

  — -270.833 kHz

  — -203.125 kHz

  — -135.417 kHz

  — -67.7083 kHz

  — Carrier Frequency

  — +67.7083 kHz

  — +135.417 kHz

  — +203.125 kHz

  — +270.833 kHz

Related Topics

****

"I/Q Tuning Measurement Description" on page 65

"SETup:IQTuning" on page 400

"INITiate" on page 344

"FETCh:IQTuning" on page 311

****

I/Q Tuning Troubleshooting

Possible Setup Issues

On most occasions the test set will be able to select the correct reference frequency when "SETup:IQTuning:REFerence[:FREQuency]" is set to AUTO. However, if the I/Q Modulator is very badly calibrated, it is possible that the test set selects the wrong offset. This could be confirmed by using the "SETup:IQTuning:REFerence[:FREQuency]" query.

If your measurement results are invalid or look as if they are centered around the wrong frequency it may be that the carrier frequency is not correctly specified. You must input the carrier frequency into the test set. Invalid measurements may be also be caused by modulation data other than all 1s or all 0s, for example, it may be that a midamble is being transmitted.

Interpreting Integrity Indicator Values

See "Integrity Indicator" on page 126.

Fast Bit Error Measurement Description

July 8, 1999

Bit Error Measurements vs. Fast Bit Error Measurements

There are three commonly used types of bit error measurements in GSM:

- "BER with Frame Erasure" or "Residual BER" when the mobile station has been configured to loopback Type A.
- "BER without Frame Erasure" or "Non-residual BER" when the mobile station has been configured to loopback Type B.
- BER using burst-by-burst loopback when the MS has been configured to loopback Type C.

The test set allows the user to select between Loopback Type A or B, and the Fast Bit Error Measurement, which uses Loopback Type C. Refer also to "Bit Error Measurement Description" on page 50.

NOTE If the test set has codeware version A.02.00 or above, unnecessary loopback commands and delays can be eliminated by taking advantage of enhancements available.

Previous versions of the test set required the user to set the loopback type, and did not have a feature that allowed time for the loop to close.

How is a fast bit error (FBER) measurement made?

During FBER measurements, the test set generates a downlink TCH with (Pseudo Random Binary Sequence) PRBS-15 data at a known low level. The mobile station receives the data, loops it back to its transmitter, and returns the data to the test set. The test set compares data sent to data received, and FBER is calculated. see "CALL:TCHannel" on page 280

SETup subsystem commands are sent to the test set to specify close loop delay, signal loopback control, the number of bits to test, TDMA frames delay, measurement unit, trigger arm, and measurement timeout values.

When a call is established on the TCH, the loopback type is sent to the mobile station if the signal loopback control is on, see "SETup:FBERror:SLControl" on page 387. If the user sets signal loopback control to off, the loopback type is controlled using "CALL:TCHannel:LOOPback" on page 285, manually the Mobile Loopback F12 key provides user access.

FBER measurements use MS burst-by-burst loopback, referred to as loopback type C. In loopback type C the comparison is made between the 114 bits of data sent from the test set to the MS, then looped back and received by the test set.

The loop must be closed before a FBER test can start, using the close loop signalling delay time feature allows time for the loop to close. See "SETup:FBERror:CLSDelay[:STIMe]" on page 384 for more details.

Each MS may have a different delay between receiving a TDMA frame and re-sending it on the uplink. By default, the test set is configured to LDControl:AUTO:ON, and the amount of delay needed is determined automatically when the test set has, for two frames, correctly received 80% of the downlink bits back on the uplink. The test set can be queried for the TDMA frames delay value.

If necessary, the user may manually set the delay. See "SETup:FBERror:LDControl:AUTO" on page 386 or "SETup:FBERror:MANual:DELay" on page 387

NOTE In case the test set is not able to correlate the data it transmits on the downlink with the data it receives on the uplink, a Measurement Timeout value should be set. If a timeout is not set and the test set is unable to correlate, the measurement will appear to “hang”.

The FBER, BERR and the DAUDIO (uplink speech level) measurements are mutually exclusive, that is which ever of these measurements is activated last forces the other to become inactive. see “Decoded Audio Measurement Description” on page 57

FBER measurement trigger source is always set to immediate. The FBER measurement does not offer multi-measurement results. see “Statistical Measurement Results” on page 137

FBER measurement results

These the measurement results available from an FBER measurement.

The results of a FBER measurement can be displayed in two ways, (number of errors counted) or (the ratio bad bits (errors) to total bits counted). For the remote user these results are available by using the FETCh command, see “FETCh:FBERror:COUNt?” on page 309 or “FETCh:FBERror:RATio?” on page 310. The manual user will need to select either Count or % from the Measurement Units field.

Manual user results:

- Fast BER Ratio (bad bits to total bits tested)
- Fast BER Count (bad bits found during a measurement)
- TDMA frame Delay (if TDMA Frame Loopback Delay Control = Manual)
- RX Level
- RX Quality

Remote user results:

- Fast BER Ratio (bad bits to total bits tested)
- Fast BER Count (bad bits found during a measurement)
- TDMA Frame Delay (if TDMA Frame Loopback Delay Control = Manual)
- Integrity Indicator
- Intermediate Count

Related Topics

****

"Programming a Fast Bit Error Measurement" on page 74

"Test Adherence to Standards" on page 112

"Bit Error Measurement Description" on page 50

"Programming a Bit Error Measurement" on page 53

"CALL:TCHannel:LOOPback" on page 285

****

Programming a Fast Bit Error Measurement

This section provides an example of how to make the fast bit error (FBER) measurement via GPIB.

The following procedure assumes that an active link is established between the test set and the mobile station. See “Establishing an Active Link with the Mobile Station” on page 26.

1. Set the cell power to a good level.
2. Configure FBER measurement parameters using the SETup subsystem.
3. Set the cell power to a low level for a FBER measurement.
4. Start the FBER measurement using the INITiate subsystem.
5. Use the INITiate:DONE? command to find out if the FBER measurement results are available.
6. Use the FETCh? command to obtain FBER measurement results.
7. Set the cell power to a good level.

Program Example

```
10     OUTPUT 714;”SETUP:FBERROR:TIMEOUT:TIME 5” ! BER measurement times out after
20                                               ! 5 seconds.
30     OUTPUT 714;”CALL:CELL:POWER:AMPLITUDE -85 DBM” ! Sets the cell power level to
40                                                    ! a good level.
50     OUTPUT 714;”SETUP:FBERROR:CONTINUOUS OFF” ! Configures a BER measurement to
60                                               ! Single Trigger.
70     OUTPUT 714;”SETUP:FBERROR:COUNT 10000” ! Sets the number of bits to measure
80                                            ! at 10,000.
90     OUTPUT 714;”SETUP:FBERROR:CLSDELAY:STIME 500 MS” ! Sets the Close Loop Delay
100                                                     ! to 500 ms.
110    OUTPUT 714;”SETUP:FBERROR:SLCONTROL ON” ! Sets the Signal Loop Control state to on.
120    OUTPUT 714;”SETUP:FBERROR:LDCONTROL:AUTO OFF” ! Configure loopback delay
130                                                  ! control to manual.
140    OUTPUT 714;”SETUP:FBERROR:MANUAL:DELAY 6” ! Set frame delay to 6 frames in order
150                                              ! to correlate uplink and downlink bits.
160    OUTPUT 714;”CALL:CELL:POWER:AMPLITUDE -102 DBM” ! Sets the cell power level
170                                                    ! to a “low” level for the
180                                                    ! BER measurement.
190    OUTPUT 714;”INITIATE:FBERROR”  ! Start a FBER measurement.
200    REPEAT
210      OUTPUT 714;”INITIATE:DONE?”
220      ENTER 714;Meas_comp$
230      PRINT Meas_comp$
240    UNTIL Meas_comp$=”FBER”
250    OUTPUT 714;”FETCH:FBERROR?”
260    ENTER 714;Integrity,Bits_tested,Fas_bit_ratio,Fas_bit_err_cnt
270    OUTPUT 714;”CALL:CELL:POWER:AMPLITUDE -85 DBM” ! Sets the cell power level
280                                                   ! to a good level.
290    END
```

Returned values

The measurements returned by this program are:

- `Integrity` returns the measurement "Integrity Indicator" on page 126 (0 means a successful measurement with no errors).
- `Bits_tested` returns the number of bits tested.
- `Bit_error_ratio` retuns the ratio of bit errors to total bits tested, in percent (%).
- `Bit_error_count` returns the number of bit errors.

Related Topics

****

"Fast Bit Error Measurement Description" on page 71

"SETup:FBERror" on page 383

"INITiate" on page 344

"FETCh:FBERror" on page 308

"Comprehensive Program Example" on page 195

****

FBER Troubleshooting

July 8, 1999

Possible Setup Issues

During remote operation of the Fast BER measurement the user should configure the trigger arm to single, see "SETup:FBERror" on page 383.

Failure to set trigger arm to single may result in the measurement never giving a result. When trigger arm is continuous the measurement rearms itself and starts another measurement cycle, during remote operation the fetch query may not be synchronized to the measurement cycle, see "Measurement States" on page 147.

Set signalling loopback control to on; if signalling loopback control is off, set loopback to Type C, see "CALL:TCHannel:LOOPback" on page 285.

The test set may never correlate the uplink and downlink, see "SETup:FBERror:LDControl:AUTO" on page 386 so that the measurement appears to hang. The MS may not have closed its loop after the loopback type was set, the user needs to allow sufficient time for the MS to close its loop and set time out mechanisms see "SETup:FBERror:TIMeout[:STIMe]" on page 388.

Interpreting Integrity Indicator values

See "Integrity Indicator" on page 126.

Questionable Result for PGSM (15) Fast BER measurement appears to work but it is only possible on a Phase 2 GSM system.

Output RF Spectrum Measurement Description

How is an output RF spectrum (ORFS) measurement made?

ORFS is a narrow-band measurement that provides information about the distribution of the mobile station transmitter’s out-of-channel spectral energy due to modulation and switching as defined in ETSI 05.05, section 4.2.1 and ETSI 11.10, section 13.4.2.

The test set’s measurements include both ORFS due to modulation and ORFS due to switching. Switching and modulation measurements may be performed from the same burst, if the user requests both modulation and switching results at the same frequency offsets measurement throughput is improved. Measurements are made using a 30 kHz IF bandwidth, 5-pole synchronously tuned filter.

ORFS due to modulation measures out of channel interference during the useful part of the burst excluding the midamble. The measurement returns relative results in (dB) using the power in a 30 kHz bandwidth at zero offset as the reference. The user may set from 0 to 22 offsets.

ORFS due to switching measures out of channel interference over the entire burst, plus up to 10 additional bits on either side of the 147 bit wide normal burst. The measurement returns absolute power results (dBm) for each offset indicating the maximum value over the entire burst. The user may set from 0 to 8 ORFS due to switching offsets.

The number of measurements to be averaged for each offset may be different. The test set internally controls all other aspects of the measurement, including calibration, there is no user calibration required.

TX power (average power), 30 kHz bandwidth power at zero offset, ORFS due to modulation average power, and ORFS due to switching maximum power are included in an ORFS measurement, when both modulation and switching measurements are made. (TX power is performed using the same method as the “Transmit Power Measurement Description” on page 108, which synchronizes the measurement with the burst amplitude).

ORFS due to modulation

When multiple offsets for the ORFS due to modulation measurement are set, the DSP averages the power across the appropriate time segments (40 bits) of the burst with a 30 kHz resolution bandwidth, 5-pole, synchronously tuned filter placed at the center frequency of the burst and compares it to a time segment of the response of the same filter placed at some frequency offset. The result is a relative power measurement using the 30 kHz bandwidth power at zero offset as a reference. For each user specified offset, the DSP retunes the filter and measures the 30 kHz bandwidth power and compares it to the reference, giving a relative power measurement of signal power over the entire burst. The DSP processes the data and makes the results available to the user. The 30 kHz bandwidth power at zero offset is measured only if the user requests at least one ORFS due to modulation measurement.

For offsets up to 1.799999 MHz, an ORFS due to modulation measurement uses the 30 kHz resolution bandwidth filter required in GSM 05.05. At 1800 kHz offset frequency the ORFS due to modulation measurement is made using 30 kHz resolution bandwidth filter, not the 100 kHz resolution bandwidth filter required by ETSI.

The ORFS due to modulation measurement measures both the front and back data portions of the burst. Measurements occur from bit 15 to 60 and from bit 87 to 132. GSM 11.10 recommends that this measurement be performed on only the back section of the burst. Measuring both the front and back of the burst has the speed advantage of providing two modulation measurements per burst.

ORFS due to switching

When multiple offsets for the ORFS due to switching measurement are set, the DSP tunes the 30 kHz resolution bandwidth, 5-pole, synchronously tuned filter to the first requested offset and samples the power of the signal over the entire burst. The result for this measurement is the maximum of these sampled values and is reported as an absolute power measurement. The DSP then retunes the filter, samples the signal, processes the data for each requested offset, then makes the results available to the user.

The 30 kHz bandwidth power at zero offset measurement is not made during ORFS due to switching measurements. In order to make that measurement, the user must request at least one ORFS due to *modulation* measurement.

Single or Multi-Measurements

To obtain statistical measurement results, the multi-measurement count must be set for both switching and modulation measurements. (See “Statistical Measurement Results” on page 137 for more information.)

Changing the multi-measurement modulation or switching count number or setting multi-measurement to ON allows the test set to make multiple measurements at each frequency offset, thereby providing average power results across the number of frequency offsets selected. Multi-measurement count state OFF means only one ORFS measurement will be completed at each offset (that is, one ORFS due to modulation, and one ORFS due to switching measurement).

- If the user wants to make multiple ORFS due to *modulation* measurements and no ORFS due to switching measurements, a number must be entered in the multi-measurement modulation count, and all the *switching* offset frequencies must be off.
- In order to make multiple ORFS due to *switching* measurements and no ORFS due to modulation measurements, a number must be entered in the multi-measurement switching count, and all *modulation* offset frequencies must be off.

Types of Signals ORFS can Measure

ORFS measurements can be made on these types of input signals:

- Normal GSM TCH burst with mobile station in active cell mode.
- Normal GSM TCH burst with mobile station in test mode.
- Non-bursted signal including GMSK modulation with mobile station in test mode.

  For a non-bursted signal, an ORFS due to switching measurement result is not useful.

Input Signal Requirements

The ORFS measurement will complete and meet its accuracy specification under the following conditions:

- Level is between –10 dBm and +43 dBm.
- Level within ±3 dB of the expected input level.
- Frequency is within ±200 Hz of expected input frequency.

Trigger Source

Auto triggering is the recommended trigger source for each measurement, allowing the test set to choose the preferred trigger source. However, the user may want to select the trigger source.

Table 1. Recommended Trigger Source Settings

Input Signal Type	Recommended Trigger Source
Normal GSM TCH burst with mobile station in active cell mode	Protocol
Normal GSM TCH burst with mobile station in test mode	RF Rise
Non-bursted signal including GMSK data with mobile station in test mode	RF Rise

Related Topics

****

"Programming an Output RF Spectrum Measurement" on page 80

"Test Adherence to Standards" on page 112

****

Programming an Output RF Spectrum Measurement

This section provides an example of how to make the output RF spectrum (ORFS) measurement via GPIB.

The following procedure assumes that an active link is established between the test set and the mobile station. See "Establishing an Active Link with the Mobile Station" on page 26.

1. Configure the ORFS measurement parameters using the SETup subsystem.
2. Start the ORFS measurement using the INITiate subsystem.
3. Use the INITiate:DONE? command to find out if ORFS measurement results are available.
4. Use the FETCh? command to obtain ORFS Power measurement results.

Example Program

```
10  OUTPUT 714;"SETUP:ORFSPECTRUM:CONTINUOUS OFF" !Configures a ORFS measurement
20                                                !to single trigger mode.
30  OUTPUT 714;"SETUP:ORFSPECTRUM:COUNT:STATE ON" !Configures a multi-measurement
40                                                !state to on.
50  OUTPUT 714;"SETUP:ORFSPECTRUM:TRIGGER:SOURCE AUTO" !Configure trigger source
60                                                     !to auto.
70  OUTPUT 714;"SETUP:ORFSPECTRUM:SWITCHING:COUNT:NUMBER 50" !Configures ORFS due
80                                                           !to switching
90                                                           !multi-measurement
100                                                          !count.
110 OUTPUT 714;"SETUP:ORFSPECTRUM:SWITCHING:FREQUENCY 200KHZ,400KHZ" !Configure
120                                                                  !switching
130                                                                  !offsets.
140 OUTPUT 714;"SETUP:ORFSPECTRUM:MODULATION:COUNT:NUMBER 100" !Configure ORFS
150                                                            !due to modulation
160                                                            !multi-measurement
170                                                            !count.
180 OUTPUT 714;"SETUP:ORFSPECTRUM:MODULATION:FREQUENCY 200KHZ" !Configure
190                                                            !modulation offset.
200 OUTPUT 714;"INITIATE:ORFSPECTRUM" !Start ORFS measurement.
210 REPEAT
220 OUTPUT 714;"INITIATE:DONE?" !Check to see if ORFS measurement is done.
230 ENTER 714;Meas_complete$
240 UNTIL Meas_complete$="ORFS" !"ORFS" must be all upper case.
250 OUTPUT 714;"FETCH:ORFSPECTRUM:ALL?" !Fetch ORFS results.
260 ENTER 714;Integrity,Tx_pwr,Max_swit_200,Max_swit_400,Bw_pwr,Avg_mod_200
270 END
```

Returned values

The measurements returned by this program are:

- `Integrity` returns the measurement “Integrity Indicator” on page 126 (0 means a successful measurement with no errors).
- `Tx_pwr` returns the transmit power in dBm.
- `Max_swit_200,Max_swit_400` returns maximum ORFS power due to switching in dBm (one maximum power level at a 200 kHz offset and one maximum power level at a 400 kHz offset).
- `Bw_pwr` returns the power level in a 30 kHz bandwidth at zero offset in dBm (this is the reference level for ORFS power due to switching and ORFS power due to modulation).
- `Avg_mod_200` returns the average ORFS power due to modulation in dBm (one average power level at a 200 kHz offset).

Related Topics

****

“Output RF Spectrum Measurement Description” on page 77

“SETup:ORFSpectrum” on page 406

“INITiate” on page 344

“FETCh:ORFSpectrum” on page 315

“Comprehensive Program Example” on page 195

****

ORFS Troubleshooting

Possible Setup Issues

During remote operation of the Output RF Spectrum measurement the user should configure the trigger arm to single, see "SETup:ORFSpectrum" on page 406.

Failure to set trigger arm to single may result in the measurement never giving a result. When trigger arm is continuous the measurement rearms itself and starts another measurement cycle, during remote operation the fetch query may not be synchronized to the measurement cycle, see "Measurement States" on page 147.

ORFS due to modulation measurements: Averaging for each measurement, including the zero offset measurement, is performed over 40 or more bits on the front and back of the burst, from bit 15 to 60 and bit 87 to 132. ETSI standards only require measuring the back bits 87 to 132. By making measurements on the front and back of the burst, two measurements per burst are achieved.

When fetching (frequency offsets) for ORFS due to modulation or switching remotely, the values for the offsets are entered after the " ? ", see "FETCh:ORFSpectrum:MODulation:FREQuency[:OFFSet]?" on page 318 or "FETCh:ORFSpectrum:SWITChing:FREQuency[:OFFSet][:MAXimum]?" on page 320 for GPIB commands.

The ORFS Transmit Power, 30 kHz BW Power, Max switching offset level and Average switching offset level results are shifted in proportion to the value of Amplitude Offset that a user may set. The following table shows the measurements that are affected and how amplitude offset affects them. For more information about amplitude offset commands, see "Measurement Related Configuration" on page 540.

Table 2. Measurements affected by amplitude offset

Amplitude Offset Command	Power (dBm)		Switching Offset Level (dBm)		Cell Power Setting (dBm)
	ORFS Transmit	30 kHz BW	Max	Average (up to 8)	
OUTPUT 714;"SYSTEM:CORRECTION:SGAIN -3" !Offset for 3 dB of loss in the network.	6.74	-1.42	-35.60	-36.07	-82
OUTPUT 714;"SYSTEM:CORRECTION:SGAIN 3" !Offset for 3 dB of gain in the network.	6.75	-1.66	-35.71	-36.09	-88
OUTPUT 714;"SYSTEM:CORRECTION:SGAIN 0" !Zero dB of offset.	6.67	-1.18	-35.64	-36.09	-85

Interpreting Integrity Indicator values

See “Integrity Indicator” on page 126.

If over range (5) is returned the input signal is likely to clip during the useful part of the burst or the ORFS TX Power measurement has detected an over range.

If signal too noisy (10) is returned, the actual power at certain offsets is > 8 dB off from the expected level.

If under range (6) is returned; the measured power result is more than 10 dB below the expected input power level. Under range is also indicated if, the input power is more than 2 dB below the calibrated range of the test set’s power detector for the RF Range setting. RF Range is automatically set based on the input power setting. Input power is a combination of amplitude offset and expected power settings. See “Receiver example” on page 541.

Phase and Frequency Error Measurement Description

How is a phase and frequency error (PFER) measurement made?

The PFER measurement performs a narrow-band (<200 kHz) measurement of the modulation quality and frequency accuracy of the GSM mobile station's transmitter. The test set measures frequency error, rms phase error and peak phase error over the useful part of the burst.

The PFER measurement demodulates the data and compares the measured wave form with the "ideal" waveform that was expected for the data received. The frequency error is the difference in frequency, after adjustment for the effect of the modulation and phase error, between the RF transmission from the mobile station and the test set. The phase error is the difference in phase, after adjustment for the effect of the frequency error, between the mobile station and the theoretical "ideal" transmission. This measurement conforms to the ETSI 05.05 and 11.10 standards.

The PFER measurement is controlled by the DSP in the test set. No calibration is required by the user, the DSP gets calibration information during test set power up. PFER measurements can be initiated with any measurement made by the test set.

Single or Multi-Measurements

The DSP demodulates the data and compares the measured waveform with the "ideal" waveform created by the DSP.

A single burst for a PFER measurement calculates the following:

- peak phase error
- rms phase error
- frequency error

A multiple burst PFER measurement is made when the multi-measurement state is on and calculates the maximum, minimum and average values for the following:

- peak phase error
- rms phase error
- frequency error
- worst frequency error (worst frequency error is the frequency furthest from zero.)

All of these results are available to the user with the FETCh command. If the most positive and the most negative frequency error are the same value, the most positive frequency will be returned. Worst frequency error is only accessible through GPIB. The test set always has integrity indicator available to the user regardless of single or multiple burst measurements.

Types of Signals PFER can Measure

PFER measurements can be made of these types of input signals.

- Normal GSM TCH burst with mobile station in active cell mode.
- Access (RACH) burst with mobile station in active cell mode.
- Normal GSM TCH burst with mobile station in test mode.
- Access (RACH) burst with mobile station in test mode.
- Bursted signal with GMSK modulation without a valid midamble.

Input Signal Requirements

The PFER measurement will complete and meet its accuracy specification of:

- Frequency error measurement accuracy of ±12 Hz + timebase reference.
- rms phase error measurement accuracy of less than ±1 degree.
- Peak phase error measurement accuracy of less than ±4 degrees.

under these conditions

- Level is between –15 dBm and +43 dBm.
- Level within ±3 dB of the expected input level.
- Frequency is within ±100 kHz of expected input frequency.

Trigger Source

Auto triggering is the recommended trigger source for each measurement allowing the test set may choose the preferred trigger source. However, the user may want to select the trigger source. Immediate trigger source is not recommended for PFER measurements.

Table 3. Recommended Trigger Source settings

Input Signal Type	Recommended Trigger Source
Normal GSM TCH burst with mobile station in active cell mode	Midamble or Amplitude
RACH burst with mobile station in active cell mode	Midamble or Amplitude
Normal GSM TCH burst with mobile station in test mode	Amplitude
RACH burst with mobile station in test mode	Amplitude
Bursted signal with GMSK modulation but no valid midamble	Amplitude
Non-bursted non-GMSK signals with a manual frequency offset of +/- 67.7083 kHz	Immediate

Burst Synchronization

The PFER measurement provides the user a choice for the time reference (burst synchronization). see “Burst Synchronization of Measurements” on page 117

Table 4.

Burst Synchronization	Description
Midamble	References measurement timing to the midamble transmitted within a timeslot.
RF Amplitude	The amplitude rise and fall of a transmitted burst determines the measurement time reference.
None	No edge of the burst will be detected, the measurement will be made using the first 87 or 147 bits of data found centered around the middle of the expected burst position. For may be used when measuring non-bursted signals

Related Topics

****

“Programming a Phase and Frequency Error Measurement” on page 87

“Test Adherence to Standards” on page 112

****

Programming a Phase and Frequency Error Measurement

This section provides an example of how to make the phase and frequency error (PFER) measurement via GPIB.

The following procedure assumes that an active link is established between the test set and the mobile station. See “Establishing an Active Link with the Mobile Station” on page 26.

1. Configure PFER measurement parameters using the SETup subsystem.
2. Start the PFER measurement using the INITiate subsystem.
3. Use the INITiate:DONE? command to find out if PFER measurent results are available.
4. Use the FETCh? command to obtain PFER measurement results.

Example Program

```
10  OUTPUT 714;”SETUP:PFERROR:CONTINUOUS OFF” !Configures a PFER measurement to
20                                            !single trigger mode.
30  OUTPUT 714;”SETUP:PFERROR:COUNT:NUMBER 100 !Configures a multi-measurment
40                                             !of 100.
50  OUTPUT 714;”SETUP:PFERROR:TRIGGER:SOURCE AUTO”!Configure trigger source
60                                                !to auto.
70  OUTPUT 714;”SETUP:PFERROR:BSYNC:MIDAMBLE !Configures a PFER measurement so
80                                           !that burst synchronization, which
90                                           !will synchronize the timing of the
100                                          !measurement algorithm relative to
110                                          !the data sample, will be set
120                                          !to midamble.
130 OUTPUT 714;”INITIATE:PFERROR” !Starts the PFER measurement.
140 REPEAT
150 OUTPUT 714;”INITIATE:DONE?” !Query to see if PFER measurement is done
160 ENTER 714;Meas_complete$
170 UNTIL Meas_complete$=”PFER”
180 OUTPUT 714;”FETCH:PFERROR:ALL?”
190 ENTER 714;Integrity, Max_phase_err, Max_peak_error, Worst_freq_err
200 END
```

Returned values

The measurements returned by this program are:

- `Integrity` returns the measurement "Integrity Indicator" on page 126 (0 means a successful measurement with no errors).
- `Max_phase_err` returns the maximum rms phase error in degrees
- `Max_peak_phase_error` returns the maximum peak phase error in degrees
- `Worst_freq_err` returns the the frequency, in Hz, that is the furthest from zero, if the most positive and the most negative frequency error are the same value, the most positive will be returned.

Related Topics

****

"Phase and Frequency Error Measurement Description" on page 84

"SETup:PFERror" on page 415

"INITiate" on page 344

"FETCh:PFERror" on page 322

"Comprehensive Program Example" on page 195

****

PFER Troubleshooting

June 29, 1999

Possible Setup Issues

During remote operation of the Phase and Frequency Error measurement the user should configure the trigger arm to single, see "SETup:PFERror:CONTinuous" on page 416.

Failure to set trigger arm to single may result in the measurement never giving a result. When trigger arm is continuous the measurement rearms itself and starts another measurement cycle, during remote operation the fetch query may not be synchronized to the measurement cycle, see "Measurement States" on page 147.

The Manual Frequency must be offset by +/- 67.7083 kHz in order to measure non-bursted or non-GMSK modulated signals.

If the Trigger Source is set to RF Rise and the signal measured is not burst modulated the measurement will wait until aborted or timed out.

If the input signal is more than 10 dB below the Expected Power, see "Expected Power" on page 500 or if the input signal is below -30 dBm there is not enough power to generate an RF Rise trigger so the measurement will hang.

Interpreting Integrity Indicator values

See "Integrity Indicator" on page 126.

If the signal has both over range (5) and under range (6) conditions only the over range (5) will be indicated.

Syn Not Found (11) will be returned if the measurement Burst Synchronization is set to Midamble synchronized and Expected Burst pattern is not set to TSC0 through TSC7, or RACH. see "CALL:BURSt" on page 232

Power versus Time Measurement Description

July 6, 1999

How is a power versus time (PvT) measurement made?

PvT measurements determine if the mobile station's transmitter power falls within specified power and timing ranges. Refer to the "Typical GSM PvT Measurement" on page 93.

During a PvT measurement, the test set makes a narrowband point-by-point measurement of the instantaneous power received during the GSM burst. A pass or fail result is returned based on a mask comparison (defined in "ETSI GSM 05.05 Ver 4.21.0 Annex B").

Included with the narrowband point-by-point measurement is a broad-band PvT carrier power measurement, labeled as Transmit Power on the Summary screen. The PvT Transmit Power measurement is synchronized to the burst midamble as recommended in ETSI GSM 11.10. (The test set also provides a faster transmit power measurement that is synchronized to the burst's amplitude. See "Transmit Power Measurement Description" on page 108).

The dynamic range of the PvT measurement is approximately a 70 dB.

This measurement conforms to "ETSI GSM 11.10 Ver 4.21.1 Sect 13.3" which is based on "ETSI GSM 05.05 Ver. 4.21.0 Annex B".

Power versus Time Measurement Results

The primary result of a PvT measurement is the pass/fail result. The pass/fail result that the test set returns to the user indicates whether the **entire** burst fell within power and timing ranges determined by a point-by-point comparison of the power versus time measurement mask.

The PvT measurement examines the burst to determine the points where the burst fails by the most or is closest to failing the upper and lower limits. These worst case points provide the upper and lower limit margin results. A negative value, along with the offset time, is returned for the result if the burst fails the mask. A positive value indicates the burst is within the mask. See "FETCh:PVTime:MASK:ALL?" on page 331.

For statistical analysis, the test set allows the user to set up to 12 time markers. These markers do not define the mask, but are merely used to get results from specified points on the mask. See "SETup:PVTime:TIME[:OFFSet]" on page 423. Note that these points are not the same as those used in the point-by-point comparison which determines the pass/fail result.

- Results for a **single** PvT measurement include:
  1. PvT pass/fail result (0 = Pass, 1 & NaN = Fail)
  2. PvT measurement integrity indicator
  3. Transmit carrier power with midamble synchronization (average power during the burst)
  4. Upper limit power margin worst case (how close to or where the signal exceeded upper power limit)
  5. Lower limit power margin worst case (how close or where the signal exceeded lower power limit)
  6. Upper limit timing margin worst case (the time offset where the signal came close to or exceeded upper timing limit)
  7. Lower limit timing margin worst case (the time offset where the signal came close to or exceeded lower timing limit)
- Results for **multi-measurement** PvT measurements include:
  1. Average of transmit carrier power measurements (average of averages)
  2. Maximum transmit carrier power measured across each burst
  3. Minimum transmit carrier power measured across each burst
  4. Standard deviation of transmit carrier power measured across each burst
- Statistical PvT measurement results, calculated from measurements taken at each of the active time offset markers or across a subset of the markers and available only through programming commands, include:
  1. Average Power (in dBc) measured at the marker(s) relative to transmit power (carrier power)
  2. Maximum power (in dBc) measured at the marker(s) relative to transmit power (carrier power)
  3. Minimum power (in dBc) measured at the marker(s) relative to transmit power (carrier power)
  4. Standard deviation of power (in dBc) measured at the marker(s) relative to transmit power (carrier power)
- The measurement integrity indicator is another result available for any completed PvT measurement. This result provides information about error conditions which occurred and may have affected the accuracy of the most recently completed measurement. For more information about measurement integrity, refer to “Integrity Indicator” on page 126.
- Measurement progress report is a feature that allows the user to periodically see how far multi-measurement cycle has progressed. When the multi-measurement count is greater than 1, the progress report will indicate the number of individual sub-measurements that have been completed, *n*, out of the total number to be completed, *m*. “n” is referred to as ICOunt remotely. “m,” the total number of measurements to be made, is based on the PvT user settings and input signal attributes.

  The progress report is displayed on the test set’s screen in an “n of m” format. The number of measurements completed, *n*, increases from zero to the total number of measurements which need to be made, *m*.

Types of Signals Power vs. Time Can Measure

The following list summarizes the input signal attributes and mobile station operating modes for which PvT can be measured with the test set.

1. Normal GSM TCH burst with mobile station in active cell mode
2. Normal GSM TCH burst with mobile station in test mode (no protocol)
3. RACH burst with valid midamble with mobile station in active cell mode

Power vs. Time Input Signal Requirements

The PvT measurement will complete and meet the PvT measurement accuracy specifications when the signal meets the following input signal conditions.

1. Input signal level is between –15 dBm and +43 dBm.
2. Transmit power is within ±3 dB of expected input level.
3. Input signal frequency is within ±10 kHz of expected input frequency.

Trigger Source

Triggering choices available for the PvT measurement are RF rise, protocol, immediate, and auto. In most cases, auto triggering provides the optimum measurement triggering condition for the PvT measurement.

When auto triggering is selected, the test set chooses a trigger source based on the optimum trigger source available. For example, PvT measurements will automatically be triggered by a protocol trigger if a call is connected or call processing events provide the protocol trigger source.

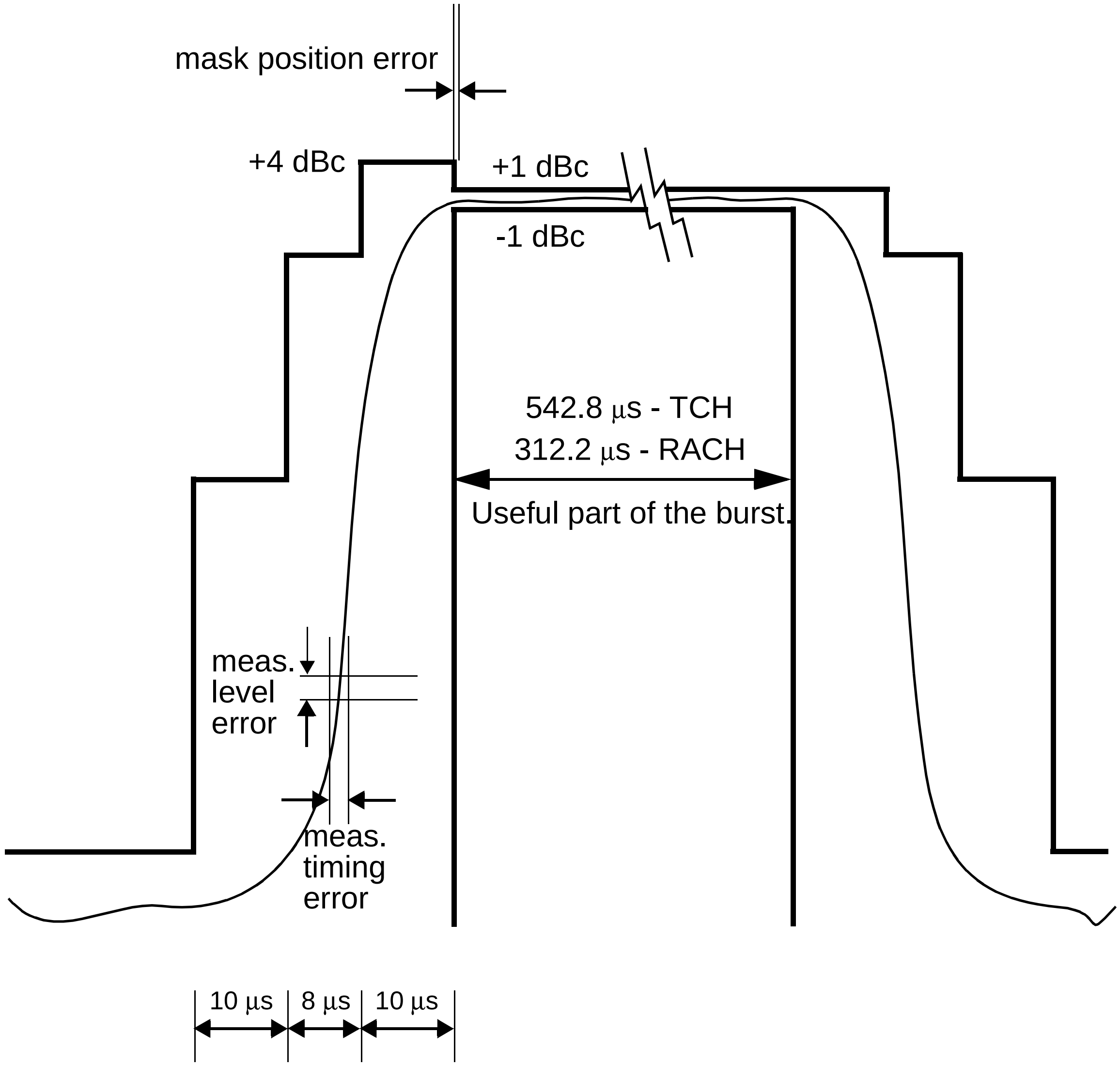
In situations where no protocol trigger is available, the test set will choose RF rise triggering for the PvT measurement. An example of this situation might be when the test set is in test mode operating mode.

Table 5. Recommended Trigger Source Settings

Input Signal Type	Recommended Trigger Source
Normal GSM TCH burst with mobile station in active cell mode	RF Rise or Protocol
RACH burst with mobile station in active cell mode	RF Rise or Protocol
Normal GSM TCH burst with mobile station in test mode	RF Rise
RACH burst with mobile station in test mode	RF Rise
Bursted signal with GMSK modulation but no valid midamble	RF Rise
CW signal	Immediate

For more information on measurement triggering, refer to “Measurement Triggering” on page 145.

Figure 3. Typical GSM PvT Measurement



Burst Synchronization

The PvT measurement provides the user a choice for the time reference (burst synchronization). see “Burst Synchronization of Measurements” on page 117

Table 6.

Burst Synchronization	Description
Midamble	References measurement timing to the midamble transmitted within a timeslot.
RF Amplitude	The amplitude rise and fall of a transmitted burst determines the measurement time reference.
None	No edge of the burst will be detected, the measurement will be made using the first 87 or 147 bits of data found centered around the middle of the expected burst position. For may be used when measuring non-bursted signals

Related Topics

****

“Programming a Power versus Time Measurement” on page 95

“Test Adherence to Standards” on page 112

****

Programming a Power versus Time Measurement

This section provides an example of how to make the power versus time (PvT) measurement via GPIB.

The following procedure assumes that an active link is established between the test set and the mobile station. See “Establishing an Active Link with the Mobile Station” on page 26.

1. Configure PvT measurement parameters using the SETup subsystem.
2. Start the PvT measurement using the INITiate subsystem.
3. Use the INITiate:DONE? command to find out if the PvT measurement results are available.
4. Use the FETCh? command to obtain PvT measurement results.

Example Program

```
10  OUTPUT 714;”SETUP:PVTIME:CONTINUOUS OFF” !Configures a PvT measurement to
20                                           !single trigger mode.
30  OUTPUT 714;”SETUP:PVTIME:COUNT:NUMBER 100 !Configures a multi-measurment
40                                            !of 100.
50  OUTPUT 714;”SETUP:PVTIME:TRIGGER:SOURCE AUTO” !Configure trigger source
60                                                !to auto.
70  OUTPUT 714;”SETUP:PVTIME:BSYNC MIDAMBLE” !Configures a PvT measurement so
80                                           !that burst synchronization, which
90                                           !will synchronize the time of the
100                                          !measurement algorithm relative to
110                                          !the data sample, will be set
120                                          !to midamble.
130 OUTPUT 714;”SETUP:PVTIME:TIME:OFFSET -28US,-18US !Turns on time markers
140                                                  !-28 and -18 microseconds.
150 OUTPUT 714;”INITIATE:PVTIME” !Start PvT measurement.
160 REPEAT
170 OUTPUT 714;”INITIATE:DONE?” !Check to see if PvT measurement is done.
180 ENTER 714;Meas_complete$
190 UNTIL Meas_complete$=”PVT”
200 OUTPUT 714;”FETCH:PVTIME:ALL?” !PvT results for time measurements.
210 ENTER 714;Integrity,Pvt_mask, Pvt_power, Max_offset
220 END
```

Returned values

The measurements returned by this program are:

- `Integrity` returns the measurement "Integrity Indicator" on page 126 (0 means a successful measurement with no errors).
- `Pvt_mask` returns the mask pass/fail indicator. When the multi-measurement count is greater than 1, the PvT mask pass/fail result will return Fail (1) if any single measurement fails.
- `Pvt_power` returns the PvT carrier power in dBm.
- `Max_offset` returns the maximum offset level in dB, relative to the PvT carrier power.

Related Topics

****

"Power versus Time Measurement Description" on page 90

"SETup:PVTime" on page 420

"INITiate" on page 344

"FETCh:PVTime" on page 328

"Comprehensive Program Example" on page 195

****

PVT Troubleshooting

June 29, 1999

Possible Setup Issues

During remote operation of the Power vs. Time measurement the user should configure the trigger arm to single, see “SETup:PVTime:CONTinuous” on page 421.

Failure to set trigger arm to single may result in the measurement never giving a result. When trigger arm is continuous the measurement rearms itself and starts another measurement cycle, during remote operation the fetch query may not be synchronized to the measurement cycle, see “Measurement States” on page 147.

If the Trigger Source is set to RF Rise and the signal measured is not burst modulated the measurement will wait until aborted or timed out.

If the input signal does not rise above the threshold set at 20 to 30 dB below the Expected Power, see “Expected Power” on page 500 there is not enough power to generate an RF Rise trigger so the measurement may hang.

The PvT Transmit Power measurement results are shifted in proportion to the value of Amplitude Offset that a user may set. The following table shows the measurements that are affected and how amplitude offset affects them. For more information about amplitude offset commands, see “Measurement Related Configuration” on page 540.

Table 7. Measurements affected by amplitude offset

Amplitude Offset Command	PVT Transmit Power (dB)			Cell Power Setting (dBm)
	Minimum	Maximum	Average	
OUTPUT 714;”SYSTEM:CORRECTION:SGAIN -3” !Offset for 3 dB of loss in the network.	7.123	7.152	7.136	-82
OUTPUT 714;”SYSTEM:CORRECTION:SGAIN 3” !Offset for 3 dB of gain in the network.	7.129	7.16	7.14	-88
OUTPUT 714;”SYSTEM:CORRECTION:SGAIN 0” !Zero dB of offset.	7.112	7.147	7.124	-85

Interpreting Integrity Indicator values

See “Integrity Indicator” on page 126.

If over range (5) is returned; the PvT input power has exceeded the test set’s internal sampler maximum value during some part of the sampling or the input power has exceeded the calibrated range of the test set’s power detector for the RF Range setting. RF Range is automatically set based on the input power setting. Input power is a combination of amplitude offset and expected power settings. See “Receiver example” on page 541.

If the signal has both over range and under range conditions only the over range (5) will be indicated.

If under range (6) is returned; the PvT Transmit Power result is more than 10 dB below the expected input power level. Under range is also indicated if, the input power is more than 2 dB below the calibrated range of the test set’s power detector for the RF Range setting. RF Range is automatically set based on the input power setting. Input power is a combination of amplitude offset and expected power settings. See “Receiver example” on page 541.

Syn Not Found (11) will be returned if the measurement Burst Synchronization is set to Midamble synchronized and Expected Burst pattern is not set to TSC0 through TSC7, or RACH. see “CALL:BURSt” on page 232

RACH Measurement Description

What is a RACH?

When a mobile first attempts to originate a call it sends a RACH (Random Access Channel) burst. The RACH is transmitted on the uplink frequency of the channel number used by the Broadcast channel (BCH). The RACH is the first burst sent by the mobile. This burst is short, only 312.2 ms, as opposed to the normal GSM burst of 542.8 ms. The RACH is used by the base station to determine the timing advance which it then sends back to the mobile. Once the mobile receives this information it starts to transmit normal bursts.

Measurements that can be performed on a RACH

The test set can perform the following three measurements on a RACH in Active Cell or Test mode:

- Power versus Time
- Transmit Power
- Phase and Frequency Error

NOTE Only one measurement at a time can be made on the RACH even if two measurements are initiated.

Triggering

The type of triggering used is dependent on whether you are in Active Cell or Test mode:

Active Cell mode:
The default triggering of Auto is acceptable for most signals. (In Active Cell mode Auto is equivalent to Protocol.) However, if the mobile's RACH timing is outside the specified limits you may need to use RF Rise triggering.

Test mode:
The default triggering of Auto should be used. (In Test mode Auto is equivalent to RF Rise.)

Overview of Measurement Procedure in Active Cell Mode

1. Set operating mode to Active Cell.
2. Set the receiver control to manual.
3. Set the test set's measurement receiver to the frequency the RACH will arrive on. The simplest way to do this is to set the manual channel (that is, the expected ARFCN) to the ARFCN of the BCH. Alternatively you could set the expected frequency to the uplink frequency of the BCH ARFCN.
4. Ensure trigger mode is set to Auto.

Once the RACH measurement is completed, in order to make further measurements on the TCH, ensure you reset the receiver control to Auto.

Overview of Measurement Procedure in Test Mode

1. Set operating mode to Test.
2. Set the test function to either BCH, or, BCH + TCH.
3. Set the Broadcast Channel to the channel you wish to use.
4. Using your proprietary commands, initiate the mobile to generate a sequence of RACH bursts on the BCH.
5. Start the appropriate measurement.

Example Procedure

The following procedure details how to make a power versus time RACH measurement manually while in Active Cell mode.

1. Press **SHIFT PRESET**. The “Call Setup Screen” is displayed.
2. Press the **More** key which is positioned immediately below **F12** two times. This displays screen 3 of 4.
3. Press **F7** and set the **Receiver Control** to **Manual**.
4. Press **F9** and change the **Manual Channel** from 30 to 20. (This sets it to the same channel as the Broadcast Chan on screen 1 of 4.)
5. Press **Measurement selection**. (This key is positioned below the display.)
6. Select **Power vs Time**.
7. Press **F1**, **Power vs Time Setup**.
8. Press **F1**, **Measurement Setup**.
9. Set **Trigger Arm** to **Single**.
10. Press **START SINGLE** on the front panel of the test set. (Note, you are starting the measurement before originating a call. This is to ensure that it is the RACH burst that is measured.)
11. Connect the mobile, then originate a call from the mobile.
12. Immediately you press send on the mobile the power versus time measurement result is displayed. You can confirm that the measurement has occurred on the RACH by examining the measurement results. With a RACH measurement, since the burst is shorter than normal, the power drops of rapidly after 331 µs. To examine the results select **F6**, **Return to PvT Control**, **F2**, **Change View**, then select **F2**, **Numeric 1 of 2** and **F3**, **Numeric 2 of 2**.
13. To do further measurements on the TCH ensure that the Receiver Control is returned to Auto.

Related Topics

****

“Programming a RACH Measurement” on page 101

“RACH Troubleshooting” on page 104

****

Programming a RACH Measurement

This section provides an example of how to make a power versus time measurement on a RACH. The same principles as used in this example can also be used for transmit power and phase and frequency error measurements.

Overview of Measurement Procedure

1. Ensure that the mobile is switched off.
2. Set the test set's measurement receiver to the frequency the RACH will arrive on. The simplest way to do this is to set the manual channel (that is, the expected ARFCN) to the ARFCN of the BCH. Alternatively you could set the expected frequency to the uplink frequency of the BCH ARFCN.
3. Set triggering to single.
4. Set trigger mode to Auto.

Once the RACH measurement is completed, in order to make further measurements on the TCH, ensure you reset the receiver control to Auto.

NOTE Only one measurement at a time can be made on the RACH even if two measurements are initiated.

Example Procedure

The following example details how to make a power versus time RACH measurement on a mobile originated call in Active Cell mode.

Alternatively, the same measurement could be made on a base station originated call by replacing lines 160 and 170 with the CALL:ORIGinate command.

```
10    INTEGER Int
20    DIM Results(11)
30    REAL Mask,Power
40    OUTPUT 714;”*RST”
50    OUTPUT 714;”RFANALYZER:MANUAL:CHANNEL:SELECTED 20” !Configures the
60                         !test set to expect a transmission on ARFCN 20.
70    OUTPUT 714;”RFANALYZER:EXPECTED:POWER:SELECTED 10 DBM” !Configures
80                        !the test set to expect a power level of 10 dBm.
90    OUTPUT 714;”SETUP:PVTIME:CONTINUOUS OFF”  !Configures trigger
100                        !mode to single for a pvt measurement.
110   OUTPUT 714;”SETUP:PVTIME:COUNT:STATE OFF”  !Configures the
120   !multi_measurement state to OFF.
130   OUTPUT 714;”SETUP:PVTIME:TRIGGER:SOURCE AUTO” !Configures the
140                                              !trigger source to AUTO.
150   OUTPUT 714;”INITIATE:PVTIME” !Start a pvt measurement.
160   PRINT “Connect your mobile to the Test Set and initiate a call”
170   PRINT “from the mobile.”
180   OUTPUT 714;”FETCH:PVTIME:ALL?”!Fetches the measurement integrity
190   !value, mask indicator, tx power, and pvt offsets.
200   ENTER 714;Int,Mask,Power,Results(*)
210   PRINT “****************************************”
220   PRINT “*Power vs Time RACH Measurement Results*”
230   PRINT “****************************************”
240   PRINT “Integrity = “;Integrity
250   PRINT “Mask = “;Mask
260   PRINT “Carrier Power =”;Power
270   PRINT “Offset        Level (dB)”
280   PRINT “(micro sec)   (dB)”
290   PRINT “-------       ----------”
300   PRINT “-28            “;Results(0)
310   PRINT “-18            “;Results(1)
320   PRINT “-10            “;Results(2)
330   PRINT “0              “;Results(3)
340   PRINT “321.2          “;Results(4)
350   PRINT “331.2          “;Results(5)
360   PRINT “339.2          “;Results(6)
370   PRINT “349.2          “;Results(7)
380   PRINT “542.8          “;Results(8)
390   PRINT “552.8          “;Results(9)
400   PRINT “560.8          “;Results(10)
410   PRINT “570.8          “;Results(11)
420   EN
```

Related Topics

****

"RACH Measurement Description" on page 99

"RACH Troubleshooting" on page 104

****

RACH Troubleshooting

December 1, 1999

Possible Setup Issues

During manual or remote operation of a RACH measurement ensure that the multi-measurement count is set to Off. The measurement would not complete if multi-measurement count was set to On.

If required refer to the appropriate command:

- "SETup:PVTime:COUNt:STATe" on page 422
- "SETup:TXPower:COUNt:STATe" on page 428
- "SETup:PFERror:COUNt:STATe" on page 417

Interpreting Integrity Indicator values

See "Integrity Indicator" on page 126.

SACCH Report Measurement Descriptions

July 12, 1999

When a call is established (the operating mode is active cell and the call status is not idle), the MS is required to report on the SACCH logical channel. The reported results available from the test set are shown here:

- MS TX Level Reported
- TCH Timing Advance Reported
- RX Level
- RX Qual
- Neighbour Channel
- Neighbour RX Level 1
- Neighbour NCC 1
- Neighbour BCC 1

When are SACCH Report Measurements Made?

When the test set receives SACCH data from the MS, results are reported to the user in the SACCH Report window (Call Setup screen), and the Neighbour Cell Report window (Cell Info screen). The results are reported remotely with the CALL:MS:REPORTED commands. No mechanism is provided to turn off SACCH data reports.

The SACCH reports are delayed, they reflect what the MS is actually experiencing. It is possible for SACCH reported MS TX level results to be different than the cell power level due to limitations of the MS. The SACCH reported TCH timing advance should eventually match the value in the Timing Advance field once the MS has time to react.

SACCH data will report any time there is a downlink TCH and the MS is synchronized to the test set transmitting a valid SACCH on the uplink.

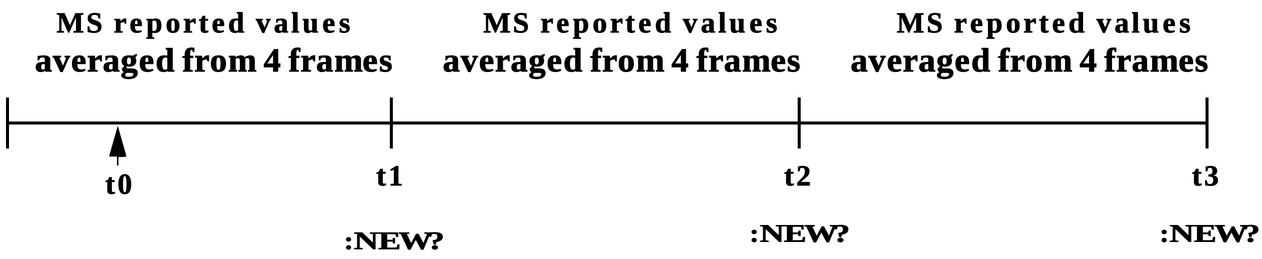
:NEW? and [:LAST?] Queries

:NEW? queries hang until a new SACCH message is received by the test set. The MS issues data updates on the SACCH every 480 ms, (4 frames).

Measurements made during this four frame period are averaged and the result of these averaged measurements are reported by the MS during the next period. Measurements must be stable in order to give valid (stable) results for a :NEW? query. Therefore, it may take up to three SACCH reports before a reported value accurately reflects a change to any of its parameters. See Figure 1.

After changing measurement parameters, you must send three consecutive :NEW? queries to obtain stable, accurate results. By querying :NEW? three times the value becomes stable for the second query, and meaningful stable results are then reported for the third query. The results from the first two queries should not be used.

Figure 4. SACCH Report Measurement Cycle



t0: measurement parameter is changed to a new value.
t1-t2: MS measures the new value.
t3: the test set receives the first SACCH report that contains valid results reflecting the new parameter value.

If several SACCH reported values are needed from the same report, the first value needed should be queried three times (to receive a stable new report). Then the additional values should be immediately queried using the :LAST? query before the next report arrives or the measurement parameters are changed again.

The :LAST? query is not a hanging query; values are returned from the last SACCH report. As shown in the following program example (line 60), the :LAST? command is optional. If :NEW? is not used in the MS:REPORTED command, the :LAST value is automatically reported.

Program example:

```
10    OUTPUT 714;”CALL:CELL:POW -83”
20    OUTPUT 714;”CALL:MS:TADV 11”
30    OUTPUT 714;”CALL:MS:TXL 11”
40    OUTPUT 714;”CALL:MS:REPORTED:TXL:NEW?;NEW?;NEW?”   ! Query 3 times
50    ENTER 714;Ignore_result,Ignore_result,Valid_result ! Only use Valid_result
60    OUTPUT 714;”CALL:MS:REPORTED:RXL?;TADV?”           ! Additional values
70    ENTER 714;Rceived_lvl,Timing_adv
80    END
```

SACCH Report Measurement Results

- MS TX level reported results reflect the value set in the Call Parms, MS TX Level field.
- TCH timing advance reported results reflect the value set in the Call Parms, Timing Advance field.
- RX Level reported reflects the received level of TCH in dB, from the Call Parms, Cell Power field that the MS measured during the preceding SACCH.
- RX Qual reported reflects the perceived quality of the signal used for the RX level SACCH report.

Neighbour Report Measurement Results

The MS determines what neighbour cells to measure from the BA tables transmitted on the BCH and the SACCH. The test set reports results from neighbour cell 1.

- Neighbour channel 1 results reflect the first ARFCN reported by the MS in the SACCH report.
- Neighbour NCC 1 results reflect the first network color code reported by the MS in the SACCH report.
- Neighbour BCC 1 results reflect the first base station color code reported by the MS in the SACCH report.
- Neighbour RX level 1 results reflect the first cell power level reported by the MS in the SACCH report.

Related Topics

****

"Configuring Mobile Station Operating Parameters" on page 497

"CALL:MS:REPorted:TXLevel[:LAST]?" on page 255

"CALL:MS:REPORTED:TXLEVEL:NEW?;NEW?;NEW?" on page 256

"CALL:MS:REPorted:TADVance[:LAST]?" on page 255

"CALL:MS:REPorted:TADVance:NEW?;NEW?;NEW?" on page 255

"CALL:MS:REPorted:RXLevel[:LAST]?" on page 253

"CALL:MS:REPorted:RXLevel:NEW?;NEW?;NEW?" on page 253

"CALL:MS:REPorted:RXQuality[:LAST]?" on page 254

"CALL:MS:REPorted:RXQuality:NEW?;NEW?;NEW?" on page 254

"CALL:MS:REPorted:NEIGhbour[1]?" on page 252

****

Transmit Power Measurement Description

How is a transmit power (TXP) measurement made?

The TXP measurement performs a power measurement on a mobile station, averaged over the useful part of the burst. The signal is captured with a wide band 3 GHz fast RF power detector.

In order to provide the user with a very fast TXP measurement the test set measures the power without synchronizing it to the midamble. The measurement is made with RF amplitude synchronization; therefore, the signal does not need to be demodulated to determine the midamble. This technique is different than the TXP measurement defined in ETSI GSM 11.10. (See “Burst Synchronization of Measurements” on page 117). The power versus time measurement provides a carrier power measurement that is synchronized to the burst’s midamble, and conforms to the ETSI GSM 11.10 standard. (See the “Power versus Time Measurement Description” on page 90.)

The output RF spectrum measurement makes the TXP measurement as part of its measurement process, and makes this measurement result available along with output RF spectrum due to modulation and switching.

The TXP measurement is completely controlled by the digital signal processor (DSP) in the test set. Any power measurement requires calibration to ensure accuracy. The power meter used for this measurement is zeroed automatically by the DSP as needed, with no action required by the user. No temperature dependent calibration is required because temperature compensation in the power detector circuits provide temperature stability.

Single or Multi-Measurements

The DSP analyzes the data and calculates the results. A single burst for a TXP measurement calculates the average power over the useful part of the burst. A multiple burst transmit power measurement is made when the multi-measurement state is on. This measurement calculates average, minimum, maximum, and standard deviation of the average power measured. All of these results are available to the user with the FETCh command. The test set always has an integrity indicator available to the user regardless of whether single or multiple burst measurements are selected.

Types of Signals TX Power can Measure

TXP measurements can be made on these types of input signals.

- Normal GSM TCH burst with mobile station in active cell mode.
- Access (RACH) burst with mobile station in active cell mode.
- Normal GSM TCH burst with mobile station in test mode.
- Access (RACH) burst with mobile station in test mode.
- Bursted signal with GMSK modulation without a valid midamble.
- CW signal.

Input Signal Requirements

The TX Power measurement will complete and meet its accuracy specification of less than ±0.6dB when.

- Level is between –20dBm and +3 dBm.
- Level within ±3 dB of the expected input level.
- Frequency is within ±100kHz of expected input frequency.

Trigger Source

Auto triggering is the recommended trigger source for each measurement allowing the test set may choose the preferred trigger source. However the user may want to select the trigger source. See Table 8. on page 109

Table 8. Recommended Trigger Source Settings

Input Signal Type	Recommend Trigger Source
Normal GSM TCH burst with mobile station in active cell mode	Amplitude or Protocol
RACH burst with mobile station in active cell mode	Amplitude or Protocol
Normal GSM TCH burst with mobile station in test mode	Amplitude
RACH burst with mobile station in test mode	Amplitude
Bursted signal with GMSK modulation but no valid midamble	Amplitude
CW signal	Immediate

Related Topics

****

“Programming a Transmit Power Measurement” on page 110

“Test Adherence to Standards” on page 112

****

Programming a Transmit Power Measurement

This section provides an example of how to make the transmit power (TXP) measurement via GPIB.

The following procedure assumes that an active link is established between the test set and the mobile station. See "Establishing an Active Link with the Mobile Station" on page 26.

1. Configure the TXP measurement parameters using the SETup subsystem.
2. Start the TXP measurement using the INITiate subsystem.
3. Use the INITiate:DONE? command to find out if TXP measurement results are available.
4. Use the FETCh? command to obtain TXP measurement results.

Example Program

```
10  OUTPUT 714;"SETUP:TXPOWER:CONTINUOUS OFF" !Configures a TXP measurement to
20                                            !single trigger mode.
30  OUTPUT 714;"SETUP:TXPOWER:COUNT:NUMBER 100 !Configures a multi-measurement
40                                             !of 100.
50  OUTPUT 714;"SETUP:TXPOWER:TRIGGER:SOURCE AUTO" !Configure trigger source
60                                                 !to auto.
70  OUTPUT 714;"INITIATE:TXPOWER" !Start TXP measurement.
80  REPEAT
90  OUTPUT 714;"INITIATE:DONE?" !Check to see if TXP measurement is done.
100 ENTER 714;Meas_complete$
110 UNTIL Meas_complete$="TXP" !"TXP" must be all upper case.
120 OUTPUT 714;"FETCH:TXPOWER:ALL?" !Fetch TXP results.
130 ENTER 714;Integrity, Avg_tx_power
140 END
```

Returned Values

The measurements returned by this program are:

- `Integrity` returns the measurement "Integrity Indicator" on page 126 (0 means a successful measurement with no errors).
- `Avg_tx_power` returns the average transmit power in dBm.

Related Topics

****

"Transmit Power Measurement Description" on page 108

"SETup:TXPower" on page 426

"INITiate" on page 344

"FETCh:TXPower" on page 340

"Comprehensive Program Example" on page 195

****

Transmit Power Troubleshooting

June 29, 1999

Possible Setup Issues

During remote operation of the Transmit Power measurement the user should configure the trigger arm to single, see “SETup:TXPower” on page 426.

Failure to set trigger arm to single may result in the measurement never giving a result. When trigger arm is continuous the measurement rearms itself and starts another measurement cycle, during remote operation the fetch query may not be synchronized to the measurement cycle, see “Measurement States” on page 147.

If trigger source immediate is used for burst modulated signals the results returned will be unreliable. Burst modulated signals should be measured with Trigger Source set to RF Rise or Auto.

The Transmit Power Average, Transmit Power Maximum, Transmit Power Minimum results are shifted in proportion to the value of Amplitude Offset that a user may set. The following table shows the measurements that are affected and how amplitude offset affects them. For more information about amplitude offset commands, see “Measurement Related Configuration” on page 540.

Table 9. Measurements affected by amplitude offset

Amplitude Offset Command	Transmit Power (dBm)			Cell Power Setting (dBm)
	Average	Maximum	Minimum	
OUTPUT 714;”SYSTEM:CORRECTION:SGAIN -3” !Offset for 3 dB of loss in the network.	6.86	6.86	6.85	-88
OUTPUT 714;”SYSTEM:CORRECTION:SGAIN 3” !Offset for 3 dB of gain in the network.	6.86	6.86	6.86	-82
OUTPUT 714;”SYSTEM:CORRECTION:SGAIN 0” !Zero dB of offset.	6.86	6.87	6.85	-85

Interpreting Integrity Indicator values

See “Integrity Indicator” on page 126.

If over range (5) is returned; the input power has exceeded the test set’s internal sampler maximum value during some part of the sampling or the input power has exceeded the calibrated range of the test set’s power detector for the RF Range setting. RF Range is automatically set based on the input power setting. Input power is a combination of amplitude offset and expected power settings. See “Receiver example” on page 541.

If the signal has both over range and under range conditions only the over range (5) will be indicated.

If under range (6) is returned; the Transmit Power result is more than 10 dB below the expected input power level. Under range is also indicated if, the input power is more than 2 dB below the calibrated range of the test set’s power detector for the RF Range setting. RF Range is automatically set based on the input power setting. Input power is a combination of amplitude offset and expected power settings. See “Receiver example” on page 541.

Test Adherence to Standards

December 1, 1999

The Agilent Technologies 8960 series 10 is compliant with ETSI GSM 11.10 Phase 2 Technical specifications.

Frequency Error and Phase Error - ETSI GSM 11.10 section 13.1

The method of test implemented by the test set's Phase & Frequency Error measurement conforms to the measurement method defined in "ETSI GSM 11.10 Ver 4.21.1 Sect 13.1."

Measurements

"Phase and Frequency Error Measurement Description" on page 84

Transmitter Output Power and Burst Timing Error - ETSI GSM 11.10 section 13.3

To make transmitter output power measurement that conforms to ETSI GSM 11.10 standards, perform a Power versus Time measurement with the desired setup. An ETSI compliant, transmitter output power (TXPower) result is available as a result of this measurement. Pass/fail checking of the Power versus Time mask is also available done by the Power versus Time measurement. The Burst Timing Error is available on the Call Setup screen and by issuing a query to the CALL subsystem ("CALL:STATus:TCHannel:TERRor?" on page 279).

Making a faster Transmitter Output Power Measurement.

An alternative method of test for making a transmitter output power measurement is to use the TX Power measurement in the test set. The TX Power measurement implemented in the test set varies from the ETSI recommended method for measuring carrier power in terms of synchronization. The TX Power measurement synchronizes using RF amplitude synchronization instead of midamble synchronization. This was intentionally done to speed up the measurement, as this is one of the most common measurements performed in manufacturing. Obviously, speed is the benefit to the alternative technique used here. This measurement is approximately four times faster than the synchronized method with the same accuracy. However, provided the input signal meets the GSM Power vs. Time (PvT) characteristics, the TX Power measurement gives the same results as the midamble synchronized PvT Carrier Power result.

Measurements

"Transmit Power Measurement Description" on page 108

"Power versus Time Measurement Description" on page 90

Output RF Spectrum Testing Method of Test - ETSI GSM 11.10 section 13.4.4

The Output RF Spectrum due to Switching method of test conforms to the measurement method in "ETSI GSM 11.10 Ver 4.21.1 Sect 13.4.4" for offsets < 1800 kHz.

The Output RF Spectrum due to Modulation method of test conforms to the measurement method in "ETSI GSM 11.10 Ver 4.21.1 Sect 13.4.4" for offsets < 1800 kHz and when "Multi-Measurement Count (Modulation)" is Off, or 1.

Making a faster ORFS measurement.

When Multi-Measurement Count (Modulation) is greater than 1, the measurement is performed over 40 or more bits in each of the regions from bit 15 to 60 and bit 87 to 132 of the burst. In GSM 11.10, the measurement is only specified on the latter section of the burst.

Measuring on both the front and back of the burst has two advantages. First, this method provides two modulation measurements per burst to the user, effectively doubling measurement throughput. Secondly, it provides additional information regarding the spurious performance of the mobile.

The method of test in GSM 11.10 is based upon time gated spectrum analysis; this technique only allows one measurement per bust. Modern DSP techniques employed in the test set makes it possible to measure more of the burst while still excluding the unwanted effects of the midamble and switching transients generated by burst modulation.

Measurements

“Output RF Spectrum Measurement Description” on page 77

Reference Sensitivity - ETSI GSM 11.10 section 14.2

The method of test implemented by the test set's Bit Error measurement conforms to the measurement method defined in "ETSI GSM 11.10 Ver 4.21.1 Sect 14.2.".

Making a faster Reference Sensitivity measurement.

An alternative method of test for making a Reference Sensitivity measurement is to use the Fast Bit Error (FBER) measurement in the test set. The FBER measurement is five times faster than the normal BER measurement.

Measurements

“Bit Error Measurement Description” on page 50

“Fast Bit Error Measurement Description” on page 71

I/Q Tuning Measurement

The I/Q Tuning measurement is not an ETSI specified measurement.

Measurements

“I/Q Tuning Measurement Description” on page 65

Dynamic Power Measurement

The Dynamic Power measurement is not an ETSI specified measurement.

Measurements

“Dynamic Power Measurement Description” on page 63

3 General Programming

Burst Synchronization of Measurements

Measurement Synchronization

Measurement Synchronization Description

Measurement synchronization determines how a measurement's time reference is determined from the measurement data (a sampled time record). Measurement synchronization occurs after the measurement data is captured.

For the transmit power and ORFS (switching and modulation) measurements, the RF amplitude of the input signal is used for measurement synchronization. For Phase and Frequency Error Measurement and the Power versus Time Measurement (see "Phase and Frequency Error Measurement Description" on page 84 and "Power versus Time Measurement Description" on page 90.), however, there are three possible settings for measurement synchronization:

- Midamble
- RF Amplitude
- None

Selecting midamble causes the test set to use the input signal's midamble data to determine the measurement's time reference. A measurement is capable of midamble synchronization if the test set is able to determine transmitted data from measurement samples (i.e. perform demodulation). Midamble synchronization is not available for Transmit Power measurements, however Power vs. Time measurements performs the average power measurement and does provide midamble synchronization.

NOTE When the test set's operating mode is "test mode" or when the cell activated state is "off", the burst type may need to be specified before the test set can synchronize to the input signal's midamble. See "Expected Burst" on page 506.

Selecting RF amplitude causes the test set to use the input signal's rising and falling edges (if edges are detected within the sampled time record) to determine the measurement's time reference. If a non-bursted signal was sampled, the measurement's time reference will be developed using the beginning and end of the sampled time record, and the samples used for making the measurement will be taken from the middle of the time record.

Selecting None causes the test set to perform measurements exactly as if RF amplitude was chosen.

An integrity indicator is returned for each completed measurement. Integrity errors are prioritized so that when multiple errors occur, the highest priority error is returned first, as the root error. The integrity indicator returns a number from 0 to 16, where zero = normal. The following integrity indicators reveal problems with measurement synchronization:

- (7) Burst Short
- (8) Trigger Early
- (8) Fall Early
- (9) Trigger Late
- (9) Rise Late
- (11) Sync Not Found

Refer to "Integrity Indicator" on page 126 for descriptions of integrity indicators.

Programming Example:

```
OUTPUT 714;"SETUP:PVTIME:BSYNC MIDAMBLE"!selects midamble synchronization for PVT
measurements
```

Related Topics

****

"Integrity Indicator" on page 126

"INITiate" on page 344

"SETup Subsystem" on page 395

****

Programming a Channel Mode Change

This section provides an example of how to change a mobile stations's channel mode to enhanced full rate speech via GPIB while a call is connected and a measurement is running.

The following procedure assumes that an active link is established between the test set and the mobile station. See "Establishing an Active Link with the Mobile Station" on page 26.

1. Ensure the mobile is initially in full rate speech channel mode.
2. Configure the parameters for the measurement(s) you want to run using the SETup subsystem.
3. Start the measurement(s) using the INITiate subsystem.
4. Change the mobile's channel mode to enhanced full rate speech.
5. Use the INITiate:DONE? command to find out if the measurement results are available.
6. Use the FETCh? command to obtain the measurement results.

Program Example

The following program uses the TX Power measurement to show how to change the channel mode to enhanced full rate speech while a measurement is running. The TX Power measurement is chosen because it is one of the measurements that is supported in enhanced full rate speech mode.

```
10    OUTPUT 714;"CALL:TCHANNEL:CMODE FRSPEECH" !Ensure mobile is in
20                        !full rate speech channel mode initially.
30    OUTPUT 714;"SETUP:TXPOWER:CONTINUOUS OFF" !Configures trigger
40                        !mode to single for a TX Power measurement.
50    OUTPUT 714;"SETUP:TXPOWER:COUNT:NUMBER 100" !Configures a
60                        !multi measurement of 100.
70    OUTPUT 714;"SETUP:TXPOWER:TRIGGER:SOURCE AUTO" !Configures the
80                        !trigger source to auto.
90    OUTPUT 714;"INITIATE:TXPOWER" !Start TX Power measurement.
100   OUTPUT 714;"CALL:TCHANNEL:CMODE EFRSPEECH" !Sets the channel
110                       !mode to enhanced full rate speech while
120                       !the TX Power measurement is running.
130   REPEAT
140   OUTPUT 714;"INITIATE:DONE?" !Check to see if TX Power
150                       !measurement is complete.
160   ENTER 714;Meas_complete$
170   UNTIL Meas_complete$="TXP"
180   OUTPUT 714;"FETCH:TXPOWER:ALL?" !Fetch TX Power results.
190   ENTER 714;Integrity,Avg_tx_pwr
200   PRINT "TX Power Measurement Results"
210   PRINT "Integrity=";Integrity
220   PRINT "TX Power=";Avg_tx_pwr
230   END
```

Returned Values

The measurements returned by this program are:

- Integrity returns the measurement “Integrity Indicator” on page 126 (0 means a successful measurement with no errors).
- Avg_tx_pwr returns the average transmit power in dBm.

Related Topics

****

“Testing a Mobile for Enhanced Full Rate Speech Channel Mode” on page 512

“CALL:TCHannel:CMODe” on page 284

****

Programming a Dualband Handover

December 1, 1999

The dualband handover function has been implemented as an interband channel assignment rather than an interband handover, since the test set currently has one BCH (cell).

How the Test Set Performs a Dualband Handover

The test set has the ability to switch traffic channels (TCH) from the EGSM or PGSM band to the DCS or PCS band, from the DCS or PCS band to the EGSM or PGSM band. No other combinations of traffic channel band handovers are supported. Also, the traffic channel band can be changed only when an active link exists between the test set and a mobile station. See "Establishing an Active Link with the Mobile Station" on page 26

To perform a handover from the test set's front panel from PGSM select DCS or PCS from the Traffic Band field in the Call Parms window.

To perform a handover from the test set's front panel from EGSM select DCS or PCS from the Traffic Band field in the Call Parms window.

There is a set of parameters that can be set up to take on different values depending on the broadcast band currently selected. These are called "Frequency Banded Parameters" on page 481. After a handover, the frequency banded parameters for the new band are active. Only one set of frequency banded parameters is active at any one time; however, the user can set up any of the BCH and TCH parameters for both bands involved in the handover because the test set will remember the settings and switch to them when the handover occurs.

Programming Example

```
OUTPUT 714;"CALL:TCHANNEL:BAND DCS" !Performs a dualband handover to the
                                    !currently selected DCS traffic channel.
```

Related Topics

****

"Performing a Dual-Band Handover" on page 187

"CALL:TCHannel" on page 280

****

Dealing With Semicolon Separated Response Data Lists

In accordance with IEEE 488.2-1992 Section 8.4.1 the test set uses the semicolon (;) as the response message unit separator (RMUS). The RMUS separates sequential response message unit elements from one another when multiple response message unit elements are sent in a response message. This condition would occur when combining multiple queries into a single GPIB transaction.

Query Response Data Types Used By Test Set

The test set can return the following data types in response to queries:

- character data (char): ASCII characters A-Z (65-90 decimal), underscore (95 decimal), digits (48-57 decimal).
- string data: ASCII characters enclosed in quotes (for example, “5551212” or “PGSM”)
- numeric response data (nr1): numeric data in the form +/- dddddddd
- numeric response data (nr3): numeric data in the form +/- ddd.ddd E +/- dddd

Semicolon Separated Response Data Lists Containing Mixed Data Types

Problems can occur when trying to enter semicolon separated response data lists containing mixed data types.

For example: If the following command string is sent to the test set, the test set will respond by constructing a response message which contains multiple response message unit elements (that is, one response message unit element for each query item contained in the command string). Some response message unit elements are string data type, some are character data type and some are nr3 data type.

```
OUTPUT 714;"CALL:MS:REP:IMSI?;PCL?;REV?;SBAN?;ONUM?;MCC?;MNC?;LAC?"
```

An example response message generated by the test set in response to the above OUTPUT statement would be:

“001012345678901”;+4.00000000E+000;PHAS1;”PGSM”;”5551212”;9.91E37;9.91E37;9.91E37

Since the programmer knows that the control program should expect multiple responses to the above command string he or she might construct the following data entry statement:

```
ENTER 714;Imsi$,Pcl,Rev$,Sban$,Onum$,Mcc,Mnc,Lac
```

In the Rocky Mountain Basic programming environment the above ENTER statement will fail with an ‘Insufficient data for ENTER’ error. Some programming languages, Rocky Mountain Basic for example, cannot use the semicolon character as a data item terminator for string variables. In this example Rocky Mountain Basic will attempt to enter data into Imsi$ until it sees an LF (line feed) data item terminator. The test set does not send the LF until all the data has been sent. Consequently when Rocky Mountain Basic sees the LF it terminates entry of data into Imsi$ and starts to look for data to enter into Pcl. Since the test set is no longer sending any data the error message ‘Insufficient data for ENTER’ is generated.

One possible workaround is to enter all the data into a single string variable, replace all semicolons with line feeds and then enter the data from the string into the individual data items. For example:

```
DIM Response$[500]
!
!
OUTPUT 714;"CALL:MS:REP:IMSI?;PCL?;REV?;SBAN?;ONUM?;MCC?;MNC?;LAC?"
ENTER 714;Response$
Semicolon=POS(Response$,";")
WHILE Semicolon
Response$[Semicolon,Semicolon]=CHR$(10)
Semicolon=POS(Response$,";")
END WHILE
ENTER Response$;Imsi$,Pcl,Rev$,Sban$,Onum$,Mcc,Mnc,La
```

Semicolon Separated Response Data Lists Containing Only Numeric Data Types

Semicolon separated response data lists containing only numeric data types do not present the types of problem associated with semicolon separated response data lists containing mixed data types. The number building routines in most languages will use any non-numeric character (that is, anything other than +/- 0123456789 E .) as the data item terminator. Consequently when the number building routines encounter the semicolon the data item is terminated. The following example illustrates this:

```
OUTPUT 714;"FETCH:TXP:INT?;POW:MIN?;MAX?"
ENTER 714;Integrity,Min_power,Max_powe
```

Concurrent Measurements

July 27, 1999

A number of measurements can be initiated (with the INITiate command) while other measurements are being made, and the test set will perform as many operations simultaneously as its architecture allows. This technique is referred to as concurrency. Performing measurements concurrently can greatly improve test throughput.

This table shows the concurrency considerations for the E1960A GSM Mobile Test Application .

Table 1. Concurrency Considerations

	BER	TCH assignment/handover	Transmit Power Level change	Mobile SACCH info	Audio Level Meas	Audio Source	Downlink Speech Source	Decoded Audio	Fast Bit Error	Output RF Spectrum	Phase & Frequency Error	Power vs. Time	Transmit Power
Uplink Path Demodulation													
Transmit Power		C								B		B	
Power vs. Time		C			B		B	B		B	B		
Phase & Frequency Error		C			B		B	B		B			
Output RF Spectrum		C			B		B	B					
Fast Bit Error	A	C	C				A	A					
Decoded Audio	A	C											
Downlink Speech Source	A												
Audio Source													
Audio Level Meas													
Mobile SACCH info													
Transmit Power Level change	C												

Table Key:

Empty cell: No concurrency considerations

A: Cannot operate concurrently. Whichever measurement is activated most recently will cause all other conflicting measurements to be deactivated.

B: These measurements share a sampler path. If multiple measurements are initiated at same time, the measurements will execute sequentially. If multiple measurements are configured to operate off of the same trigger event and only a single occurrence of that event happens, only one measurement will complete (the first measurement in the sequence of measurements).

C: The test set will not prevent the user from changing the TCH ARFCN or transmit power level while the measurement is in progress. However, changing the TCH ARFCN or transmit power level while the measurement is in progress will cause the measurement to start over which will cause the measurement to take longer to execute.

Operating Considerations

The test set's block diagram ("Block Diagram" on page 484) includes three parallel signal paths. One path, the demodulation downconverter, is primarily used for base station emulation. This frees the measurement downconverter and power detector from performing functions necessary to maintain an active RF link. Since measurements are DSP (digital signal processor) based, and there are four A/D converters available to digitize or "sample" the input signal for analysis by the DSP, the test set will always have the capability to perform link maintenance, one transmitter, and one receiver measurement concurrently. The test set's ability to perform multiple transmitter, or multiple receiver tests concurrently will depend on the availability of resources within the test set and availability of the signal to be tested.

The only absolute restriction regarding concurrency is that the downlink speech source cannot be used when the FBER or BER measurements are running. These measurements take absolute control of the downlink speech source and use it to generate the pseudo-random data. (The test set prevents the user from accessing the downlink speech source while the FBER or BER measurements are running). Other than this restriction, multiple measurements can always be initiated with a single program message, and the test set will manage and report the sequence that measurement results are made available to the controlling application through the INITiate:DONE? query. Refer to "Measurement Event Synchronization" on page 133.

Related Topics

****

"Measurement Event Synchronization" on page 133

****

Integrity Indicator

Description

The test set can evaluate its own performance and make a determination as to the validity of a measurement result. The test set evaluates the conditions surrounding a measurement and reports to the user its evaluation of these conditions in a parameter called the measurement integrity indicator. A measurement integrity indicator value is returned for every completed measurement. It is recommended that the user take advantage of this feature in every measurement.

The returned value defines whether or not a problem was encountered by the measurement process. It is not, however, guaranteed to be the only or root cause of the measurement problem. This is because some of the conditions surrounding a measurement may interact and the test set may have insufficient information to determine the root cause of the measurement problem. However, in most cases, the value returned is the most likely cause of the problem.

The values returned by the measurement integrity indicator range from 0 to 16. Not all of the values are available for each measurement or Test Application, if a value doesn't apply it will not be available.

Example: Questionable Result for PGSM (15) and Questionable Result Due To Channel Mode (16) are GSM only integrity indicator values.

NOTE Measurement synchronization must be set to midamble in order for GSM measurements to return integrity indicator (8, 9, 11).

(**0**) Normal: Indicates the measurement completed successfully without error and the result is accurate.

(**1**) No Result Available: Indicates that there is no measurement result and returns NAN (not a number).

(**2**) Measurement Timeout: Indicates that a measurement has timed out. The measurement timeout state must be set to ON.

(**3**) Hardware Not Installed: Indicates that a piece of hardware is not installed in the test set, or the hardware has failed in a way which leads the instrument controller to believe it isn't installed.

(**4**) Hardware Error: Indicates that a hardware failure has occurred. These include failures such as a phase lock loop out-of-lock, defective DSP samplers, or power detectors that can not be calibrated.

(**5**) Over Range: Indicates that the input signal is over range. The amplitude of the device-under test's (DUT's) signal is causing the voltage at a DSP sampler to be above its maximum input level or the frequency is too high or the voltage measured is beyond the maximum voltmeter range, either positive or negative.

(**6**) Under Range: Indicates that the input signal is under range. The amplitude of the DUT's signal is not high enough for the DSP sampler to produce accurate results with the measurement algorithm.

(**7**) Burst Short: Indicates that the burst duration is too short, or part of the burst was not sampled due to improper triggering.

(**8**) Trigger Early or Fall Early: Indicates that the DUT's burst amplitude fell prematurely or, due to an early trigger (early relative to a transmitted burst) the measurement sampling operation terminated before the falling edge of the burst.

(**9**) Trigger Late or Rise Late: Indicates that either the rising edge of the DUT's burst was late or, due to a late trigger (late relative to a transmitted burst) the measurement sampling operation didn't start until after the rising edge of the transmitted burst.

(**10**) Signal Too Noisy: Indicates that the measurement algorithm has found the signal measured to be too noisy to provide accurate results.

(**11**) Sync Not Found: Indicates that the midamble was not found therefore the measurement was not synchronized.

(**12**) Oven Out of Range: Indicates that a temperature controlled oven (other than the internal timebase oven) is outside of its operating range. The power meter's oven is checked and its condition reported with this value. (The internal timebase generates a temporary error message (out of lock) that is sent to the system error queue and the display. This is not an integrity indicator value, it is an error message.)

(**13**) Unidentified Error: Indicates errors which are not covered by the other integrity values. Examples include: parameter errors, algorithm memory errors (too many measurements), measurements unavailable (unable to control), autorange unable to converge, default calibration data used.

(**14**) PCM Full Scale Warning: Indicates that the PCM signal has reached plus or minus full scale. The measurement made will be accurate on the PCM signal but would typically indicate an overdriven or oscillating element in the DUT.

(**15**) Questionable Result for PGSM: Indicates that the user attempted to make an FBER measurement in a phase 1 system. FBER is only possible in a phase 2 GSM system. This indicator is available only when the selected broadcast band is PGSM.

(16) Questionable Result Due To Channel Mode: Indicates that the channel mode was set to Enhanced Full Rate Speech while a Decoded Audio measurement was active. Decoded Audio is not supported for EFR Speech.

Integrity Indicators verses Error Message

Error messages are divided into four classes: integrity errors, fatal errors, persistent errors, and non-persistent errors.

Integrity indicator errors are 1 of 16 different messages that indicate if a measurement was valid.

Fatal errors consist of asserts and exceptions. Asserts occur when firmware encounters a condition that should never occur. Exceptions occur when firmware attempts to access a memory location that is invalid.

Non-persistent occur errors if a condition exists that is incorrect but has no serious lasting effect on instrument operation.

Persistent errors occur when hardware failures are found or when damage or injury to a person or the test set may occur.

Example Program

```
10  OUTPUT 714;"INITIATE:TXPOWER" !Start TXP measurement
20  OUTPUT 714;"FETCH:TXPOWER?" !Request measurement results.
30  ENTER 714;Integrity,Tx_power !Read measurement results.
40  IF Integrity = 0 THEN !Permits measurement to be printed if integrity
50                        !indicator indicates a successful measurement
60  PRINT "TX Power =";Tx_power!if 0 then measurement was successful
70  ELSE
80  PRINT "Measurement integrity questionable, integrity value = ";Integrity
90                                        !If integrity not zero then print
100                                       !integrity value.
110 END IF
120 END
```

Related Topics

****

"Classes of Errors" on page 550

****

Measurement Timeouts

Description

The primary use of measurement timeouts is to regain control of the test set's GPIB in cases where the bus could potentially "hang."

The time normally required for a measurement to complete may vary greatly depending on the individual measurement, its settings, it's multiple measurement count value, and so forth. Because of this, the default timeout and timeout resolution are fairly coarse and are set to allow large variations in measurement time. You may need to set the timeout longer than the default for measurements where a large number of multiple measurements are requested or where measurement triggers may be infrequent.

Be careful when setting a timeout that is shorter than the default. It is possible, especially when measurements are performed concurrently, to specify a timeout that is so short the measurement does not even have a chance to begin. Measurement timeouts should always be at least several seconds long.

Table 2. List of Timeouts and Default Values

Measurement Function	Default Timeout Time	Default Timeout State	Integrity Indicator Value
Transmit Power (TX power or TXP)	10 seconds	OFF	2
Power versus Time (PvT)	10 seconds	OFF	2
Phase and Frequency Error (PFER)	10 seconds	OFF	2
Output RF Spectrum (ORFS)	10 seconds	OFF	2
Fast Bit Error Rate (FBER)	10 seconds	OFF	2
Bit Error Rate (BER)	10 seconds	OFF	2
Analog Audio (AAUDIO)	10 seconds	OFF	2
Decoded Audio (DAUDIO) also know as uplink speech level	10 seconds	OFF	2
Call Control Status Change Arm	10 seconds	OFF	Not included

Timeout units default to S (seconds). The seconds suffix is an optional part of the command. If you want MS (milliseconds), US (microseconds) or NS (nanoseconds), you must specify these units in the suffix.

Program Example

The following program will force a timeout to occur on an attempted transmit power measurement. The integrity indicator should return a 2 (the measurement timeout indicator).

```
10  OUTPUT 714;"CALL:END" !Ends a call that may have been connected, inhibiting
20                        !protocol as a trigger source.
30  OUTPUT 714;"SETUP:TXPOWER:TIMEOUT:TIME 5;STATE ON" !Sets a timeout value
40                                                     !of 5 seconds
50  OUTPUT 714;"INITIATE:TXPOWER" !Initiates a single TX power measurement.
60  OUTPUT 714;"FETCH:TXPOWER?" !Queries the TX Power measurement result.
70  ENTER 714;Integrity,Tx_pwr_result
80  PRINT "Integrity indicator was ";Integrity
90  IF Integrity = 2 THEN !Integrity Indicator 2 indicates TX power timed-out.
100 PRINT "Measurement timed out"
110 ELSE
120 PRINT "Measurement did not time out, TX power measurement result was ";Tx_pwr_result
130 END IF
140 END
```

In this example, if the TX power measurement takes longer than 5 seconds to complete, the FETCh command will obtain an integrity value of 2. The test set's GPIB will then be available to accept more commands.

Related Topics

****

"Integrity Indicator" on page 126

****

Invalid Measurement Results

Description

Invalid measurement results are returned by the test set when conditions such as signal level are not within the present measurement range. Three different invalid measurement results are provided in order to help the user understand the condition that caused the invalid result.

- 9.9E+37 = INFinity (Infinity)
- -9.9E+37 = NINF (Negative Infinity)
- 9.91E+37 = NAN (Not A Number)

9.9E+37 (INFinity)

9.9E+37 is returned by the test set when, the measurement is out of range, results are far above the present measurement range.

-9.9E+37 (NINFinity)

-9.91E+37 is returned by the test set when, the measurement is out of range, results are far below the present measurement range.

9.91E+37 (NAN)

9.91E+37 is returned by the test set when, the measurement is out of range but it can not be determined if measurement results are far above, or far below the measurement range.

If a measurement exceeds its measurement timeout value before a valid result is determined, 9.91E+37 is returned.

FETCH? and READ? Invalid Results

When a FETCH? or READ? query is performed on a measurement with invalid results, the integrity indicator will return a value of 1, indicating No Result Available.

Manual Users Invalid Results

Manual users will generally see four dashes , "----" on the test set display. When the measurement timeout value has been exceeded, "Measurement Timeout" is displayed as well as the four dashes .

Measurement Progress Report

Description

The measurement progress report is a query of how far along a multi-measurement cycle has progressed. When the multi-measurement count is greater than one, the measurement progress report will indicate the number of measurements that have completed. The returned value will be the last update and not the actual number, because the value is updated periodically and not for each multi-measurement cycle. Every measurement has the measurement progress report available.

Example

```
OUTPUT 714;"FETCH:PVTIME:ICOUNT?" !Returns the approximate number of
                                  !multi-measurement cycles completed during a
                                  !multi-measurement count cycle
```

Related Topics

****

"Statistical Measurement Results" on page 137

****

Measurement Event Synchronization

December 1, 1999

Description

Measurement event synchronization controls the communication between the controller, the test set, and the mobile station so that no device does something before it is supposed to, which can cause errors, or does something well after it could have, which wastes time. Because some measurements can run concurrently (see “Concurrent Measurements” on page 124), it is necessary that the control program know when individual measurement results are available.

Measurement event synchronization is accomplished using the INITiate subsystem’s command INITiate:DONE? or the STATus:OPERation:NMRReady:GSM status registers.

INITiate:DONE?

The INITiate:DONE? query returns a string that indicates what, if any, measurements are ready to be fetched. This query should be used inside a loop, checking each measurement that was initiated. See “INITiate:DONE?” on page 346 for more details about this query.

The INITiate:DONE? query returns at least one of the following indicators for each pass through the loop:

- "TXP" - The transmit power measurement results are available
- "PVT" - The power versus time measurement results are available.
- "PFER" - The phase and frequency error measurement results are available.
- "FBER" - The fast bit error measurement results are available.
- “BERR” - The bit error measurement results are available.
- "AAUD" - The analog audio measurement results are available.
- "DAUD" - The decoded audio measurement results are available.
- "ORFS" - The output RF spectrum measurement results are available.
- "DPOW" - The dynamic power measurement results are available.
- "IQT" - The I/Q Tuning measurement results are available.
- "WAIT" - There are one or more measurements which are in the measuring state which are not excluded from the query. See “INITiate:DONE:FLAG<measurement mnemonic>” on page 347. When WAIT is returned at least one measurement is not ready to be fetched yet.
- "NONE" - There are no measurements currently in the measuring state. This assumes no measurements have been excluded. See “INITiate:DONE:FLAG<measurement mnemonic>” on page 347. This would indicate that all measurements results are available or none have been initiated.

Programming Example

The following example assumes that a call is currently connected and that no measurements other than TX power (TXP) and phase and frequency error (PFER) are currently being triggered. See “Establishing an Active Link with the Mobile Station” on page 26 and “Triggering Process Description” on page 146.

```
10  OUTPUT 714;”SETUP:TXPOWER:CONTINUOUS OFF” !Sets TX power trigger mode
20                                            !to single.
30  OUTPUT 714;”SETUP:PFERROR:CONTINUOUS OFF” !Sets PFER trigger mode
40                                            !to single.
50  OUTPUT 714;”INITiate:TXPower;PFERror” !Begins a TX power and
60                                        !PFER measurement.
70  REPEAT
80  OUTPUT 714;”INITIATE:DONE?” !Queries the test set for measurements
90                              !that are done
100 ENTER 714;Meas_done$ !String value representing DONE measurements,
110                      ! NONE if no measurements are done.
120 SELECT Meas_done$ !This variable will be set to WAIT until measurements
130                   !are DONE.
140 CASE “TXP” !Characters must be upper case.
150 OUTPUT 714;”FETCH:TXPOWER:POWER?” !If this case is selected, Tx power
160                                   !(no integrity indicator) is FETCHed.
170 ENTER 714;Tx_power
180 PRINT “TX_Power is “;Tx_power
190 CASE “PFER” !Characters must be uppercase.
200 OUTPUT 714;”FETCH:PFERROR:RMS?” !If this case is selected, rms phase error
210                                 !measurement is FETCHed.
220 ENTER 714;Phs_error
230 PRINT “Max RMS Phase Error is “;Phs_error
240 END SELECT
250 UNTIL Meas_done$ = “NONE” !When all triggered measurements have completed,
260                           !the INITiate:DONE? query returns NONE.
270 END
```

STATUS:OPERATION:NMRREADY:GSM

The STATus:OPERation:NMRReady:GSM command allows the program to immediately branch to the next operation or command without continuing through a loop as in INITiate:DONE? See "STATus:OPERation:NMRReady:GSM Condition Register Bit Assignment" on page 440 for more details about this command.

The user must enable the following so that as soon as the enabled NMRReady bit is true the program moves on.

- Positive or negative transition filter. See"Transition Filters" on page 141.
- STATus:OPERation:NMRReady:GSM bit for the measurement desired.
- STATus:OPERation:NMRReady bit (4 for GSM) for the required system. See "The Test Set's STATus Subsystem" on page 138.
- STATus:OPERation bit (512 for NMRReady). See "The Test Set's STATus Subsystem" on page 138.
- Service Request Enabling (*SRE 128 for NMRReady). See "The Test Set's STATus Subsystem" on page 138.

The "STATus:OPERation:NMRReady:GSM Condition Register Bit Assignment" on page 440 status register provides status reporting on the following measurement completions:

- TX Power
- Power vs. Time
- Phase/Frequency Error
- Output RF Spectrum
- Analog Audio
- Decoded Audio
- Fast Bit Error
- Bit Error
- I/Q Tuning
- Dynamic Power

Example 1. Generating a Service Request (SRQ) Interrupt - Bit Error Rate NMRR

The following example illustrates the use of the STATus subsystem to generate a service request when a BERR measurement has completed. This code assumes a call is already connected and the BERR measurement is setup (mobile station must be in loopback type A or B).

```
10  OUTPUT 714;"STATUS:OPERATION:NMRREADY:GSM:PTR 256" !Enable positive transition
20                                                   !filter on fast BER bit.
30  OUTPUT 714;"STATUS:OPERATION:NMRREADY:GSM:ENABLE 256" !Enable the fast BER Bit to
40                                                      !generate a summary message.
45  OUTPUT 714;"STATUS:OPERATION:NMRREADY:ENABLE 4" !Enable the GSM summary bit.
50  OUTPUT 714;"STATUS:OPERATION:ENABLE 512" !Enable the Operation summary bit to
60                                             !generate a summary message.
70  OUTPUT 714;"*SRE 128" !Enable the service request enable register to generate SRQ.
80  OUTPUT 714;"*CLS" !Clear all status data structures.
90  ON INTR 7,15 CALL Meas_complete !Define interrupt-initiated branch with a priority
100                                 !of 15 (highest)
110 ENABLE INTR 7;2 !Enable interrupt on interface card 7 with a bit mask
120                 !(for interface's interrupt-enable register) of 2.
130 OUTPUT 714;"SETUP:FBER:CONTINUOUS OFF;:INITIATE:FBERROR" !Initiate a single
140                                                          !fast BER test.
150 LOOP
160 DISP "Waiting for BERR test to complete"
170 WAIT .1 !"Dummy" loop
180 END LOOP
190 !Instead of a "dummy" loop, controlling application could be performing setups,
200 !making measurements, etc.
210 END
220 SUB Meas_complete
230 DISP "BER test complete, OK to FETCh results now"
240 Clear_interrupt=SPOLL(714) !Clear the RQS message in the status byte register.
250 STOP
260 SUBEND
```

Operating Considerations

Only one indicator is returned per query.

To ensure that when a measurement completes it will remain in a state that qualifies it as DONE, use the SETup subsystem to set all active measurements to single (CONTinous:OFF) trigger mode.

Related Topics

****

"INITiate Command Functions" on page 349

"What Happens When a Measurement is INITiated?" on page 349

****

Statistical Measurement Results

Description

Most measurements have a setup window that provides for the entry of a multi-measurement count value. This specifies how many measurements the test set will perform to obtain a set of values from which to calculate the following statistical measurement results:

- Average (arithmetic mean) of measurement set
- Minimum value from measurement set
- Maximum value from measurement set
- Standard Deviation of measurement set

Operating Considerations

The advantages of using the multi-measurement feature to obtain statistical measurement data include: reduced time associated with GPIB bus traffic, and reduced time configuring hardware. This is because the number of measurements specified in the multi-measurement count value are performed during one measurement cycle.

Programming Example

```
OUTPUT 714;”SETUP:TXPOWER:SNUMBER 10” !Enters a TX Power multi-measurement count
                                      !value of 10, and turns the TX Power
                                      !multi-measurement state on.
```

Related Topics

****

“Measurement Progress Report” on page 132

****

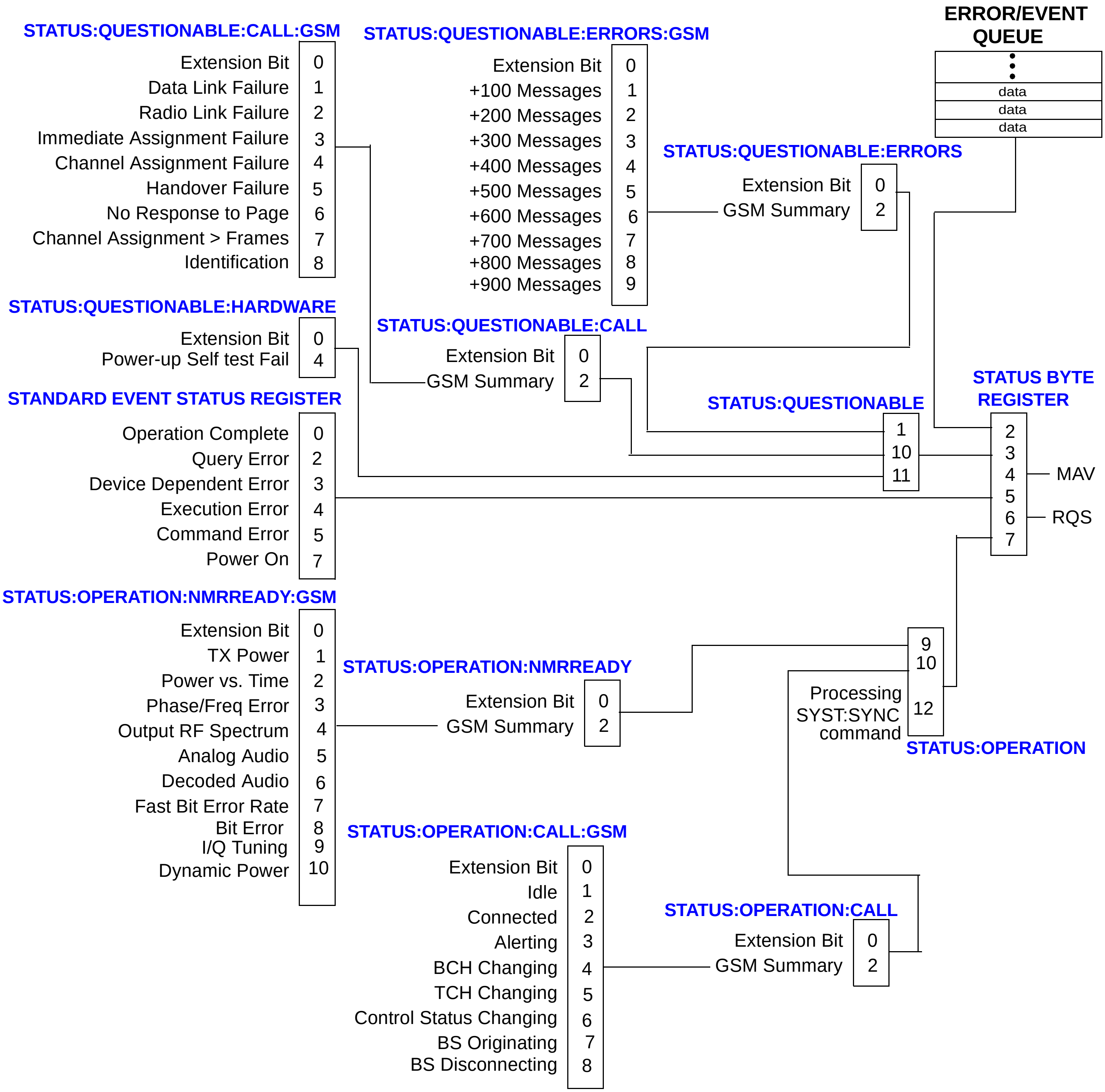
Status Subsystem Overview

The Test Set's STATus Subsystem

The following STATus subsystem functionality, leveraged from SCPI and IEEE 488.2 are implemented in the test set:

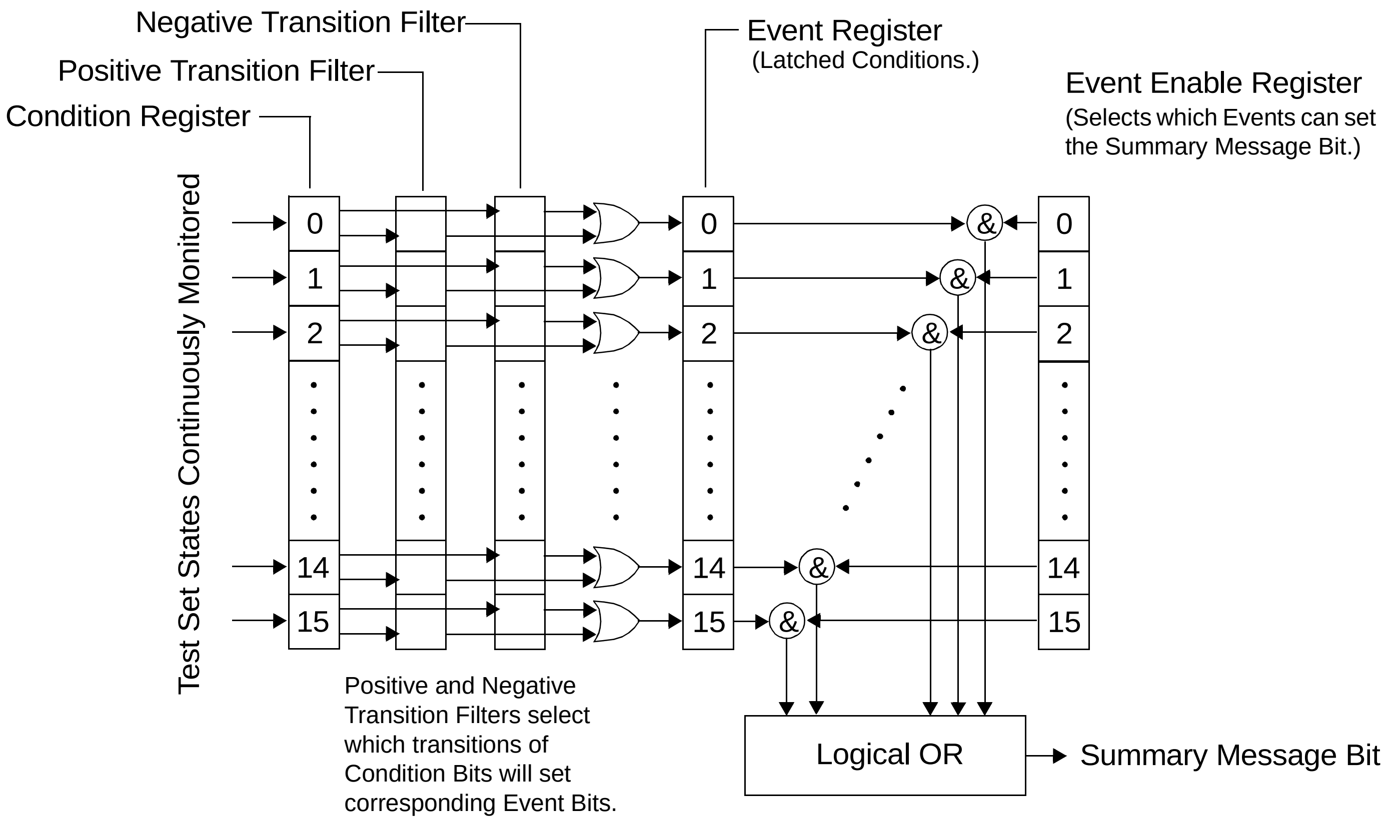
- SCPI - defined "fan-out", where a Summary Message Bit is associated with another entire register (see "Overview of STATus Reporting Structure" on page 139.
- IEEE 488.2 Status Data Structure - Register Model (see "Status Data Structure - Register Model" on page 140).
- The SCPI - defined Error/Event Queue (see "Status Data Structure - Queue Model" on page 142.
- The IEEE 488.1 - defined and IEEE 488.2 - defined Status Byte (see "*STB?" on page 454)
- The SCPI OPERation and QUEStionable (data/signal) Status Registers (see "Syntax Diagrams and Command Descriptions" on page 431.
- The IEEE 488.2 - defined Standard Event Status Register (see "Standard Event Status Register Model" on page 143)
- The IEE 488.2 - defined Status Byte Enabling Register (see "Service Request Enabling Register Model" on page 144)

Overview of STATus Reporting Structure



Status Data Structure - Register Model

The generalized status register model consists of a Condition Register, Transition Filters, an Event Register, an Enable Register, and a Summary Message Bit.



Condition Register

A condition is a test set state that is either TRUE or FALSE (a GPIB command error has occurred or a GPIB command error has not occurred). Each bit in a Condition Register is assigned to a particular test set state. A Condition Register continuously monitors the hardware and firmware states assigned to it. There is no latching or buffering of any bits in a Condition Register; it is updated in real time. Condition Registers are read-only. Condition Registers in the test set are 16 bits long and may contain unused bits. All unused bits return a zero value when read.

Some status register groups do not implement Condition registers for certain test set conditions. In the tables labeled “Bit Definitions”, these conditions are indicated by the word “NO” in the column labeled “Is Condition Register Implemented?”.

Transition Filters

In the test set, the Transition Filters are implemented as two registers: a 16-bit positive transition (PTR) register and a 16-bit negative transition (NTR) register.

For each bit in the Condition Register, a Transition Filter bit determines the state transitions which will set a corresponding bit in the Event Register. Transition Filters may be set to pass positive transitions (PTR), negative transitions (NTR) or either (PTR or NTR). A positive transition refers to a condition bit which has changed from 0 to 1. A negative transition refers to a condition bit which has changed from 1 to 0.

A positive transition of a bit in the Condition register will be latched in the Event Register if the corresponding bit in the positive transition filter is set to 1. A positive transition of a bit in the Condition register will not be latched in the Event Register if the corresponding bit in the positive transition filter is set to 0.

A negative transition of a bit in the Condition register will be latched in the Event Register if the corresponding bit in the negative transition filter is set to 1. A negative transition of a bit in the Condition register will not be latched in the Event Register if the corresponding bit in the negative transition filter is set to 0. Either transition (PTR or NTR) of a bit in the Condition Register will be latched in the Event Register if the corresponding bit in both transition filters is set to 1. No transitions (PTR or NTR) of a bit in the Condition Register will be latched in the Event Register if the corresponding bit in both transition filters is set to 0.

Transition Filters are read-write.

Transition Filters are unaffected by a *CLS (clear status) command.

Transitions Filters are set to pass positive transitions (all 16 bits of the PTR register are set to 1 and all 16 bits of the NTR register are set to 0) at power on or after receiving the *RST (reset) command.

Event Register

The Event Register captures bit-state transitions in the Condition Register as defined by the Transition Filters. Each bit in the Event Register corresponds to a bit in the Condition Register, or if there is no Condition Register/Transition Filter combination, each bit corresponds to a specific condition in the test set. Bits in the Event Register are latched, and, once set, they remain set until cleared by a query of the Event Register or a *CLS (clear status) command. This guarantees that the application can't miss a bit-state transition in the Condition Register. There is no buffering; so while an event bit is set, subsequent transitions in the Condition Register corresponding to that bit are ignored. Event Registers are read-only. Event Registers in the test set are either 8 or 16 bits long and may contain unused bits. All unused bits return a zero value when read.

Event Enable Register

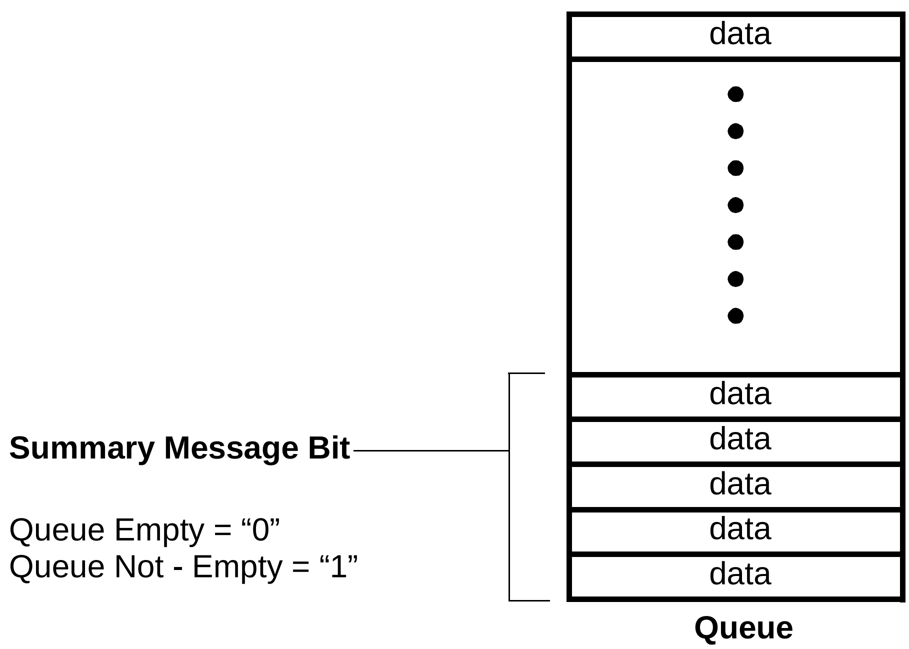
The Event Enable Register defines which bits in the Event Register will be used to generate the Summary Message. Each bit in the Enable Register has a corresponding bit in the Event Register. The test set logically ANDs corresponding bits in the Event and Enable registers and then performs an inclusive OR on all the resulting bits to generate the Summary Message. By using the enable bits the application program can direct the test set to set the Summary Message to the 1 or TRUE state for a single event or an inclusive OR of any group of events. Enable Registers are read-write. Enable Registers in the test set are either 8 or 16 bits long and may contain unused bits which correspond to unused bits in the associated Event Register. All unused bits return a zero value when read and are ignored when written to. Enable Registers are unaffected by a *CLS (clear status) command or queries.

Summary Message Bit

The Summary Message is a single-bit message which indicates whether or not one or more of the enabled events have occurred since the last reading or clearing of the Event Register. The test set logically ANDs corresponding bits in the Event and Enable registers and then performs an inclusive OR on all the resulting bits to generate the Summary Message. By use of the enable bits, the application program can direct the test set to set the Summary Message to the 1, or TRUE, state for a single event or an inclusive OR of any group of events. The Summary Message is TRUE when an enabled event in the Event Register is set TRUE. Conversely, the Summary Message is FALSE when no enabled events are TRUE. Summary Messages are always seen as bits in another register.

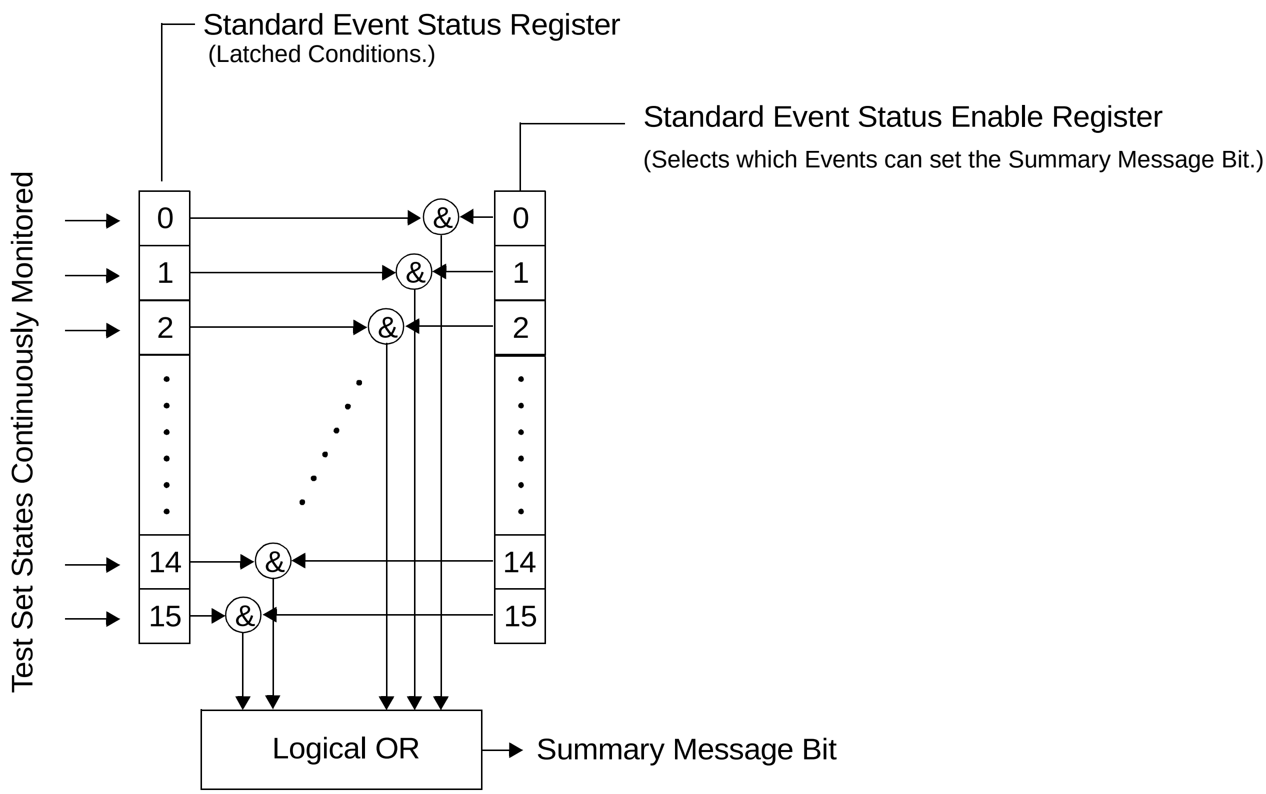
Status Data Structure - Queue Model

The generalized status queue model is the basis upon which all the status queues in the test set are built. A queue is a data structure containing a sequential list of information. The queue is empty when all information has been read from the list. The associated Summary Message is TRUE, logic 1, if the queue contains some information and FALSE, logic 0, if the queue is empty. Queues can be cleared by reading all the information from the queue. Queues, except the Output Queue, can also be cleared using the *CLS (clear status) command.



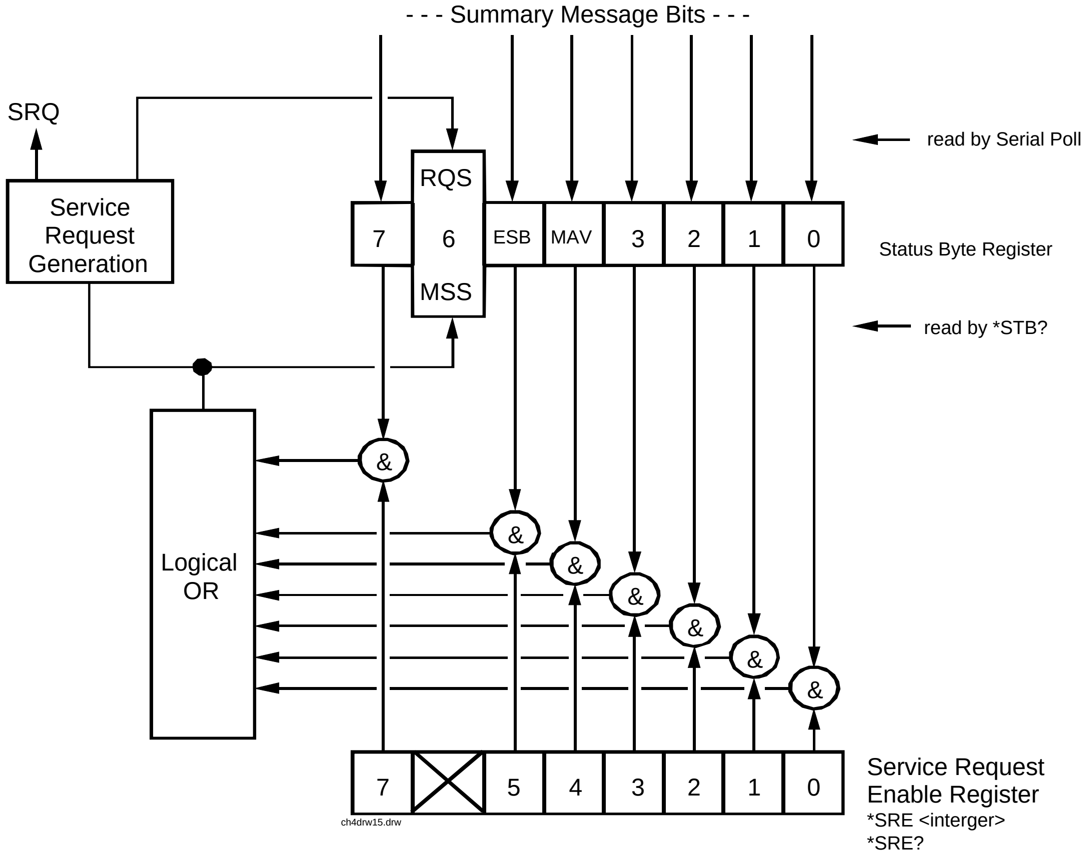
Standard Event Status Register Model

This data structure is a specific implementation of the “Status Data Structure - Register Model” on page 140. For bit definitions and command syntax, see “Standard Event Status Register” on page 455



Service Request Enabling Register Model

This data structure is a specific implementation of the “Status Data Structure - Register Model” on page 140. For bit definitions and command syntax, see “Standard Event Status Register” on page 455



Related Topics

****

“STATus Subsystem Description” on page 431

****

Triggering of Measurements

Measurement Triggering

Trigger Source Description

A measurement trigger causes hardware (for example, a sampler) to capture data which is used by a measurement algorithm to produce a measurement result. The following table shows the trigger source selections available to the user.

Table 3. Trigger Source choices

Trigger Source	Function
RF Rise	Generates trigger from amplitude of signal being measured.
Protocol	Generates trigger from protocol timing.
External	Generates trigger from an external signal.
Immediate	Generates trigger from measurement initiation.
Auto	The test set selects the trigger source optimized for a given measurement.

RF Rise Trigger Source: When RF rise triggering is selected, a measurement dependent threshold is used to define the trigger point on the envelope of the signal being measured. The envelope amplitude must fall below this threshold and remain there for a measurement-dependent period of time before the trigger is armed. After the trigger is armed, a trigger will occur as the envelope amplitude increases and passes through the threshold.

Protocol Trigger Source: When protocol triggering is selected, a data capture is triggered by a protocol generated signal. The test set's protocol engine knows when the DUT's signal should be present and generates a trigger signal for use by the measurement to trigger the data capture.

External Trigger Source: When external triggering is selected, the user supplies an external trigger signal to trigger data capture. The trigger will occur on the rising edge of this signal.

Immediate Trigger Source: When immediate triggering selected, the trigger occurs as soon as any pre-trigger samples required by the measurement algorithm are taken. Data capture is triggered when the measurement is initiated.

Auto Trigger Source: When auto triggering is selected, the test set automatically chooses the best trigger source for that measurement. This trigger source setting is convenient because the measurement trigger doesn't need to be changed when switching parameters. Auto trigger source is the best choice for most users. When the operating mode = active cell mode, Auto triggering sets the trigger source to Protocol. When the operating mode = test mode, auto triggering sets the trigger source to RF Rise. See "Test Mode Operating Mode" on page 504 and "Active Cell Operating Mode" on page 489.

Example

```
OUTPUT 714;"SETUP:PVTIME:TRIGGER:SOURCE AUTO" !Sets Trigger Source to Auto.
```

Triggering Process Description

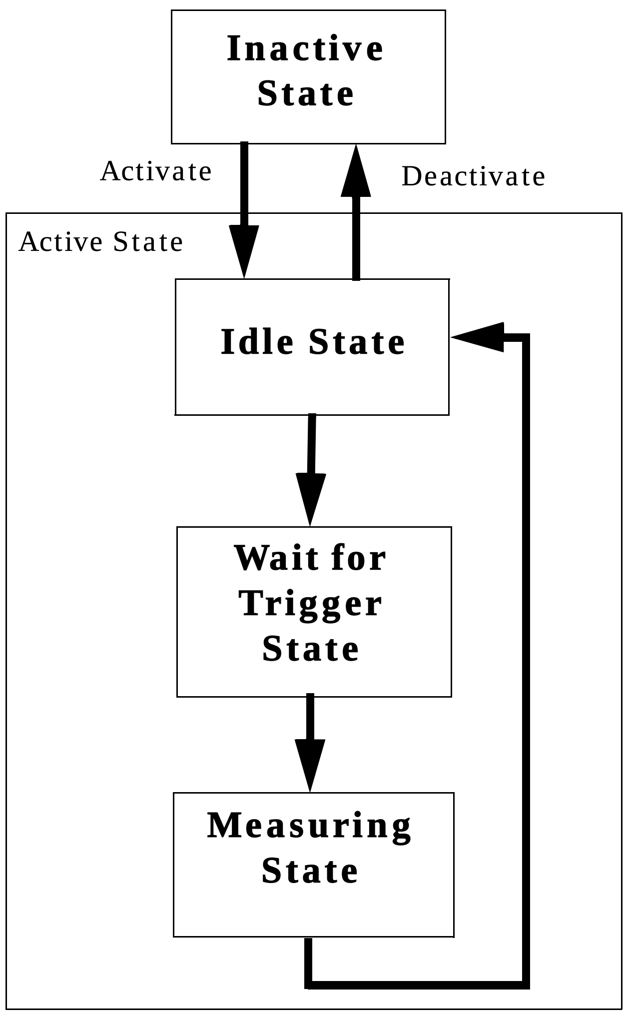
The triggering process controls the present and future states of the test set during the measurement cycle. Triggers are set up using the SETup commands and can be set up when a measurement is in the inactive state. A measurement is activated (selected) with an INITitate command. If a measurement is initiated while in its measurement cycle, it will terminate that measurement and restart it. The active state is not a single state but a collection of any state other than the inactive state. Deactivating (de-selecting) the measurement is accomplished through an INITiate:<MEAS>:OFF command. Refer to Figure 1. on page 146 for a summary of the measurement states.

Manually, a measurement is activated by selecting it from the Measurement Selection menu. A measurement is inactivated by pressing the Measurement Selection key, scrolling to measurement in the Measurement Selection menu, and then pressing F4 (Close Measurement).

Examples

```
OUTPUT 714;”INITIATE:PVTIME:OFF” !Turns off a PvT measurement.
OUTPUT 714;”INITIATE:PVTIME” !Turns on a PvT measurement.
```

Figure 1. The Test Set’s Measurement States



Measurement States

The following examples describe states of the test set under various conditions. Refer to Figure 1. on page 146.

Example 2. Inactive State

If the test set has just been powered on, or any form of preset has been performed, then the measurement state is inactive.

Example 3. Wait for Trigger State

If a measurement has been initiated with the INITiate command but has not been triggered, or a measurement has been selected from the Measurement Selection menu but has not been triggered, then the measurement state is wait for trigger. See “INITiate:<measurement mnemonic>[:ON]” on page 345.

Example 4. Measuring and Idle States (Trigger Arm Single)

If the trigger arm is set to single, the trigger source is available, and the trigger qualifier (optional) is satisfied, the measurement state transitions to measuring and measurement results are now available to the user. After results are available, the state transitions to idle (awaiting another INITiate). (See “Trigger Qualifier Description” on page 148 and “Trigger Source Description” on page 145 and “Trigger Arm (Single or Continuous) Description” on page 147)

Example 5. Measuring State (Trigger Arm Continuous)

If the trigger arm is set to continuous, the trigger source is available, and the trigger qualifier (optional) is satisfied, the measurement state transitions to measuring and measurement results are now available to the user. The measurement is continually triggered until the measurement is deactivated. When the measurement is deactivated (INITiate:<MEAS>:OFF. or Close Measurement), it becomes inactive. (See “Trigger Qualifier Description” on page 148 and “Trigger Source Description” on page 145 and “Trigger Arm (Single or Continuous) Description” on page 147.)

Trigger Arm (Single or Continuous) Description

Trigger arm determines if a measurement will make one measurement then return to idle (single), or automatically rearm on completion of a measurement and repeat the process (continuous).

NOTE When operating the test set remotely, trigger arm must be set to single, this causes the measurement cycle to transition to the idle state but remain active.

Pressing the Start Single key on the front panel will cause all currently active measurements with trigger arm set to single to arm and make the measurement.

Pressing Shift, Start Single (Stop) causes all measurements with trigger arm set to single to abort the measurement.

It is unnecessary to arm a measurement if trigger arm is set to continuous it will continue to cycle in the measuring state.

Table 4. Trigger Arm Default Settings

Action	**Trigger Arm Default Setting**
Power up of test set	Continuous
Manual Full Preset	Continuous
*RST (Remote) Full Preset	Single
Partial Preset	No change

Example

```
OUTPUT 714;"SETUP:PFERROR:CONTINUOUS OFF" !Set PFER measurement to single trigger mode.
```

Trigger Qualifier Description

When the trigger qualifier is on, the test set analyzes (samples) the input signal when a trigger is received. It then determines if the input signal was valid by looking at its power level. If the power level during sampling did not meet the requirements of a valid signal, the state returns to wait for trigger without making a measurement. Trigger qualifier is available for TX Power and Phase Frequency Error measurements only.

If a valid signal is present, then it is qualified, and the samples are processed.

Example

```
OUTPUT 714;"SETUP:PFERROR:TRIGGER:QUALIFIER ON" !Trigger Qualifier set to ON.
```

Trigger Delay Description

Trigger delay controls the delay time between the trigger and the start of sampling. Resolution is 1 nanosecond per measurement and the units are in seconds. A negative value indicates the sampling should occur prior to the trigger. The default is zero seconds which is preferred for most measurements.

Example

Example

```
OUTPUT 714;"SETUP:TXPOWER:TRIGGER:DELAY .0012 S" !Sets a trigger delay of
                                                 !1.2 milliseconds. The units
                                                 !(seconds) are an optional
                                                    !part of the command.
```

Related Topics

****

"Integrity Indicator" on page 126

"INITiate:DONE?" on page 133

"SETup Subsystem" on page 395

****

4 Programming the Agilent Technologies 8960 Series 10 for GSM Mobile Testing in Active Cell Operating Mode

Introduction

Conventions Used in This Programming Guide

Throughout this Programming Guide the term “test set” refers to an Agilent Technologies 8960 Series 10 wireless communications test set with the E1960A GSM mobile test application installed.

Purpose of This Programming Guide

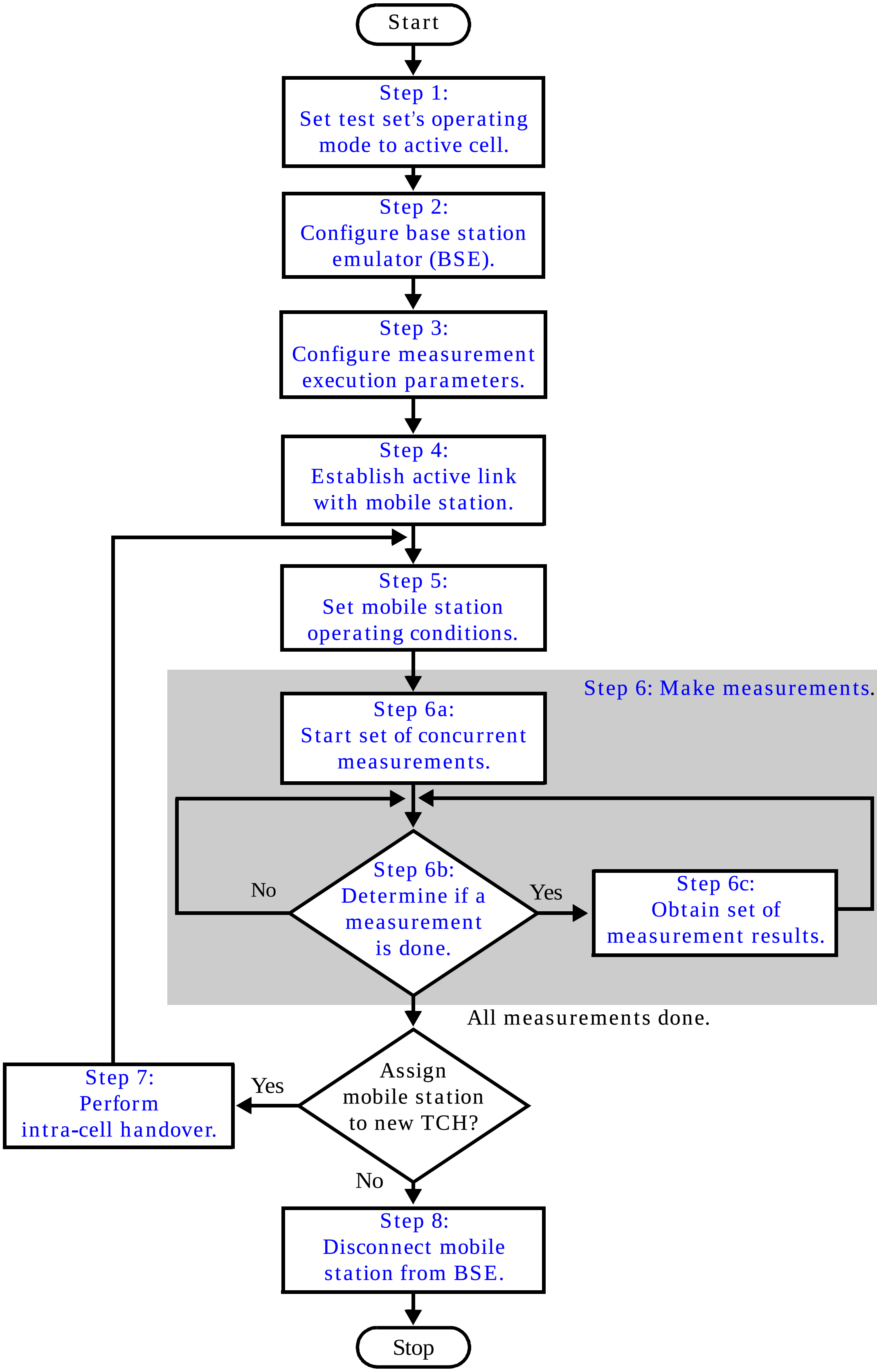
The test set represents state-of-the-art technology in one-box-testers and contains many powerful test capabilities which are accessible through easy-to-use GPIB programming commands. The purpose of this Programming Guide is to teach you how to write a basic control program, using the test set’s GPIB command set. This program will perform fundamental manufacturing tests on a GSM mobile station with the test set operating in active cell mode.

How This Programming Guide Is Organized

The Programming Guide is organized around a typical set of tasks a control program would normally perform when testing a GSM mobile station in a manufacturing environment. The set of tasks is shown in “Figure 1. Typical Flow of Tasks Performed by Control Program” on page 151.

Typically in a manufacturing environment, steps 1, 2, and 3 are done once each time a production run is started, steps 4 and 8 are done once for each mobile station tested during the production run, and steps 5, 6, and 7 are done iteratively for each mobile station tested during the production run. The number of iterations for steps 5, 6, and 7 is dependent upon how many mobile station operating conditions are being tested (that is, number of channels, number of power levels, and so fourth).

Figure 1. Typical Flow of Tasks Performed by Control Program



How to Use This Programming Guide

This Programming Guide is divided into 9 sections. Sections 1 through 8 (step 1 through 8) should be read in sequence. Each section, in order, discusses one of the tasks to be performed by the control program, showing how to accomplish that task using the test set's GPIB command set. As you progress through each section your understanding of how the test set's GPIB interface operates will increase as you see the control program evolve.

The last section of the Programming Guide presents a "Comprehensive Program Example" on page 195 which uses all of the topics discussed in sections 1 through 8 together in one program to give the programmer a sense of how to tie everything together.

About the Programming Examples Presented in This Programming Guide

Programming Language:

Programming examples presented in this Programming Guide are written in the Rocky Mountain BASIC programming language, also known as RMB.

Syntax Used in Programming Examples:

1. Programming examples use the shortened form of the command syntax to minimize GPIB bus transactions. The shortened form of a command is defined by use of capital letters in the command syntax.

   Example 1. Command Syntax:

   ```
   CALL:STATus:TCHannel:TSLot?
   ```

   Example 2. Shortened Form:

   ```
   CALL:STAT:TCH:TSL?
   ```

2. Programming examples do not include default nodes. Default nodes in the command syntax are defined by enclosing the node inside the [ ] brackets.

   Example 3. Command Syntax:

   ```
   CALL[:CELL[1]]:ACTivated[:STATe]<ON|1|OFF|0>
   ```

   Example 4. Command Syntax without Default Nodes:

   ```
   CALL:ACT <ON|1|OFF|0>
   ```

3. Programming examples make extensive use of compound commands using the ; and the ;: separators. Refer to the test set's reference information for information on the definition and use of these command separators.

Step 1: Set the Test Set’s Operating Mode to Active Cell

July 12, 1999

Background

The test set contains a GSM base station emulator (BSE). The BSE’s primary purpose is to provide the GSM call processing necessary for parametric measurements on the RF and audio signals of a GSM mobile station (MS).

An important characteristic of the test set’s BSE is its operating mode. The operating mode sets the way in which the BSE interacts with the mobile station. The BSE has two operating modes; active cell mode and test mode.

Active cell mode is used when emulating a normal GSM cell. Test mode is used when it is not possible, or not desired, to communicate with the MS via over-the-air signaling, but downlink stimulus and uplink measurements are still needed.

This Programming Guide focuses on programming the test set’s BSE in active cell operating mode.

Overview of Active Cell Operating Mode

Active cell is the default operating mode of the test set’s BSE and is used when emulating a normal GSM cell (that is, active signaling between the MS and the BSE).

Active Cell Features

The basic features provided by the BSE when the operating mode is set to active cell are:

- Generation of a BCH (broadcast channel) without TCH (traffic channel).
- Support for location updating.
- Call setup, both MS and BSE originated.
- Changing TCH parameters during a call using over-the-air signaling.
- BSE initiated and MS initiated call disconnection.
- All measurements supported in the test application are available.
- The BSE automatically controls the test set’s demodulation receiver.

Setting the Test Set’s Operating Mode to Active Cell

The test set’s operating mode is set using the CALL:OPERating:MODE command.

Example 5. Command Syntax:

```
CALL:OPERating:MODE <CELL|TEST>
```

Example 6. Programming Example:

```
!**********************************************************************
! Step 1: Set Test Set Operating Mode To Active Cell
!**********************************************************************
!
OUTPUT Test_set;”CALL:OPER:MODE CELL
```

Step 2: Configure the Base Station Emulator (BSE)

Background

The test set contains a GSM base station emulator (BSE). In active cell operating mode the BSE, using the test set's GMSK modulated source, generates a downlink (BSE to MS direction) broadcast channel (BCH) which represents a cell. The MS can camp to this signal, just as it would camp to a cell on a real network. The BSE can then page the MS on the BCH and listen to the response of the MS on the uplink (MS to BSE direction), using the test set's demodulating receiver. Calls can then be set up with the establishment of a traffic channel (TCH) in both the downlink and uplink directions. Measurements can be made, using the BSE's measuring receiver, under essentially identical conditions to that which the MS would experience on a real network.

The BS Emulator can emulate a cell in any one of the following GSM frequency bands:

- PGSM - Primary (band) GSM, also known as GSM900
- EGSM - Extension (band) GSM (includes PGSM)
- DCS - Also known as DCS1800
- PCS - Also known as PCS1900

NOTE The term GSM is used to refer to any combination of, or all of, the supported bands. It is not used as a shortened term for PGSM.

The task of configuring the BSE consists of configuring the BCH and the TCH. There are numerous parameters that can be configured for both the BCH and the TCH. It may not be necessary to configure all the parameters all the time. The test set's default settings should allow a properly functioning MS to successfully camp on the cell under most circumstances.

In a manufacturing environment it may be desirable to explicitly configure the BCH and TCH parameters to ensure that the settings have not been corrupted by someone setting a parameter's value through the test set's front panel.

Configuring the Broadcast Channel Parameters

The broadcast channel parameters are configured using the CALL processing subsystem commands shown in the following table.

Broadcast Channel Settable Parameters

Parameter	**Command Syntax**	**Footnote**
Broadcast Band	CALL[:CELL[1]]:BAND <PGSM|EGSM|DCS|PCS>	1
Cell Power	CALL[:CELL[1]]:POWer[:AMPlitude]<numeric value>[<suffix>]	
Cell Power State	CALL[:CELL[1]]:POWer:STATe <ON|1|OFF|0>	
Cell Power and State	CALL[:CELL[1]]:POWer[:SAMPlitude]<numeric value>[<suffix>]	2
Cell BCH Number	CALL[:CELL[1]]:BCHannel[:ARFCn][:SELected]<numeric value> OR CALL[:CELL[1]]:BCHannel[:ARFCn]:<PGSM|EGSM|DCS|PCS> <numeric value>	3
Mobile Country Code	CALL[:CELL[1]]:MCCode <numeric value>	4
PCS Mobile Country Code	CALL[:CELL[1]]:PMNCode:VALue <numeric value>	4
Use PCS MNC	CALL[:CELL[1]]:PMNCode:STATe <ON|1|OFF|0>	4
PCS Mobile Country Code and Use PCS NMC State	CALL[:CELL[1]]:PMNCode[:SVALue] <numeric value>	4, 5
Mobile Network Code	CALL[:CELL[1]]:MNCode <numeric value>	4
Location Area Code	CALL[:CELL[1]]:LACode <numeric value>	4
Network Color Code	CALL[:CELL[1]]:NCCode <numeric value>	4
Base Station Color Code	CALL[:CELL[1]]:BCCode <numeric value>	4
Paging IMSI	CALL:PAGing:IMSI <string>	
Repeat Paging State	CALL:PAGing:REPeat[:STATe] <ON|1|OFF|0>	
Paging Mode	CALL:PAGing:MODE <NORMal | REORg>	7
Paging Multiframes	CALL:PAGing:MFRames <numeric value>	
Auto IMEI Request	CALL:IMEI:AUTO <ON|1|OFF|0>	
BA Table Entries	CALL[:CELL[1]]:BA:TABle[:SELected][<numeric value>{,<numeric value>}] OR CALL[:CELL[1]]:BA:TABle:<PGSM|EGSM|DCS|PCS> [<numeric value>{,<numeric value>}]	6

Table Footnotes

1 The broadcast band setting becomes the selected (:SELected) band (see note 3).

2 Sets amplitude to <numeric value> and state to ON in one command.

3 Sets the BCH channel for the broadcast band selected with the broadcast band command (see note 1).

4 Can only be set when Cell Activated State = OFF. See "Things That Can Go Wrong" on page 159.

5 Sets PCS mobile country code to <numeric value> and state to ON in one command.

6 Sets the BA table entries for the broadcast band selected with the broadcast band command (see note 1).

7 Setting Paging Mode to Normal causes the MS to use discontinuous reception (that is, DRX = ON).

Example 7. Programming Example:

The following program example illustrates proper use of the BSE BCH configuration commands. Not all parameters are accessed. Note the use of the cell activated state command to set the network configuration parameters.

```
!*********************************************************************
! Step 2: Configure Base Station Emulator (BSE)
!*********************************************************************
!
OUTPUT Test_set;”CALL:CELL:BAND PGSM”
OUTPUT Test_set;”CALL:PAG:MODE REOR” ! Sets discontinuous reception to OFF
OUTPUT Test_set;”CALL:ACT OFF”
OUTPUT Test_set;”CALL:CELL:MCC 1;LAC 1;MNC 1;NCC 1;BCC 5”
OUTPUT Test_set;”CALL:ACT ON”
OUTPUT Test_set;”CALL:BCH 20”
OUTPUT Test_set;”CALL:POW:SAMP -85”
```

Configuring the Traffic Channel Parameters

The traffic channel parameters are configured using the CALL processing subsystem commands shown in the following table.

Traffic Channel Settable Parameters

Parameter	Command Syntax
TCH Band ("1")	CALL:TCHannel:BAND <PGSM | EGSM | DCS | PCS>
Channel Number ("2")	CALL:TCHannel[:ARFCn][:SELected] <numeric value> OR CALL:TCHannel[:ARFCn]:<PGSM | EGSM | DCS | PCS> <numeric value>
Loopback Mode	CALL:TCHannel:LOOPback <OFF | A | B | C>
Timeslot	CALL:TCHannel:TSLot <numeric value>
Downlink Speech Source	CALL:TCHannel:DOWNlink:SPEech <NONE | ECHO | PRBS15 | SIN300 | SIN1000 | SIN3000>

Table Footnotes

1 The TCH band setting becomes the selected band (see Note 2).

2 Sets the TCH channel for the TCH band selected with the TCH Band command (see Note 1).

Example 8. Programming Example:

The following program example illustrates proper use of the BSE TCH configuration commands. Not all parameters are accessed.

```
OUTPUT Test_set;"CALL:TCH 45"
OUTPUT Test_set;"CALL:TCH:TSL 4"
```

Things That Can Go Wrong

Trying to Set the MCC, MNC, LAC, NCC, or BCC While the Cell Activated State = ON

Trying to set any of the network configuration parameters while the cell is in the active state will generate the following error:

```
GSM operation rejected; Attempting to set <MCC|MNC|LAC|NCC|BCC> while generating a BCH
```

Background The network configuration parameters are encoded into the messaging broadcast on the BCH. Changing the network parameter values while the BCH is active would require the BCH to be stopped, and have the new values encoded, and then the BCH would have to be re-started. This would cause calls to be dropped or disrupt a MS camped to the cell. Consequently the network configuration parameters cannot be changed while the cell is active.

Control of the Cell Activated State The active/inactive state of the cell is controlled using the cell activated state command. This command is only used when the operating mode is set to active cell mode.

Example 9. Command Syntax:

```
CALL[:CELL[1]]:ACTivated[:STATe]<ON|1|OFF|0>
```

Example 10. Programming Example:

```
OUTPUT Test_set;"CALL:ACT ON"
```

Effects of Activating and Deactivating the Cell

Effects of Deactivating the Cell Among others (refer to the test set's reference information for a complete listing of actions), setting the cell activated state to OFF causes the following actions to take place:

- The control program is no longer prevented from setting the following parameters: MCC, MNC, PCS MNC, Use PCS MNC, BCC, NCC and LAC.
- All signaling operations, uplink demodulation and downlink (BCH & TCH) generation are stopped.
- Any measurements that rely on uplink demodulation are aborted. No special error messages are generated.

Effects of Activating the Cell Among others (refer to the test set's reference information for a complete listing of actions), setting the cell activated state to ON causes the following actions to take place:

- The control program is prevented from setting the following parameters: MCC, MNC, PCS MNC, Use PCS MNC, BCC, NCC and LAC.
- If the cell activated state was previously OFF, the TDMA frame number of the BS emulator starts from zero, and a BCH is generated.
- If a TCH was present prior to setting cell activated state to OFF, the TCH is not reinstated.

Step 3: Configure the Measurement Execution Parameters

Background

Measurement execution parameters control the conditions under which a measurement operates. The general set of measurement execution parameters and their generic categories are as follows:

- Measurement Averaging (used by most measurements)

  Multi-Measurement Count State
  Multi-Measurement Count State

- Measurement Triggering (used by most measurements)

  Trigger Arm
  Trigger Source
  Trigger Delay
  Trigger Qualifier

- Measurement Synchronization (used by some measurements)

  Burst Synchronization

- Measurement Timeouts (used by all measurements)

  Measurement Timeout
  Measurement Timeout State

- Measurement Specific (execution parameters specific to an individual measurement)

NOTE Not all measurements use all the execution parameters shown above. Additionally, some measurements have parameters that are specific to the measurement such as offset frequency lists or filter settings. Each measurement has its own set of parameters which are unique to it and have no affect on the execution of other measurements. Refer to the GPIB syntax listing for a detailed list of execution parameters for individual measurements.

Overview

The SETup subsystem is used to configure measurement parameters. Each individual measurement parameter can be set and queried using the associated SETup subsystem command. The general hierarchy of the SETup subsystem command structure is as follows:

```
SETup:<meas-mnemonic>:<measurement parameter><parameter setting/value>
```

The following table shows the measurements available in the Agilent E1960A GSM mobile test application and their associated <meas-mnemonic> used in the SETup command syntax.

Measurement Mnemonics Used In The SETup Subsystem

Measurement	<meas-mnemonic>
Transmit Power	TXPower
Power vs Time	PVTime
Phase & Frequency Error	PFERror
Output RF Spectrum	ORFSpectrum
Bit Error	BERRor
Fast Bit Error	FBERror
Decoded Audio	DAUDio
Analog Audio	AAUDio
I/Q Tuning	IQTuning
Dynamic Power	DPOWer

Configuring Measurement Averaging Parameters

Multi-Measurement Count State Parameter

The Multi-Measurement Count State parameter is used to turn measurement averaging on and off.

Example 11. Command Syntax:

```
SETup:<meas-mnemonic>:COUNt:STATe <ON|1|OFF|0>
```

Example 12. Programming Example:

```
OUTPUT Test_set;"SET:PVT:COUN:STATe ON"
```

would turn measurement averaging ON for the power versus time measurement.

Multi-Measurement Count Number Parameter

The Multi-Measurement Count Number parameter sets the number of measurement samples taken during each measurement cycle when the COUNt:STATe parameter is set to ON.

Example 13. Command Syntax:

```
SETup:<meas-mnemonic>:COUNt:NUMBer <numeric value>
```

Example 14. Programming Example:

```
OUTPUT Test_set;"SET:TXP:COUN:NUMB 10"
```

would set the number of averages to 10 for the transmit power measurement.

Configuring Multi-Measurement Count State and Count Number Simultaneously

The multi-measurement count state can be set to ON and the multi-measurement count number can be set to some value using a single complex command.

Example 15. Command Syntax:

```
SETup:<meas-mnemonic>:COUNt[:SNUMber] <numeric value>
```

Example 16. Programming Example:

```
OUTPUT Test_set;"SET:TXP:COUN:SNUM 10"
```

would set the multi-measurement count state to ON and set the number of averages to 10 for the transmit power measurement. Note that in this example the optional command mnemonic :SNUMber has been included for purposes of clarity.

Configuring Measurement Triggering Parameters

Trigger Source Parameter

The Trigger Source parameter selects the source of the measurement trigger signal.

Example 17. Command Syntax:

```
SETup:<meas-mnemonic>:TRIGger:SOURce <AUTO|IMMediate|PROTocol|RISE>
```

Example 18. Programming Example:

```
OUTPUT Test_set;"SET:TXP:TRIG:SOUR AUTO"
```

would set the trigger source to AUTO for the transmit power measurement.

Trigger Delay Parameter

The Trigger Delay parameter controls the delay between the trigger event (the point in time at which the trigger signal is received) and the start of sampling. Negative values indicate that the sampling should occur prior to the trigger event.

Example 19. Command Syntax:

```
SETup:<meas-mnemonic>:TRIGger:DELay <numeric value>[<suffix>]
```

Example 20. Programming Example:

```
OUTPUT Test_set;"SET:TXP:TRIG:DEL 10 US"
```

would set the trigger delay to 10 µs for the transmit power measurement.

Trigger Qualifier Parameter

The Trigger Qualifier parameter enables or disables automatic trigger re-arming following a trigger event which occurred when no valid signal (burst) was present.

Example 21. Command Syntax:

```
SETup:<meas-mnemonic>:TRIGger:QUALifier <ON|1|OFF|0>
```

Example 22. Programming Example:

```
OUTPUT Test_set;"SET:TXP:TRIG:QUAL ON"
```

would turn the trigger qualifier on for the transmit power measurement.

Trigger Arm Parameter

The Trigger Arm parameter determines whether a measurement will make one measurement then stop (single), or automatically re-arm upon completion of one measurement and repeat the process (continuous).

Example 23. Command Syntax:

```
SETup:<meas-mnemonic>:CONTinuous <ON|1|OFF|0>
```

NOTE The recommend trigger arm setting for all measurements when using the remote user interface is single (CONTinuous OFF).

Example 24. Programming Example:

```
OUTPUT Test_set;"SET:TXP:CONT OFF"
```

would set the trigger arming to single for the transmit power measurement.

Configuring the Burst Synchronization Parameter

Burst Synchronization Parameter

The burst synchronization parameter specifies where in the sampled data stream the measurement algorithm starts making its analysis of the captured data. Burst synchronization occurs after the measurement data is captured. The burst synchronization parameter's setting determines how the measurement's time reference is developed from the sampled data.

Not all measurements will have synchronization choices and not all synchronization choices will be available in measurements that use synchronization. Measurement synchronization and measurement triggering are independent settings and may be used in any combination.

Example 25. Command Syntax:

```
SETup:<meas-mnemonic>:BSYNc <MIDamble|AMPLitude|NONE>
```

Example 26. Programming Example:

```
OUTPUT Test_set;"SET:PVT:BSYN MID"
```

would set the burst synchronization to midamble for the power versus time measurement.

Configuring Measurement Timeout Parameters

Measurement Timeout State Parameter

The Measurement Timeout State parameter is used to enable or disable measurement timeout functionality.

Example 27. Command Syntax:

```
SETup:<meas-mnemonic>:TIMeout:STATe <ON|1|OFF|0>
```

Example 28. Programming Example:

```
OUTPUT Test_set;"SET:PVT:TIM:STAT ON"
```

would enable measurement timeouts for the power versus time measurement.

Measurement Timeout Time Parameter

The Measurement Timeout Time parameter sets the maximum time that a measurement will execute before failing with a timeout error (when the TIMEout:STATe parameter is set to ON).

Example 29. Command Syntax:

```
SETup:<meas-mnemonic>:TIMeout:TIME <numeric value>[<suffix>]
```

Example 30. Programming Example:

```
OUTPUT Test_set;"SET:TXP:TIM:TIME 10 S"
```

would set the measurement timeout time to 10 seconds for the transmit power measurement.

Configuring Measurement Timeout State and Timeout Time Simultaneously

The measurement timeout state can be set to ON and the measurement timeout time can be set to some value using a single complex command.

Example 31. Command Syntax:

```
SETup:<meas-mnemonic>:TIMeout[:STIMe] <numeric value>[<suffix>]
```

Example 32. Programming Example:

```
OUTPUT Test_set;"SET:TXP:TIM:STIM 10"
```

would set the measurement timeout state to ON and set the measurement timeout time to 10 seconds for the transmit power measurement. Note that in this example the optional command mnemonic :STIMe has been included for purposes of clarity.

Configuring Measurement Specific Parameters

Background

Some measurements have parameters that are specific to the measurement. Refer to the GPIB syntax listings for a detailed list of execution parameters for individual measurements. This section gives you some insight into the possible programming techniques that can be used to configure these measurement specific execution parameters.

Sending Comma-Separated Parameter Configuration Lists to the Test Set

High-level measurements in the test application may require numerous parameters to configure the measurement. For example: the output RF spectrum measurement can require up to 22 frequency offsets for the modulation part of the measurement and up to 8 frequency offsets for the switching part of the measurement. The offsets are sent as comma separated lists. There are a variety of techniques that can be used to send these lists. Some of these techniques are shown below.

1. Include each individual parameter in the command itself. For example:

   ```
   OUTPUT Test_set;"SET:ORFS:SWIT:FREQ .4MHZ,.6MHZ,-.4MHZ,-.6MHZ"
   ```

2. Store the parameter values in a data structure and send the command with the data structure appended to it. For example:

   - Using a string variable:

     ```
     DIM Swit_offs$[255]
     Swit_offs$=”.4MHZ,.6MHZ,-.4MHZ,-.6MHZ,1.2MHZ,-1.2MHZ”
     OUTPUT Test_set;”SET:ORFS:SWIT:FREQ “&Swit_offs
     ```

- Using numeric arrays:

```
OPTION BASE 1
REAL Swit_offs(8),Mod_offs(22)
!
DATA 400,-400,600,-600,1200,-1200,1800,-1800
DATA .1,-.1,.2,-.2,.25,-.25,.4,-.4,.6,-.6,.8,-.8
DATA 1,-1,1.2,-1.2,1.4,-1.4,1.6,-1.6,1.8,-1.8
!
READ Swit_offs(*)
READ Mod_offs(*)
!
Swit_img:IMAGE K,7(K,”KHZ,”),K,”KHZ”
Mod_img:IMAGE K,21(K,”MHZ,”),K,”MHZ”
OUTPUT Test_set USING Swit_img;”SET:ORFS:SWIT:FREQ”,Swit_offs(*)
OUTPUT Test_set USING Mod_img;”SET:ORFS:MOD:FREQ”,Mod_offs(*)
```

Example 33. Programming Example:

The following example illustrates configuring the measurement execution parameters for the output RF spectrum, transmit power, and phase and frequency error measurements.

```
!***************************************************************************
! Step 3: Configure Measurement Execution Parameters
!***************************************************************************
!
! Configure ORFS Measurement:
!
OUTPUT Test_set;”SET:ORFS:SWIT:COUN 5”     ! Examples of using complex
OUTPUT Test_set;”SET:ORFS:MOD:COUN 10”     ! commands to set multi-meas
                                           ! state and count at same time.
OUTPUT Test_set;”SET:ORFS:TRIG:SOUR AUTO”  ! Set trig source to AUTO.
OUTPUT Test_set;”SET:ORFS:CONT OFF”        ! Set trig mode to single.
OUTPUT Test_set;”SET:ORFS:TIM 60”          ! Set timeout time to 60 sec.
! Put switching and modulation offsets to be tested into string variables.
Swit_offs$=”400KHZ,-400KHZ,600KHZ,-600KHZ,1200KHZ,-1200KHZ,1800KHZ,-1800KHZ”
Mod_offs$=”.2MHZ,-.2MHZ,.4MHZ,-.4MHZ,.6MHZ,-.6MHZ,.8MHZ,-.8MHZ,1MHZ,-1MHZ”
OUTPUT Test_set;”SET:ORFS:SWIT:FREQ “&Swit_offs$
OUTPUT Test_set;”SET:ORFS:MOD:FREQ “&Mod_offs$
!
! Configure TX Power Measurement:
!
OUTPUT Test_set;”SET:TXP:COUN 3”
OUTPUT Test_set;”SET:TXP:TRIG:SOUR RISE;QUAL ON”
OUTPUT Test_set;”SET:TXP:CONT OFF”
OUTPUT Test_set;”SET:TXP:TIM 20”
!
! Configure Phase & Frequency Error Measurement:
!
OUTPUT Test_set;”SET:PFER:COUN 8”
OUTPUT Test_set;”SET:PFER:TRIG:SOUR PROT;QUAL ON”
OUTPUT Test_set;”SET:PFER:CONT OFF”
OUTPUT Test_set;”SET:PFER:TIM 30”
OUTPUT Test_set;”SET:PFER:BSYN MID
```

Step 4: Establish an Active Link with Mobile Station

Background

Call Connect/Disconnect Synchronization

When the control program requires that an active link be established/terminated between the mobile station and the test set, the commands necessary to initiate the call connect/disconnect process are sent to the test set (for a BS originated/terminated call) or to the mobile station (for a MS originated/terminated call). In either case, synchronization is defined as the control program being able to empirically determine when the call has been successfully connected/disconnected so that the control program can proceed, or being able to empirically determine that the call has not been successfully connected/disconnected so that the control program can take appropriate action.

The determination is made by monitoring the call state as the call connect/disconnect process progresses.

Call States

At any instant in time a call can be in one of the following states:

- Idle
- Setup Request
- Proceeding
- Alerting
- Disconnecting
- Connected

Setup Request, Proceeding, Alerting and Disconnecting are referred to as transitory states because the amount of time which the call can spend in any of these states is limited by GSM protocol (that is, the call transitions through these states, it is not allowed to stay in a transitory state forever).

NOTE If repeat paging is on it is possible for the call process to stay in one of the transitory states beyond the time specified by the GSM protocol timers.

The control program can directly query the state of a call with the CALL:STATus:STATe? query command, which immediately returns the current call state (that is, Idle, Setup Request, Proceeding, Alerting, Disconnecting, or Connected)

Determining if a Call Connect/Disconnect Process is Completed

The most common technique used by control programs to determine if a call connect/disconnect process has completed (either successfully or unsuccessfully), is to repeatedly query the call state using the CALL:STATus:STATe? query command inside a program loop. The return value from each query is checked to determine if the connect/disconnect process is proceeding or has reached the desired state.

There are, however, some inherent problems associated with this technique:

- The rapid polling of the instrument increases bus traffic and places increased demand on the instrument's processors to respond to the constant stream of queries.
- The control program must handle failure conditions. For example: if a call origination process is started but the call never leaves the Idle state, the control program must incorporate some technique to prevent the program from staying in the loop forever waiting for a transition out of the Idle state.

The test set implements a set of commands designed specifically for call connect/disconnect synchronization. (see "Step 8: Disconnect the Mobile Station from the BSE" on page 190 for call disconnect synchronization). These commands directly address many of the inherent problems discussed above. When properly used these commands eliminate the need for rapid polling of the instrument, and relieve the programmer of many of the tasks associated with error handling.

Call Connect/Disconnect Synchronization Commands

Call Connected State Query Command The call-connected-state query command is used to query the connected state of a call. This command allows the control program to determine if a call is connected (that is, in the Connected state) or disconnected (that is, in the Idle state), with a built-in provision to automatically wait if the call is in one of the transitory states.

The basic operation of this query is:

- If the call is in the Connected state when the query is received by the test set, the query immediately returns a 1.
- If the call is in the Idle state (that is, disconnected) when the query is received by the test set, the query immediately returns a 0.
- If the call is in one of the transitory states (that is, Setup Request, Proceeding, Alerting, or Disconnecting) when the query is received by the test set, the query hangs (that is, does not return an answer) until the call state changes to either Idle or Connected and then behaves as above.

The call-connected-state query command can be used at any time to determine the connected state of a call. The built-in provision to automatically wait if the call is in one of the transitory states eliminates the need for rapid polling when the call-connected-state query command is used to synchronize to a call connect/disconnect process.

NOTE If repeat paging is on, a call origination process can stay in one of the transitory states until the mobile either answers the page or until the user stops the paging process. This means that if a call-connected-state query command is sent to the test set with repeat paging set to on, the query could hang "forever".

Example 34 .Command Syntax:

```
CALL:CONNected[:STATe]?
```

Using the Call Connected State Query for Call Connect Synchronization The call-connected-state query only hangs if the call is in a transitory state, otherwise it immediately returns a 1 (Connected state) or a 0 (Idle state). At the start of a call connect process the call state is Idle. Sending call-connected-state query at the start of a call connect process could immediately return a zero if the query is satisfied before the connection process has started (that is, moved from the Idle state into one of the transitory states). For correct call connect synchronization it is necessary that the query be temporarily held off until after the call connect process has started. A call-state-change-detector is provided which can be used to temporarily hold off the query from returning an answer until the appropriate state change has occurred.

Call Connected Arm Command The call-connected-arm command is used to ‘arm’ the call-state-change-detector.

Example 35. Command Syntax:

```
CALL:CONNected:ARM[:IMMediate]
```

If the call-state-change-detector is armed when a call-connected-state query is received, the reply is held off until the call-state-change-detector is disarmed. The call-state-change-detector is disarmed upon a state change from any of the transitory states to the Idle or Connected state.

The call-state-change-detector is not disarmed by a state change from Idle to any of the transitory states, from Connected to any of the transitory states, nor is it disarmed by any transitions from Idle to Idle, or Connected to Connected. These restrictions ensure that when the call-connected-state query returns an answer:

- the connect process has started since the call state must have moved from Idle to one of the transitory states

  AND

- the connect process has finished since the call state has moved from a transitory state to either the Idle or Connected state.

The arm state of the change detector can be queried with the call-connected-arm-state query command. This query never hangs and immediately returns a 1 if the change detector is armed and a 0 if it is not armed. The command is:

Example 36. Command Syntax:

```
CALL:CONNected:ARM:STATe?
```

Using the Call Connected Arm Command for Call Connect Synchronization The call-state-change-detector arm command is used by the control program to tell the test set that it is expecting a change to the state of a call prior to initiating the state change. By first arming the call-state-change-detector, then querying the call connected state, and then attempting a BS or MS originated call, the call-connected-state query will hang until the connection operation begins and then reaches a final (Idle or Connected) state.

However, if the change detector is armed and a call connection is attempted but the call state never progresses from the Idle state, the call-connected-state query would hang forever. This could easily happen if the mobile is badly broken, the mobile is not connected to the test set, no one pushes the “send” button on the mobile, etc.

A call-state-change-detector time-out timer is provided which is used to prevent the call-connected-state query from hanging forever.

Call Connected Time-out Command The call-connected-time-out command is used to set the time-out value for the call-state-change-detector time-out timer.

Example 37. Command Syntax:

```
CALL:CONNected:TIMeout <numeric value>[<suffix>]
```

Using the Call State Change Detector Time-out for Call Connect Synchronization The call-state-change-detector time-out mechanism allows the test set to disarm the call-state-change-detector which releases the call connected state query if it is currently hanging.

The time-out timer is started whenever the call-state-change-detector is armed or gets rearmed when already armed. The duration of the time-out is set using the call-connected-time-out command and should be set to the maximum amount of time the control program should wait between arming and the connect process to begin. Once the process starts and the call state has moved into one of the transitory states the GSM defined protocol timers take over and prevent the call state from staying in a transitory state forever.

If the timer expires while the call is in the Idle or Connected state, the call-state-change-detector is disarmed, which releases the call connected state query if it is currently hanging.

If the timer expires while the call is in one of the transitory states it is ignored as, once in any transitory state, the GSM-defined protocol timers limit the amount of time that can be spent in any transitory state.

Call-state-change-detector Auto Arming As a programming convenience the test set automatically arms the call-state-change-detector, using a fixed time-out value of 60 seconds, whenever a BS originate or BS disconnect is requested.

Because of this, there is never a need for the control program to explicitly arm the call-state-change-detector or set a call-state-change-detector time-out value before BS initiated events. If for sake of coding efficiency, the programmer wishes to use the same code segment for both BS and MS call processing events, the commands to arm the call-state-change-detector and to set the call-state-change-detector time-out time will be accepted but ignored should the control program actually send the commands to the test set for BS call processing events.

Overview

Establishing an active link with the mobile station when the test set is in active cell operating mode can be accomplished in one of two ways:

- Base station originated call
- Mobile station originated call

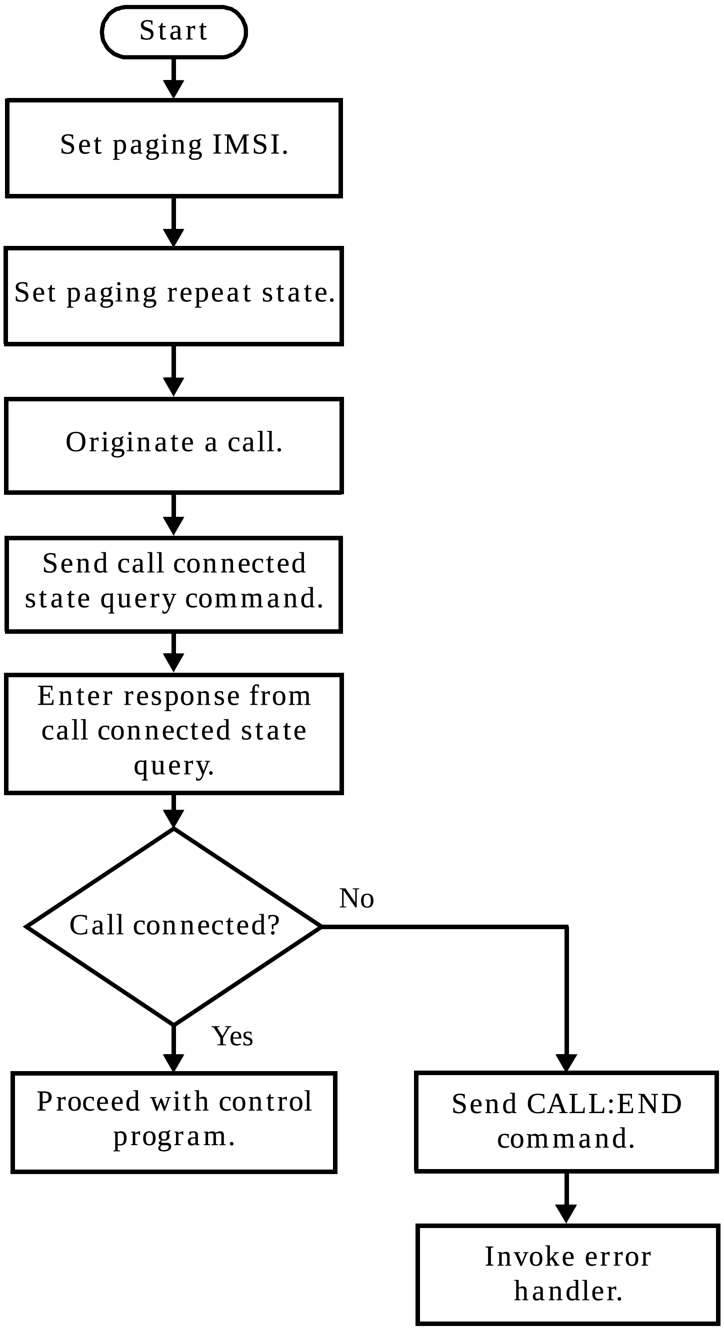
Process for Making a Base Station Originated Call

The recommended process for making a base station originated call is shown in "Step 4: Figure 1. Process for Making a Base Station Originated Call" on page 171.

The CALL:ORIGinate command is used to initiate a base station originated call.

If the call origination process fails it is necessary to send the CALL:END command to the test set to force immediate termination of all processes associated with the current call origination. This ensures that if another CALL:ORIGinate command is sent to the test set before all processes associated with the failed call origination have been terminated, it will not be ignored. Note that if the test set is currently executing a call origination and it receives another call origination command it will be ignored (that is, you are telling the test set to do something it is already doing and hence it will accept the command but it will be ignored).

Step 4: Figure 1. Process for Making a Base Station Originated Call



Example 38. Programming Example:

```
!*********************************************************************
! Step 4: Establish Active Link with Mobile Station
!*********************************************************************
!
OUTPUT Test_set;"CALL:PAG:IMSI '001012345678901'" ! Set paging IMSI
OUTPUT Test_set;"CALL:PAG:REP OFF"  ! Set paging repeat state to off
OUTPUT Test_set;"CALL:ORIG" ! Start a base station originated call
OUTPUT Test_set;"CALL:CONN:STAT?" ! Hanging GPIB query
ENTER Test_set;Call_connected     ! Program will hang here until
                                  ! origination passes or fails
IF NOT Call_connected THEN        ! Check if connection successful
  OUTPUT Test_set;"CALL:END"
! <put error handler here>
END IF
! Call is connected so proceed with control program
```

Call Origination Process Commands

Paging the Mobile Station Paging the mobile station is accomplished using the CALL:ORIGinate command.

Example 39. Command Syntax:

```
CALL:ORIGinate
```

Example 40. Programming Example:

```
OUTPUT Test_set;"CALL:ORIG"
```

would start the process of making a base station originated call.

Setting the Paging IMSI The paging IMSI is set using the PAGing:IMSI command.

Example 41. Command Syntax:

```
CALL:PAGing:IMSI <string>
```

Example 42. Programming Example:

```
OUTPUT Test_set;"CALL:PAG:IMSI '001012345678901'"
```

would set the paging IMSI to 001012345678901.

Setting the Paging Repeat State The paging repeat state is set using the PAGing:REPeat:STATe command.

Example 43. Command Syntax:

```
CALL:PAGing:REPeat[:STATe] <ON|1|OFF|0>
```

Example 44. Programming Example:

```
OUTPUT Test_set;"CALL:PAG:REP OFF"
```

would turn on paging repeat.

Process for Making a Mobile Station Originated Call

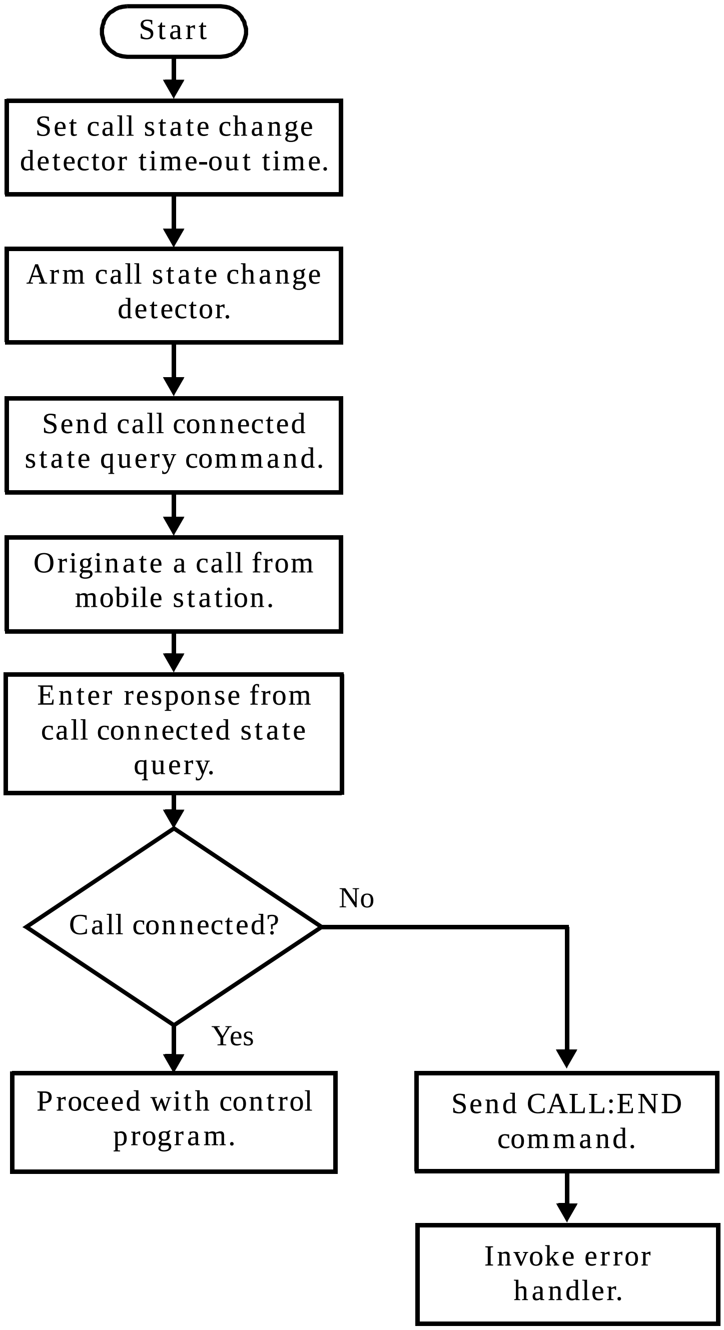
The recommended process for making a mobile station originated call is shown in “Step 4: Figure 2. Process For Making A Mobile Station Originated Call” on page 174.

There is no facility in the test set to initiate a call connect from the mobile station. This must be accomplished manually or through a test bus built into the mobile station.

If the call origination process fails it is necessary to send the CALL:END command to the test set to force immediate termination of all processes associated with the current call origination. This ensures that if the mobile station attempts another originate before all processes associated with the failed call origination have been terminated, it will not be ignored. Note that if the test set is currently executing a call origination and it receives another call origination command it will be ignored (that is, you are telling the test set to do something it is already doing and hence it will accept the command but it will be ignored).

For mobile station originated calls where the call is originated by physically dialing a number (as opposed to using a test bus) ensure that the call-state-change-detector time-out time is long enough to allow a human to dial the number.

Step 4: Figure 2. Process For Making A Mobile Station Originated Call



Example 45. Programming Example:

```
OUTPUT Test_set;"CALL:CONN:TIM 5"    ! Set timeout time to 5 seconds
OUTPUT Test_set;"CALL:CONN:ARM"      ! Arm the change detector
OUTPUT Test_set;"CALL:CONN:STAT?"    ! Initiate call connect state query
DISP "Originate call from mobile station."
ENTER Test_set;Call_connected        ! Program will hang here until
                                     ! origination passes or fails
IF NOT Call_connected THEN           ! Check if connection successful
  OUTPUT Test_set;"CALL:END"
! <put error handler here>
END IF
! Call is connected so proceed with control program
```

Step 5: Set the Mobile Station’s Operating Conditions

Overview

The mobile station’s operating conditions are set using the CALL processing subsystem commands shown in the following table.

Settable Mobile Station Operating Conditions

Parameter	Command Syntax	Table Footnotes
Timing Advance	CALL:MS:TADVance <numeric value>	
Transmit Level	CALL:MS:TXLevel[:SELected] <numeric value> OR CALL:MS:TXLevel:<PGSM|EGSM|DCS|PCS> <numeric value>	1
Discontinuous Transmission	CALL:MS:DTX[:STATe] <ON|1|OFF|0>	

Table Footnotes

1 The TCH band setting becomes the selected band.

Example 46. Programming Example:

```
!**********************************************************************
! Step 5: Set Mobile Station Operating Conditions
!**********************************************************************
!
OUTPUT Test_set;”CALL:MS:DTX OFF”
OUTPUT Test_set;”CALL:MS:TXL 14
```

Step 6: Make Measurements

Background

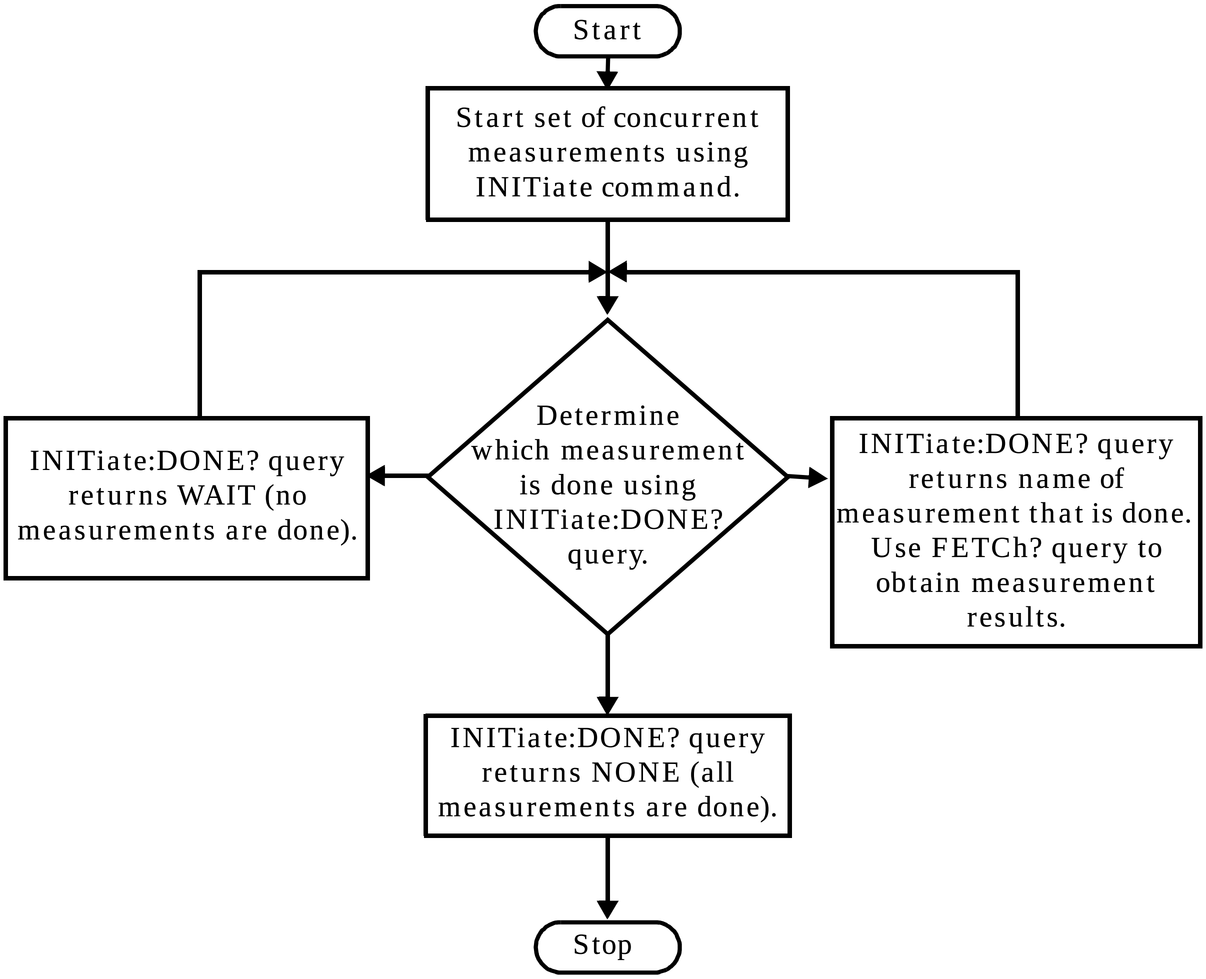
The multiple signal path, DSP based, multiple processor architecture of the test set allows the test set to make concurrent measurements. This means that:

- multiple measurements can execute and finish at the same time (concurrently)
- individual measurement completion is not influenced by other measurement processes
- availability of measurement results is not dependent upon the sequence that the measurements were requested in
- results from measurements that take few processor cycles are available without having to wait for measurements that take many processor cycles

There are no special programming commands or techniques required to implement measurement concurrency.

"Step 6: Figure 1. Process for Making Measurements" on page 178 shows the recommended process for making concurrent measurements using the test set's command set.

Step 6: Figure 1. Process for Making Measurements



Example 47. Programming Example:

The following program segment illustrates making a transmit power measurement and a phase and frequency error measurement concurrently using the recommended process shown in "Step 6: Figure 1. Process for Making Measurements" on page 178.

```
!*********************************************************************
! Step 6: Make Measurements
!*********************************************************************
!
! Step 6a: Start Set of Concurrent Measurements:
!
OUTPUT Test_set;"INIT:TXP;PFER"
!
! Step 6b: Determine If A Measurement Is Done:
!
LOOP
  OUTPUT Test_set;"INIT:DONE?"
  ENTER Test_set;Meas_done$
!
! Step 6c: Obtain Measurement Results
!
  SELECT Meas_done$
    CASE "TXP"
      OUTPUT Test_set;"FETC:TXP:POW?"
      ENTER Test_set;Avg_tx_power
    CASE "PFER"
      OUTPUT Test_set;"FETC:PFER:RMS?"
      ENTER Test_set;Max_rms_phas_er
  END SELECT
EXIT IF Meas_done$ = "NONE"
END LOOP
```

Things That Can Go Wrong

Measurement Integrity Always Returns a Value of 6

Background A measurement integrity value of 6 indicates that some characteristic of the input signal is under range. Typically this will be the amplitude (power) of the DUT signal. This low amplitude will cause the level of the DSP sampler to be below a threshold required by the measurement algorithm to produce results of specified accuracy.

Possible Cause One of the most likely causes of a measurement underrange condition is DUT signal loss caused by fixture loss or cable loss.

Suggested Workaround Fixture loss or cable loss can be compensated for by using the RF IN/OUT port's amplitude offset parameter.

Example 48. Command Syntax:

```
SYSTem:CORRection:GAIN <numeric value>[<suffix>]
```

```
SYSTem:CORRection:STATe <1|ON|0|OFF>
```

Complex form of command (sets gain to <numeric value> and state to ON using single command):

```
SYSTem:CORRection:SGAin <numeric value>[<suffix>]
```

Example 49. Programming Example:

```
OUTPUT Test_set;"SYST:CORR:SGA -6"
```

would set the RF IN/OUT port's amplitude offset to –6 dB and set the correction state to ON.

Step 6a: Start Set Of Concurrent Measurements

Starting Measurements

The INITiate command is used to start measurements. Each individual measurement in a test application can be started using the INITiate command. For starting measurements, the syntax of the INITiate command is as follows:

Example 50. Command Syntax:

```
INITiate:<meas-mnemonic>[:ON]
```

Example 51. The following table shows the measurements available in the Agilent Technologies E1960A GSM mobile test application and their associated <meas-mnemonic> used in the INITiate command syntax.

Measurement Mnemonics Used In The INITiate Subsystem

Measurement	<meas-mnemonic>
Transmit Power	TXPower
Power vs Time	PVTime
Phase & Frequency Error	PFERror
Output RF Spectrum	ORFSpectrum
Bit Error	BERRor
Fast Bit Error	FBERror
Decoded Audio	DAUDio
Analog Audio	AAUDio
I/Q Tuning	IQTuning
Dynamic Power	DPOWer

Example 51. Programming Example:

```
OUTPUT Test_set;"INIT:TXP"
```

would start the transmitter power measurement.

Using Compound Commands to Start Multiple Measurements

More than one measurement can be started using a single INITiate command. For example:

```
OUTPUT Test_set;"INIT:TXP;PFER"
```

would start the transmit power measurement and the phase and frequency error measurement. These measurements would then run concurrently.

Step 6b: Determine if a Measurement Is Done

July 12, 1999

Background

After a set of concurrent measurements have been started, it is desirable that the control program be able to determine when individual measurement results are available so that the control program can request that measurement's results without having to wait on other measurements which have not yet completed.

Overview

The INITiate:DONE? query command is used to determine which measurement is finished.

As the name implies, the query returns the name of whichever active measurement is done so that the control program can request that measurement's results.

This command is query only and returns only one response per query. The responses returned and their meaning are shown in the following table.

Once a measurement is reported as being done via the INITiate:DONE? query it is removed from the done list (measurements are only reported as being done once). The design of the INITiate:DONE? query is predicated on the control program immediately fetching a measurement's results once it is reported as being done.

Responses Returned from INITiate:DONE? Query

Response	Meaning
TXP	The transmit power measurement is done.
PVT	The power versus time measurement is done.
PFER	The phase and frequency error measurement is done.
ORFS	The output RF spectrum measurement is done.
AAUD	The analog audio measurement is done.
DAUD	The decoded audio measurement is done.
BERR	The bit error measurement is done.
FBER	The fast bit error measurement is done.
DPOW	The dynamic power measurement is done.
IQT	The I/Q Tuning measurement is done.
WAIT	There are one or more measurements that are in progress, but none of those measurements are done yet.
NONE	No measurements are in progress.

Example 52. Command Syntax:

```
INITiate:DONE?
```

Example 53. Programming Example:

See “Programming Example:” on page 179.

Step 6c: Obtain a Set of Measurement Results

Background

In order to minimize bus traffic in the manufacturing environment the test set's high-level measurements have been designed to return multiple measured values in response to a single measurement request.

For example: if a transmit power measurement with averaging is initiated there will be five measurement results available as follows:

1. Measurement integrity value
2. Average value
3. Minimum value
4. Maximum value
5. Standard deviation value

The test set has been designed with the capability to return the measurement results in a variety of formats to suit the needs of the measurement environment. For example, the transmitter power measurement results can be returned as:

- Measurement integrity and average value

  OR

- Average value and minimum value and maximum value and standard deviation value

  OR

- Average value only

  OR

- Minimum value only

  OR

- Maximum value only

  OR

- Standard deviation value only

  OR

- Measurement integrity value only

The formats available for individual measurements can be found in the test set's FETCh? subsystem's GPIB command syntax reference information.

Overview

The FETCh subsystem is used to query measurement results. The measurement results from each measurement in a test application can be queried using the FETCh subsystem. The general hierarchy of the FETCh command structure is as follows:

```
FETCh:<meas-mnemonic>:<result format>?
```

The following table shows the measurements available in the Agilent Technologies E1960A GSM mobile test application and their associated <meas-mnemonic> used in the FETCh command syntax.

The command syntax used to obtain the various measurement result formats (<result format>) for each measurement can be found in the test set's FETCh? subsystem's GPIB command syntax reference information.

Measurement Mnemonics Used In The FETCh Subsystem

Measurement	**<meas-mnemonic>**
Transmit Power	TXPower
Power vs Time	PVTime
Phase & Frequency Error	PFERror
Output RF Spectrum	ORFSpectrum
Bit Error	BERRor
Fast Bit Error	FBERror
Decoded Audio	DAUDio
Analog Audio	AAUDio
I/Q Tuning	IQTuning
Dynamic Power	DPOWer

Example 53. Command Syntax:

```
FETCh:<meas-mnemonic>:<result format>?
```

Example 54. Programming Example:

```
OUTPUT Test_set;"FETCh:TXP:POW:MIN?"
```

would return the minimum value from the set of samples taken during the transmit power measurement (when averaging is turned on and number of samples taken >1).

Step 7: Perform an Intra-Cell Handover

Background

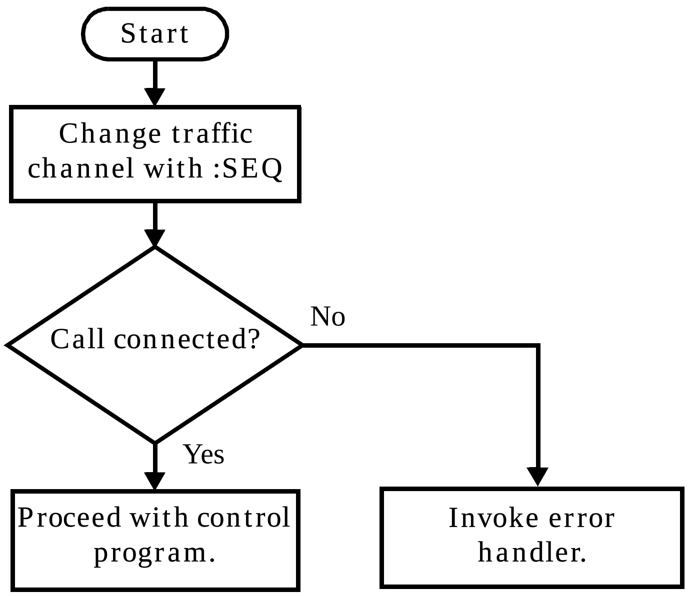
A handover is defined as assigning the mobile station to a new traffic channel. The test set is capable of performing two types of handovers:

- Intra-cell handover: assigning the mobile station to a new traffic channel within the currently active broadcast band.
- Dual-band handover: assigning the mobile station to a traffic channel in a traffic band which is different from the currently active traffic band.

Performing an Intra-Cell Handover

An intra-cell handover is accomplished using the CALL:TCHannel command in conjunction with the :SEQ synchronization command. The recommended process for performing an intra-cell handover is shown in the following figure.

Step 7: Figure 1. Process for Performing an Intra-Cell Handover



Example 55. Command Syntax:

```
CALL:TCHannel[:ARFCn][:SELected]:SEQ <numeric value>
```

OR

```
CALL:TCHannel[:ARFCn]:<PGSM|EGSM|DCS|PCS>:SEQ <numeric value>
```

Example 56. Programming Example:

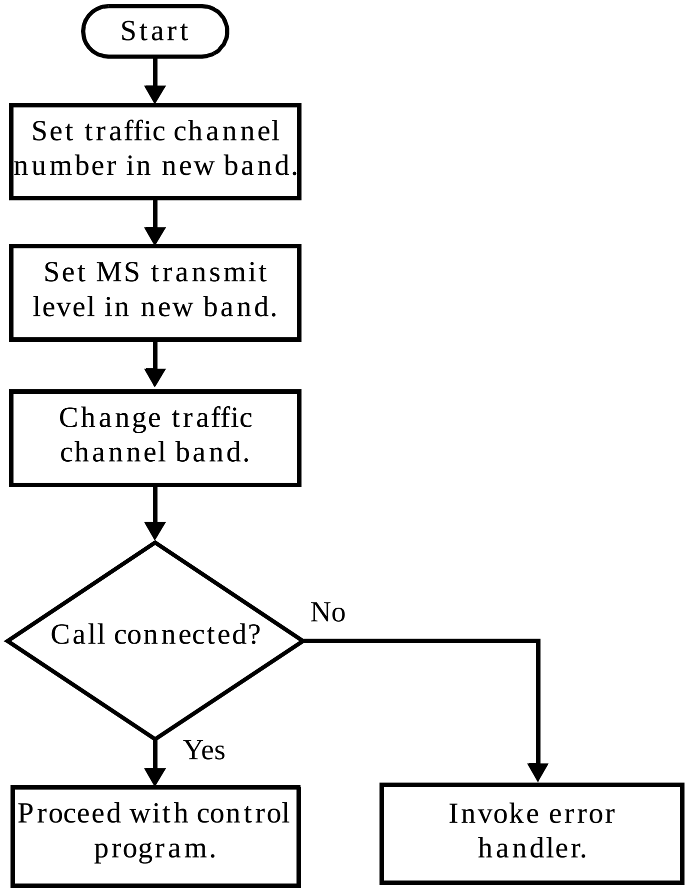
The following example illustrates how to use these commands to perform an intra-cell handover.

```
! existing conditions: a mobile station is connected to the test
! set, operating mode is set to active cell and a call is in the
! connected state.
! Step 1: Change the traffic channel number
OUTPUT Test_set;"CALL:TCH:SEQ 65"!Starts process of handing over MS
                                 !to new traffic channel 65.
                                 !No other commands will be processed
                                 !until this operation completes
                                 !because the :SEQ has been attached.
! Step #2: Check that the call is still in the connected state. It
          ! is possible that the MS did not successfully connect on the
          ! new channel.
OUTPUT Test_set;"CALL:STAT:STAT?"
ENTER Test_set;Call_status$
IF Call_status$ <> "CONN" THEN
! <put error handler here>
END IF
! Call is connected so proceed with control program
```

Performing a Dual-Band Handover

A dual-band handover is accomplished using the CALL:TCHannel:BAND command. The recommended process for performing a dual band handover is shown in the following figure.

Step 7: Figure 2. Process for Performing a Dual-Band Handover



Example 57. Programming Example:

The following example illustrates how to use the CALL:TCHannel:BAND command to perform a dual-band handover.

```
! existing conditions: a mobile station is connected to the test
! set, MS TX Level = 11, Timeslot = 4, Timing Advance = 0,
! operating mode is set to active cell, a call is in the
! connected state, and active broadcast band is EGSM
! Step #1: Configure the traffic channel in the new broadcast band
OUTPUT Test_set;"CALL:TCH:DCS 556"
OUTPUT Test_set;"CALL:MS:TXL:DCS 4"
! Step #2: Change the traffic channel band
OUTPUT Test_set;"CALL:TCH:BAND DCS" !This is a sequential command so no
                               !other commands will be executed until
                               !the handover is complete (the
                               !MS has communicated to the BSE that it
                               !has successfully transitioned to the
                               !new channel OR a protocol timer has
                               !timed out).
! Step #3: Check that the call is still in the connected state. It
          ! is possible that the MS did not successfully connect on the
          ! new channel.
OUTPUT Test_set;"CALL:STAT:STAT?"
ENTER Test_set;Call_state$
IF Call_state$ <> "CONN" THEN
! <put error handler here>
END IF
! Call is connected so proceed with control program
```

Step 8: Disconnect the Mobile Station from the BSE

Background

See “Step 4: Establish an Active Link with Mobile Station” for a discussion of call connect/disconnect synchronization.

Using the Call Connected State Query for Call Disconnect Synchronization

The call-connected-state query only hangs if the call is in a transitory state, otherwise it immediately returns a 1 (Connected state) or a 0 (Idle state). At the start of a call disconnect process the call state is Connected. Sending a call-connected-state query at the start of a call disconnect process could immediately return a one if the query is satisfied before the disconnection process has started (that is, moved from the Connected state into one of the transitory states). For correct call disconnect synchronization it is necessary that the query be temporarily held off until after the call disconnect process has started. The call-state-change-detector is provided which can be used to temporarily hold off the query from returning an answer until the appropriate state change has occurred.

Using the Call Connected Arm Command for Call Disconnect Synchronization

The call-state-change-detector arm command is used by the control program to tell the test set that it is expecting a change to the state of a call prior to initiating the state change. By first arming the call-state-change-detector, then querying the call connected state, and then attempting a BS or MS call termination, the call-connected-state query will hang until the disconnection operation begins and then reaches a final (Idle or Connected) state.

However, if the change detector is armed and a call disconnection is attempted but the call state never progresses from the Connected state, the call-connected-state query would hang forever. This could easily happen if the mobile is badly broken, no one pushes the “end” button on the mobile, etc.

The call-state-change-detector time-out timer is provided which is used to prevent the call-connected-state query from hanging forever.

Using the Call State Change Detector Time-out for Call Disconnect Synchronization

The call-state-change-detector time-out mechanism allows the test set to disarm the call-state-change-detector which releases the call connected state query if it is currently hanging.

The time-out timer is started whenever the call-state-change-detector is armed or gets rearmed when already armed. The duration of the time-out is set using the call-connected-time-out command and should be set to the maximum amount of time the control program should wait between arming and the disconnect process to begin. Once the process starts and the call state has moved into one of the transitory states the GSM defined protocol timers take over and prevent the call state from staying in a transitory state forever.

If the timer expires while the call is in the Idle or Connected state, the call-state-change-detector is disarmed, which releases the call connected state query if it is currently hanging.

If the timer expires while the call is in one of the transitory states it is ignored as, once in any transitory state, the GSM-defined protocol timers limit the amount of time that can be spent in any transitory state.

Overview

Terminating an active call with the mobile station when the test set is in active cell operating mode can be accomplished in one of two ways:

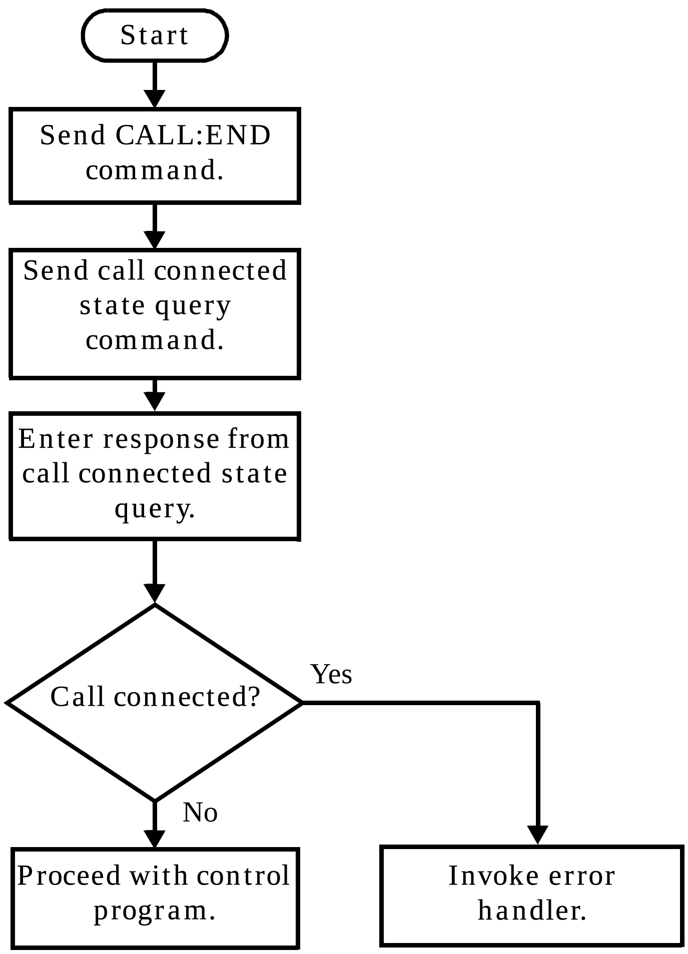
- Terminate the active call from the base station emulator
- Terminate the active call from the mobile station

Terminating an Active Call from the Base Station Emulator

The recommended process for terminating an active call from the base station emulator is shown in the following figure.

The CALL:END command is used to initiate a base station disconnect.

Step 8: Figure 1. Process for Terminating an Active Call from the BSE



Example 58. Programming Example:

```
!********************************************************************
! Step 8: Disconnect Mobile Station From BSE
!********************************************************************
!
OUTPUT Test_set;"CALL:END"        ! Initiate a base station disconnect.
OUTPUT Test_set;"CALL:CONN:STAT?" ! Initiate call connect state query.
ENTER Test_set;Call_connected     ! Program will hang here until state
                                  ! change or timer expires.
IF Call_connected THEN            ! Check if disconnect successful
! <put error handler here>
END IF
! Call is disconnected so proceed with control program
```

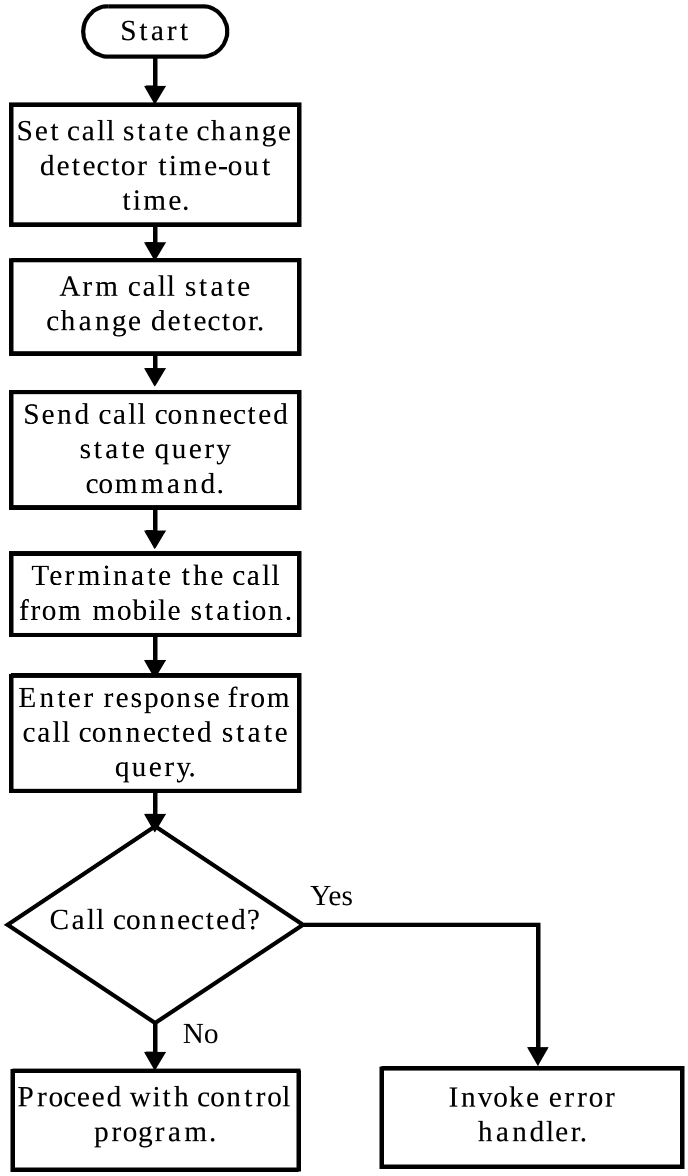
Terminating an Active Call from the Mobile Station

The process for terminating an active call from the mobile station is shown in the following figure.

There is no facility in the test set to initiate a call disconnect from the mobile station. This must be accomplished manually or through a test bus built into the mobile station.

For mobile station terminated calls where the call is terminated by physically pushing a button on the phone (as opposed to using a test bus) ensure that the call-state-change-detector time-out time is long enough to allow a human to push the button.

Step 8: Figure 2. Process for Terminating an Active Call from the Mobile Station



Example 59. Programming Example:

```
OUTPUT Test_set;"CALL:CONN:TIM 5" !Set timeout time to 5 seconds.
OUTPUT Test_set;"CALL:CONN:ARM"   !Arm the change detector.
OUTPUT Test_set;"CALL:CONN:STAT?" !Initiate call connect state query.
DISP "Terminate the call from the mobile station."
ENTER Test_set;Call_connected     !Program will hang here until state
                                  !change or timer expires.
IF Call_connected THEN            !Check if disconnect successful.
! <put error handler here>
END IF
! Call is disconnected so proceed with control program
```

Comprehensive Program Example

This section presents two example programs for making measurements using the test set. The first program follows the task flow presented at the beginning of the programming note (see “Figure 1. Typical Flow of Tasks Performed by Control Program” on page 151) and which is discussed throughout the programming guide. The second program, “Example Program Without Comments” on page 201, is basically the same as the first but comments have been removed and the coding reflects the use of compound commands and complex commands to achieve coding efficiency.

Example Program With Comments

```
10    ! Prog Name: com_man_ex.txt     Rev: A.0.2      Date Code: 12/18/98
20    !
30    ! Configure the BASIC environment, dimension and initialize variables.
40    ! These actions are unrelated to programming the Agilent 8960.
50    !
60    OPTION BASE 1
70    COM /Address/ Test_set
80    ! Allocate arrays to hold ORFS switching & modulation frequency offsets.
90    DIM Swit_offs$[255],Mod_offs$[255]
100   ! Allocate arrays to hold measurement results.
110   REAL Txpower(4)
120   Test_set=714  ! Test set’s GPIB address.
130   PRINTER IS CRT
140   CLEAR SCREEN
150   !
160   ! Reset test set to start from a known state. Not always necessary to do full
170   ! preset in a manufacturing environment but desireable in programming example.
180   !
190   OUTPUT Test_set;”*RST”
200   !
210   ! Turn on the GPIB debugger.  This is optional but very helpful for debugging
220   ! GPIB commands when developing new code.
230   !
240   OUTPUT Test_set;”SYST:COMM:GPIB:DEB:STAT ON”
250   !
260   ! Check error message queue and STOP if any errors present. This ensures that
270   ! the example program starts with no error conditions present in the test set.
280   !
290   CALL Chk_err_msg_que
300   !
310   !*****************************************************************************
320   ! Step 1: Set Test Set’s Operating Mode to Active Cell
330   !*****************************************************************************
340   !
350   OUTPUT Test_set;”CALL:OPER:MODE CELL”
360   !
370   !*****************************************************************************
380   ! Step 2: Configure the Base Station Emulator (BSE)
390   !*****************************************************************************
```

```
400   !
410   ! Set RF IN/OUT port’s amplitude offset to compensate for fixture loss of MS.
420   ! After setting offset, cell power settings reflect RF power at the MS antenna
430   ! input.
440   !
450   OUTPUT Test_set;”SYST:CORR:SGA -6”    ! MS has a -6 dB fixture loss.
460   !
470   OUTPUT Test_set;”CALL:CELL:BAND PGSM” ! Set active broadcast band to PGSM.
480   OUTPUT Test_set;”CALL:ACT OFF”        ! Deactivate cell to set network parms.
490   OUTPUT Test_set;”CALL:CELL:MCC 1;LAC 1;MNC 1;NCC 1;BCC 5” ! Set network parms.
500   OUTPUT Test_set;”CALL:ACT ON”         ! Reactivate the cell.
510   OUTPUT Test_set;”CALL:BCH 20”         ! Set broadcast channel to 20.
520   OUTPUT Test_set;”CALL:POW:SAMP -85”   ! Set cell power to -85 dBm and cell
530                                         ! power state to ON with complex command.
540   OUTPUT Test_set;”CALL:TCH 45”         ! Set traffic channel to 45.
550   OUTPUT Test_set;”CALL:TCH:TSL 4”      ! Set timeslot to 4.
560   !
570   !*****************************************************************************
580   ! Step 3: Configure the Measurement Execution Parameters
590   !*****************************************************************************
600   !
610   ! Configure ORFS Measurement:
620   !
630   OUTPUT Test_set;”SET:ORFS:SWIT:COUN 5” ! Examples of using complex commands to
640   OUTPUT Test_set;”SET:ORFS:MOD:COUN 10” ! set multi-meas state and count at
650                                          ! same time.
660   OUTPUT Test_set;”SET:ORFS:TRIG:SOUR AUTO”  ! Set trig source to AUTO.
670   OUTPUT Test_set;”SET:ORFS:CONT OFF”        ! Set trig mode to single.
680   OUTPUT Test_set;”SET:ORFS:TIM 60”          ! Set timeout time to 60 seconds.
690   ! Put switching and modulation offsets to be tested into string variables.
700   Swit_offs$=”400KHZ,-400KHZ,600KHZ,-600KHZ,1200KHZ,-1200KHZ,1800KHZ,-1800KHZ”
710   Mod_offs$=”.2MHZ,-.2MHZ,.4MHZ,-.4MHZ,.6MHZ,-.6MHZ,.8MHZ,-.8MHZ,1MHZ,-1MHZ”
720   OUTPUT Test_set;”SET:ORFS:SWIT:FREQ “&Swit_offs$
730   OUTPUT Test_set;”SET:ORFS:MOD:FREQ “&Mod_offs$
740   !
750   ! Configure TX Power Measurement:
760   !
770   OUTPUT Test_set;”SET:TXP:COUN 3”
780   OUTPUT Test_set;”SET:TXP:TRIG:SOUR RISE;QUAL ON”
790   OUTPUT Test_set;”SET:TXP:CONT OFF”
800   OUTPUT Test_set;”SET:TXP:TIM 20”
810   !
820   ! Configure Phase & Frequency Error Measurement:
830   !
840   OUTPUT Test_set;”SET:PFER:COUN 8”
850   OUTPUT Test_set;”SET:PFER:TRIG:SOUR PROT;QUAL ON”
860   OUTPUT Test_set;”SET:PFER:CONT OFF”
870   OUTPUT Test_set;”SET:PFER:TIM 30”
880   OUTPUT Test_set;”SET:PFER:BSYN MID”
890   !
900   !*****************************************************************************
910   ! Step 4: Establish an Active Link with the Mobile Station
920   !*****************************************************************************
```

```
930   !
940   OUTPUT Test_set;”CALL:PAG:IMSI ‘001012345678901’”  ! Set paging IMSI.
950   OUTPUT Test_set;”CALL:PAG:REP OFF”  ! Set paging repeat state to off.
960   !
970   ! This example uses a BSE originated call. The MS must be camped to the BSE
980   ! in order for the BSE to originate a call. The following code will try to
990   ! originate a call 50 times and then STOP the program. This should give
1000  ! adequate time for the MS to camp to the BSE.
1010  !
1020  ! NOTE: This technique will cause the following error to be displayed on the
1030  !       test set’s display and be put in the error message queue each time
1040  !       that the call fails to connect.  This is normal for this technique.
1050  ! ‘GSM call disconnected; No response to page (Timer T3113 expiry)’
1060  !
1070  Tries=1
1080  LOOP
1090    OUTPUT Test_set;”CALL:ORIG”        ! Originate a call.
1100    OUTPUT Test_set;”CALL:CONN:STAT?”  ! CALL:CONNected hanging GPIB query.
1110    ENTER Test_set;Call_connected  ! Program will hang here until origination
1120                                   ! process completes.  If successful and
1130                                   ! the call is connected the query will
1140                                   ! return a 1.  If unsuccessful and the call
1150                                   ! is not connected the query returns 0.
1160  EXIT IF Call_connected
1170    OUTPUT Test_set;”CALL:END”
1180    IF Tries=50 THEN
1190      BEEP
1200      DISP ““
1210      PRINT “Call did not connect after”;Tries;”. Program terminated.”
1220      STOP
1230    END IF
1240    DISP “Call has not connected after”;Tries;”attempts. Trying again.”
1250    Tries=Tries+1
1260  END LOOP
1270  DISP ““
1280   !
1290  !****************************************************************************
1300  ! Step 5: Set the Mobile Station’s Operating Conditions
1310  !****************************************************************************
1320  !
1330  OUTPUT Test_set;”CALL:MS:DTX OFF”             ! Turn DTX off for all MS tests.
1340  !
1350  FOR Traf_chan=120 TO 124 STEP 2               ! Test channels 120, 122 & 124.
1360    OUTPUT Test_set;”CALL:TCH:SEQ “;Traf_chan   ! Use :SEQ to force sequential
1370                                                ! execution of the TCH command.
1380    OUTPUT Test_set;”CALL:STAT:STAT?”     ! Verify that the call is still in
1390    ENTER Test_set;Call_status$           ! the connected state after handover.
1400    IF Call_status$<>”CONN” THEN
1410      PRINT “Call handover failed. New channel assignment =”;Traf_chan
1420      PRINT “Program terminated.”
1430      STOP
1440    END IF
1450    FOR Ms_pwr_lvl=5 TO 15 STEP 5               ! Test power levels 5, 10 & 15.
```

```
1460      OUTPUT Test_set;”CALL:MS:TXL:SEQ “;Ms_pwr_lvl ! Use :SEQ to force
1470                                                    ! sequential execution of
1480                                                    ! the TXLevel command.
1490  !
1500  !****************************************************************************
1510  ! Step 6: Make Measurements
1520  !****************************************************************************
1530  !
1540  ! Step 6a: Start a set of concurrent measurements:
1550  !
1560      OUTPUT Test_set;”INIT:TXP;PFER;ORFS”
1570  !
1580  ! Step 6b: Determine if a measurement is done:
1590  !
1600      LOOP
1610        OUTPUT Test_set;”INIT:DONE?”
1620        ENTER Test_set;Meas_done$
1630  !
1640  ! Step 6c: Obtain measurement results: Each measurement illustrates a
1650  !          different way of reading in results. There is no one right way. The
1660  !          method used is application dependent. Note that the examples do not
1670  !          show all possible ways.
1680  !
1690        SELECT Meas_done$
1700  !
1710        CASE “TXP”  ! TX Power measurement done.
1720          OUTPUT Test_set;”FETC:TXP:INT?;POW:ALL?”
1730          ENTER Test_set;Integrity,Txpower(*)
1740          IF (Integrity=0) THEN  ! Always check integrity value.
1750            PRINT “TX Power results: TCH =”;Traf_chan;”and TXL =”;Ms_pwr_lvl
1760            PRINT USING “5X,””Minimum:””,M2D.2D,”” dBm”””;Txpower(1)
1770            PRINT USING “5X,””Maximum:””,M2D.2D,”” dBm”””;Txpower(2)
1780            PRINT USING “5X,””Average:””,M2D.2D,”” dBm”””;Txpower(3)
1790            PRINT USING “5X,””Std Dev:””,M2D.2D,”” dB”””;Txpower(4)
1800          ELSE
1810            GOSUB Bad_measurement
1820          END IF
1830  !
1840        CASE “PFER”  ! Phase & Frequency Error measurement done.
1850          OUTPUT Test_set;”FETC:PFER:ALL?”
1860          ENTER Test_set;Integrity,Rms_phas_err,Peak_phas_err,Worst_freq_err
1870          IF (Integrity=0) THEN
1880            PRINT “PFERror results: TCH =”;Traf_chan;”and TXL =”;Ms_pwr_lvl
1890            PRINT USING “5X,””RMS Phase Error:””,M2D.2D,”” deg”””;Rms_phas_err
1900            PRINT USING “5X,””Peak Phase Error:””,M2D.2D,”” deg”””;Peak_phas_err
1910            PRINT USING “5X,””Worst Freq Error:””,M3D.2D,”” Hz”””;Worst_freq_err
1920          ELSE
1930            GOSUB Bad_measurement
1940          END IF
1950  !
1960        CASE “ORFS”  ! ORFS measurement done.
1970        !
1980        ! This code illustrates a more ‘generic’ approach to reading measurement
```

```
1990        ! results. By using the capabilities designed into high-level
2000        ! measurements, routines that access measurement results do not have to
2010        ! explicitly know what the measurement execution conditions were.  That
2020        ! information can be determined at the time the measurement results are
2030        ! queried.
2040        !
2050          OUTPUT Test_set;"FETC:ORFS:INT?"        ! Check measurement integrity.
2060          ENTER Test_set;Integrity
2070          IF (Integrity=0) THEN
2080            OUTPUT Test_set;"SET:ORFS:SWIT:FREQ:POIN?" ! Get number of offsets
2090                                                       ! tested.
2100            ENTER Test_set;Points
2110            IF Points THEN  ! Only query if one or more offsets tested.
2120              ALLOCATE Orfs_swit_res(Points),Orfs_swit_offs(Points)
2130              OUTPUT Test_set;"SET:ORFS:SWIT:FREQ?"  ! Get measurement offsets.
2140              ENTER Test_set;Orfs_swit_offs(*)
2150              OUTPUT Test_set;"FETC:ORFS:POW?;:FETC:ORFS:SWIT?" ! Get results.
2160              ENTER Test_set;Tx_power,Orfs_swit_res(*)
2170              PRINT "ORFS Swit Results: TCH =";Traf_chan;"and TXL =";Ms_pwr_lvl
2180              PRINT USING "19X,""TX Power ="",M2D.2D,"" dBm""";Tx_power
2190              PRINT "     Offset(kHz)          Level(dBm)"
2200              PRINT "     -----------          ----------"
2210 Orfs_image:  IMAGE 6X,M4D.2D,12X,M4D.2D
2220              FOR J=1 TO Points
2230                PRINT USING Orfs_image;(Orfs_swit_offs(J)/1.E+3),Orfs_swit_res(J)
2240              NEXT J
2250              DEALLOCATE Orfs_swit_res(*),Orfs_swit_offs(*)
2260            END IF
2270            OUTPUT Test_set;"SET:ORFS:MOD:FREQ:POIN?" ! Get number of offsets
2280                                                      ! tested.
2290            ENTER Test_set;Points
2300            IF Points THEN ! Only query if one or more offsets tested.
2310              ALLOCATE Orfs_mod_res(Points),Orfs_mod_offs(Points)
2320              OUTPUT Test_set;"SET:ORFS:MOD:FREQ?" ! Get measurement offsets.
2330              ENTER Test_set;Orfs_mod_offs(*)
2340              OUTPUT Test_set;"FETC:ORFS:POW?;:FETC:ORFS:MOD?" ! Get results.
2350              ENTER Test_set;Tx_power,Pwr_30khz,Orfs_mod_res(*)
2360              PRINT "ORFS Mod Results: TCH =";Traf_chan;"and TXL =";Ms_pwr_lvl
2370              PRINT USING "18X,""30 KHz BW Power ="",M2D.2D,"" dBm""";Pwr_30khz
2380              PRINT "     Offset(kHz)          Level(dB)"
2390              PRINT "     -----------          ---------"
2400              FOR J=1 TO Points
2410                PRINT USING Orfs_image;(Orfs_mod_offs(J)/1.E+3),Orfs_mod_res(J)
2420              NEXT J
2430              DEALLOCATE Orfs_mod_res(*),Orfs_mod_offs(*)
2440            END IF
2450          ELSE
2460            GOSUB Bad_measurement
2470          END IF
2480        END SELECT
2490      EXIT IF Meas_done$="NONE"
2500      END LOOP  ! If 'WAIT' is returned from 'INIT:DONE?' query, it just falls
2510                ! through the loop.
```

```
2520    NEXT Ms_pwr_lvl
2530    !
2540  !***************************************************************************
2550  ! Step 7: Perform an Intra-cell Handover
2560  !***************************************************************************
2570  !
2580  NEXT Traf_chan  ! The handover is performed at the top of the FOR loop at line
2590                  ! 1300
2600  !
2610  !***************************************************************************
2620  ! Step 8: Disconnect the Mobile Station From the BSE
2630  !***************************************************************************
2640  !
2650  OUTPUT Test_set;"CALL:END"
2660  OUTPUT Test_set;"CALL:CONN:STAT?"
2670  ENTER Test_set;Call_connected
2680  IF Call_connected THEN
2690    BEEP
2700    PRINT "Unable to complete BS termination. Program terminated."
2710    STOP
2720  END IF
2730  PRINT "Program completed."
2740  STOP
2750  !
2760 Bad_measurement: !
2770  PRINT "Measurement error: "&Meas_done$
2780  PRINT "Measurement Integrity value =";Integrity
2790  RETURN
2800  !
2810  END  ! End of program
2820  !
2830  SUB Chk_err_msg_que
2840    COM /Address/ Test_set
2850    DIM Error_message$[255]
2860    Error_flag=0
2870    LOOP
2880      OUTPUT Test_set;"SYST:ERR?"
2890      ENTER Test_set;Error_number,Error_message$
2900    EXIT IF Error_number=0
2910      IF Error_number=-350 THEN
2920        Error_flag=1
2930        PRINT "Error Message Queue overflow. Error messages have been lost."
2940      ELSE
2950        Error_flag=1
2960        PRINT Error_number,Error_message$
2970      END IF
2980    END LOOP
2990    IF NOT Error_flag THEN
3000      PRINT "No errors in Error Message Queue."
3010      SUBEXIT
3020    END IF
3030    STOP
3040  SUBEND
```

Example Program Without Comments

The following program is basically the same as the example program presented in "Example Program With Comments" on page 195 but comments have been removed and the coding reflects the use of compound commands and complex commands to achieve coding efficiency.

```
10    ! Prog Name: sim_man_ex.txt     Rev: A.0.2      Date Code: 12/18/98
20    OPTION BASE 1
30    COM /Address/ Test_set
40    DIM Swit_offs$[255],Mod_offs$[255]
50    REAL Txpower(4)
60    Test_set=714
70    PRINTER IS CRT
80    CLEAR SCREEN
90    OUTPUT Test_set;”*RST;SYST:COMM:GPIB:DEB:STAT ON”
100   CALL Chk_err_msg_que
110   OUTPUT Test_set;”CALL:OPER:MODE CELL;:SYST:CORR:SGA -6”
120   OUTPUT Test_set;”CALL:CELL:BAND PGSM;BCH 20;POW:SAMP -85;:CALL:TCH:ARFC 45;TSL 4”
130   OUTPUT Test_set;”CALL:CELL:ACT OFF;MCC 1;LAC 1;MNC 1;NCC 1;BCC 5;ACT ON”
140   OUTPUT Test_set;”SET:ORFS:SWIT:COUN 5;:SET:ORFS:MOD:COUN 10”
150   OUTPUT Test_set;”SET:ORFS:CONT OFF;TIM 60;TRIG:SOUR AUTO”
160   Swit_offs$=”400KHZ,-400KHZ,600KHZ,-600KHZ,1200KHZ,-1200KHZ,1800KHZ,-1800KHZ”
170   Mod_offs$=”.2MHZ,-.2MHZ,.4MHZ,-.4MHZ,.6MHZ,-.6MHZ,.8MHZ,-.8MHZ,1MHZ,-1MHZ”
180   OUTPUT Test_set;”SET:ORFS:SWIT:FREQ “&Swit_offs$&”;:SET:ORFS:MOD:FREQ “&Mod_offs$
190   OUTPUT Test_set;”SET:TXP:COUN 3;CONT OFF;TIM 20;TRIG:SOUR RISE;QUAL ON”
200   OUTPUT Test_set;”SET:PFER:COUN 8;CONT OFF;TIM 30;BSYN MID;TRIG:SOUR PROT;QUAL ON”
210   OUTPUT Test_set;”CALL:PAG:REP OFF;IMSI ‘001012345678901’”
220   Tries=1
230   LOOP
240     OUTPUT Test_set;”CALL:ORIG;CONN:STAT?”
250     ENTER Test_set;Call_connected
260   EXIT IF Call_connected
270     OUTPUT Test_set;”CALL:END”
280     IF Tries=50 THEN
290       BEEP
300       DISP ““
310       PRINT “Call did not connect after”;Tries;”. Program terminated.”
320       STOP
330     END IF
340     DISP “Call has not connected after”;Tries;”attempts. Trying again.”
350     Tries=Tries+1
360   END LOOP
370   DISP ““
380   OUTPUT Test_set;”CALL:MS:DTX OFF”
390   FOR Traf_chan=120 TO 124 STEP 2
400     OUTPUT Test_set;”CALL:TCH:SEQ “;Traf_chan;”;:CALL:STAT:STAT?”
410     ENTER Test_set;Call_status$
420     IF Call_status$<>”CONN” THEN
430       PRINT “Call handover failed. New channel assignment =”;Traf_chan
440       PRINT “Program terminated.”
450       STOP
460     END IF
470     FOR Ms_pwr_lvl=5 TO 15 STEP 5
```

```
480       OUTPUT Test_set;”CALL:MS:TXL:SEQ “;Ms_pwr_lvl;”;:INIT:TXP;PFER;ORFS”
490       LOOP
500         OUTPUT Test_set;”INIT:DONE?”
510         ENTER Test_set;Meas_done$
520         SELECT Meas_done$
530         CASE “TXP”
540           OUTPUT Test_set;”FETC:TXP:INT?;POW:ALL?”
550           ENTER Test_set;Integrity,Txpower(*)
560           IF (Integrity=0) THEN
570             PRINT “TX Power results: TCH =”;Traf_chan;”and TXL =”;Ms_pwr_lvl
580             PRINT USING “5X,””Minimum:””,M2D.2D,”” dBm”””;Txpower(1)
590             PRINT USING “5X,””Maximum:””,M2D.2D,”” dBm”””;Txpower(2)
600             PRINT USING “5X,””Average:””,M2D.2D,”” dBm”””;Txpower(3)
610             PRINT USING “5X,””Std Dev:””,M2D.2D,”” dB”””;Txpower(4)
620           ELSE
630             GOSUB Bad_measurement
640           END IF
650         CASE “PFER”
660           OUTPUT Test_set;”FETC:PFER:ALL?”
670           ENTER Test_set;Integrity,Rms_phas_err,Peak_phas_err,Worst_freq_err
680           IF (Integrity=0) THEN
690             PRINT “PFERror results: TCH =”;Traf_chan;”and TXL =”;Ms_pwr_lvl
700             PRINT USING “5X,””RMS Phase Error:””,M2D.2D,”” deg”””;Rms_phas_err
710             PRINT USING “5X,””Peak Phase Error:””,M2D.2D,”” deg”””;Peak_phas_err
720             PRINT USING “5X,””Worst Freq Error:””,M3D.2D,”” Hz”””;Worst_freq_err
730           ELSE
740             GOSUB Bad_measurement
750           END IF
760         CASE “ORFS”
770           OUTPUT Test_set;”FETC:ORFS:INT?”
780           ENTER Test_set;Integrity
790           IF (Integrity=0) THEN
800             OUTPUT Test_set;”SET:ORFS:SWIT:FREQ:POIN?”
810             ENTER Test_set;Points
820             IF Points THEN
830               ALLOCATE Orfs_swit_res(Points),Orfs_swit_offs(Points)
840               OUTPUT Test_set;”SET:ORFS:SWIT:FREQ?;:FETC:ORFS:POW?;:FETC:ORFS:SWIT?”
850               ENTER Test_set;Orfs_swit_offs(*),Tx_power,Orfs_swit_res(*)
860               PRINT “ORFS Swit Results: TCH =”;Traf_chan;”and TXL =”;Ms_pwr_lvl
870               PRINT USING “19X,””TX Power =””,M2D.2D,”” dBm”””;Tx_power
880               PRINT “     Offset(kHz)          Level(dBm)”
890               PRINT “     -----------          ----------”
900 Orfs_image:   IMAGE 6X,M4D.2D,12X,M4D.2D
910               FOR J=1 TO Points
920                 PRINT USING Orfs_image;(Orfs_swit_offs(J)/1.E+3),Orfs_swit_res(J)
930               NEXT J
940               DEALLOCATE Orfs_swit_res(*),Orfs_swit_offs(*)
950             END IF
960             OUTPUT Test_set;”SET:ORFS:MOD:FREQ:POIN?”
970             ENTER Test_set;Points
980             IF Points THEN
990               ALLOCATE Orfs_mod_res(Points),Orfs_mod_offs(Points)
1000              OUTPUT Test_set;”SET:ORFS:MOD:FREQ?;:FETC:ORFS:POW?;:FETC:ORFS:MOD?”
```

```
1010              ENTER Test_set;Orfs_mod_offs(*),Tx_power,Pwr_30khz,Orfs_mod_res(*)
1020              PRINT “ORFS Mod Results: TCH =”;Traf_chan;”and TXL =”;Ms_pwr_lvl
1030              PRINT USING “18X,””30 KHz BW Power =””,M2D.2D,”” dBm”””;Pwr_30khz
1040              PRINT “     Offset(kHz)          Level(dB)”
1050              PRINT “     -----------          ---------”
1060              FOR J=1 TO Points
1070                PRINT USING Orfs_image;(Orfs_mod_offs(J)/1.E+3),Orfs_mod_res(J)
1080              NEXT J
1090              DEALLOCATE Orfs_mod_res(*),Orfs_mod_offs(*)
1100            END IF
1110          ELSE
1120            GOSUB Bad_measurement
1130          END IF
1140        END SELECT
1150      EXIT IF Meas_done$=”NONE”
1160      END LOOP
1170    NEXT Ms_pwr_lvl
1180  NEXT Traf_chan
1190  OUTPUT Test_set;”CALL:END;CONN:STAT?”
1200  ENTER Test_set;Call_connected
1210  IF Call_connected THEN
1220    BEEP
1230    PRINT “Unable to complete BS termination. Program terminated.”
1240    STOP
1250  END IF
1260  PRINT “Program completed.”
1270  STOP
1280  !
1290 Bad_measurement: !
1300  PRINT “Measurement error: “&Meas_done$
1310  PRINT “Measurement Integrity value =”;Integrity
1320  RETURN
1330  !
1340  END
1350  !
1360  SUB Chk_err_msg_que
1370    COM /Address/ Test_set
1380    DIM Error_message$[255]
1390    Error_flag=0
1400    LOOP
1410      OUTPUT Test_set;”SYST:ERR?”
1420      ENTER Test_set;Error_number,Error_message$
1430    EXIT IF Error_number=0
1440      IF Error_number=-350 THEN
1450        Error_flag=1
1460        PRINT “Error Message Queue overflow. Error messages have been lost.”
1470      ELSE
1480        Error_flag=1
1490        PRINT Error_number,Error_message$
1500      END IF
1510    END LOOP
1520    IF NOT Error_flag THEN
1530      PRINT “No errors in Error Message Queue.”
```

```
1540      SUBEXIT
1550    END IF
1560    STOP
1570  SUBEND
```

5 GPIB Command Syntax

Diagram Conventions

July 7, 1999

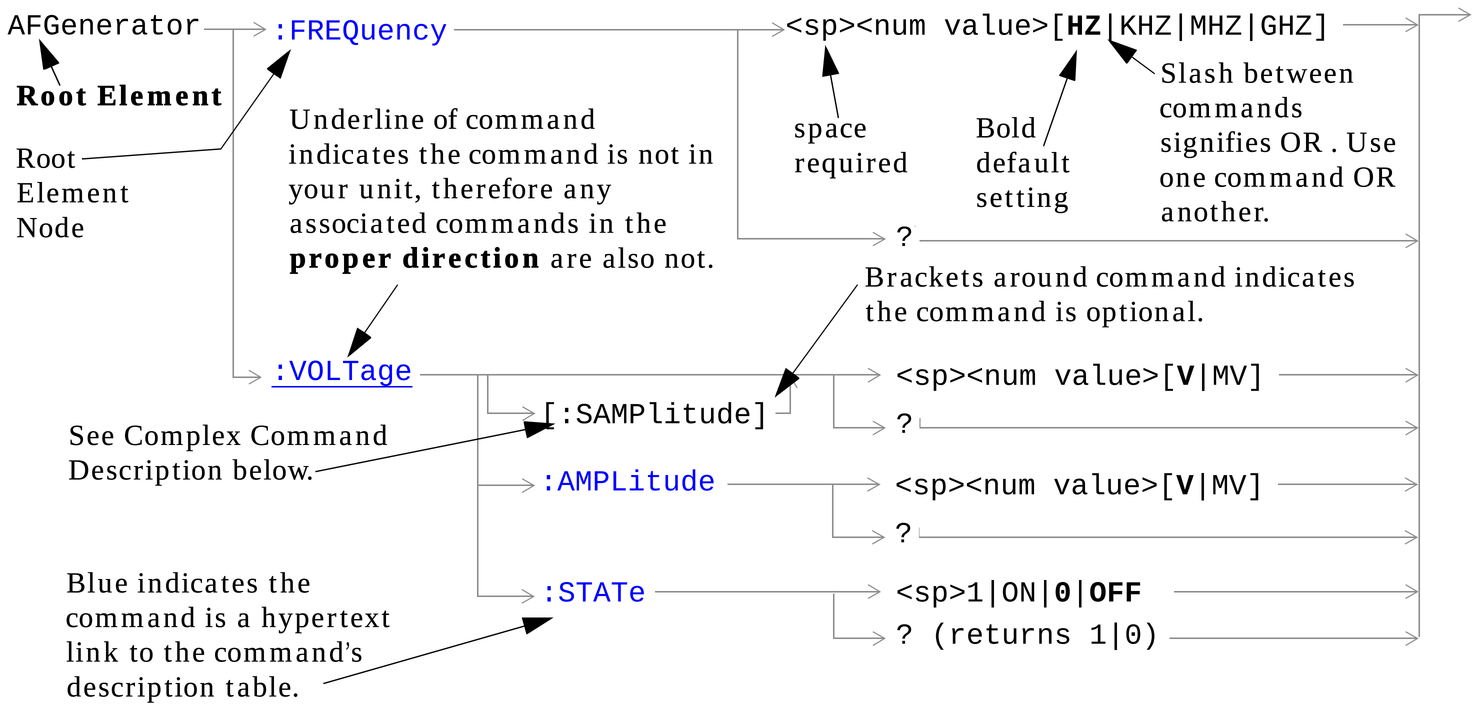


Diagram Description

Statement elements are connected by lines. Each line can be followed in only one direction, as indicated by the arrow at the end of the line. Any combination of statement elements that can be generated by starting at the **Root Element** and following the line the **proper direction** is syntactically correct. The drawings show the proper use of spaces. Where spaces are required they are indicated by **<sp>**, otherwise no spaces are allowed between statement elements.

Complex Command Description

A complex command sets the state of the parameter to ON, and is used to set a value for that parameter. These parameters; amplitude, frequency, gain, number, time, and value can be used as a complex command. Refer to the specific command for the parameter that applies.

Developing Code

It is recommended that you set the Test Set's operating environment to debug. To set the Test Set debug mode to "ON" use the following syntax:

```
SYSTem:COMMunicate:GPIB:DEBug ON
```

Units-of-Measure

If you do not specify units-of-measure in your code the following table indicates the default units-of-measure that will be assumed.

Amplitude (linear)	V
Frequency	HZ
Power (logarithmic)	dBm
Time	S

ABORt Subsystem

Description

The ABORt command causes a measurement cycle in progress to stop. If the measurement is not being continuously armed (single trigger) , the measurement will remain in the idle state after this event. If the measurement is being continuously armed, a new measurement cycle will begin after ABORt. If an ABORt command is issued from any measurement state other than measuring, the command is ignored.

Other Commands that Execute an ABORt Action

INITiate:<meas> will execute an ABORt:<meas> as part of the INITiate:<meas> command.

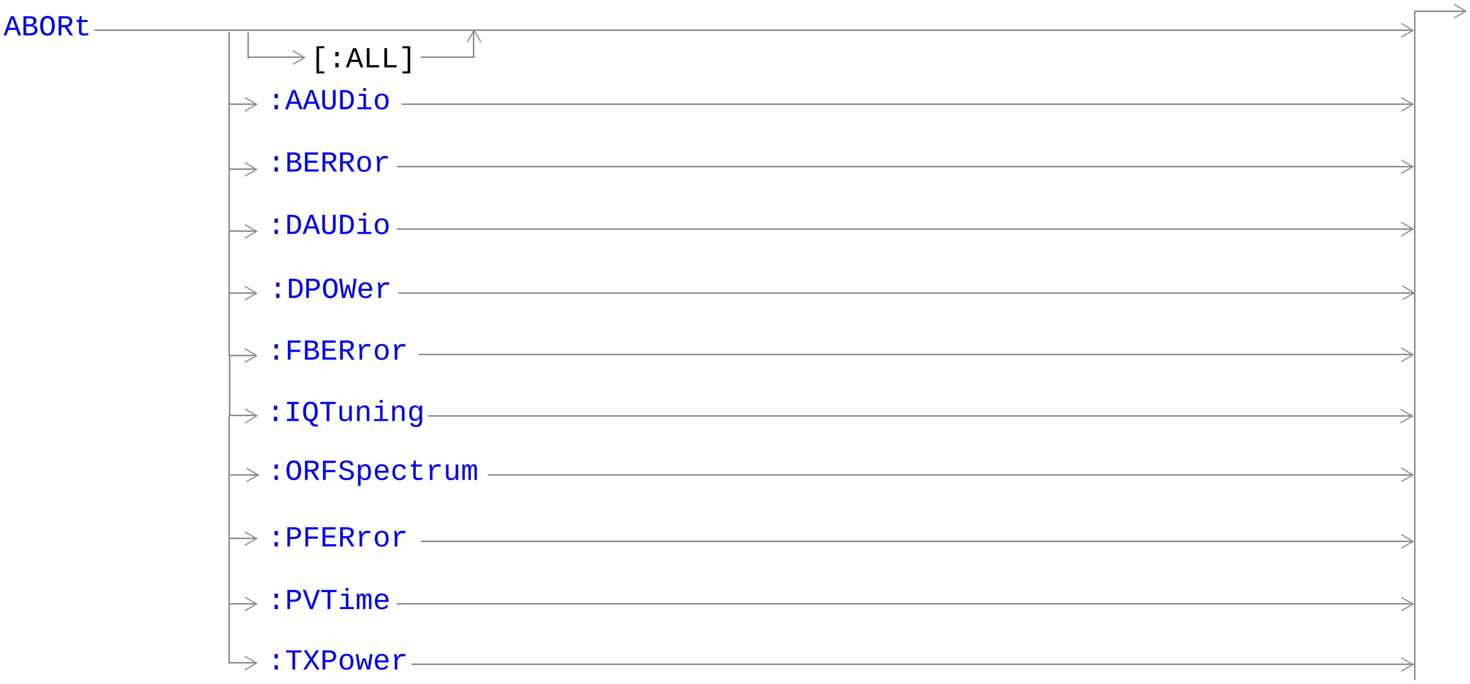
READ:<meas>? will execute an ABORt:<meas> action that aborts just one trigger sequence and then combines the INITiate and FETCh? commands.

Syntax Diagram and Command Descriptions

"ABORt"

ABORt

December 1, 1999



"Diagram Conventions" on page 207

ABORt[:ALL]

Function	Stops any and all measurements that are active. See “Measurement States” on page 147 If the trigger arm is set to single, see “Trigger Arm (Single or Continuous) Description” on page 147 the measurements will go to the idle state. If the trigger arm is set to continuous the measurements will re-arm and initiate again.
Setting	Range • AAUDio • BERRor • DAUDio • DPOWer • FBERror • IQTuning • ORFSpectrum • PFERror • PVTime • TXPower
Programming Example `OUTPUT 714;"ABORT:ALL" !Aborts all active measurements in progress.`	

ABORt:<meas-mnemonic>

Function	Stops the selected measurement if it is active. See “Measurement States” on page 147 If the trigger arm is set to single, see “Trigger Arm (Single or Continuous) Description” on page 147the measurements will go to the idle state. If the trigger arm is set to continuous the measurements will re-arm and initiate again.
Setting	Range • AAUDio • BERRor • DAUDio • DPOWer • FBERror • ORFSpectrum • IQTuning • PFERror • PVTime • TXPower
Programming Example	

```
OUTPUT 714;"ABORT:PVTIME" !Aborts a PvT measurement.
```

AFGenerator Subsystem

Description

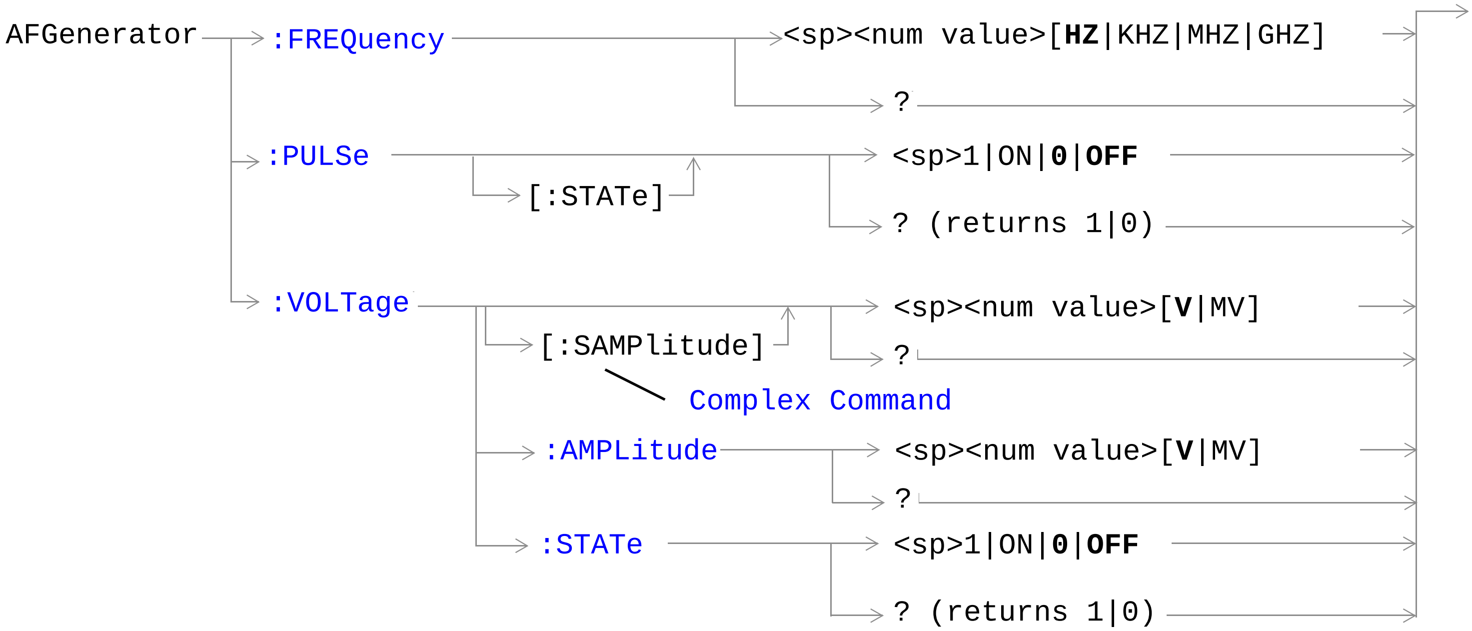
The AFGenerator subsystem is used to control the audio source that is available at the Audio Output connector.

Syntax Diagram and Command Descriptions

"AFGenerator"

AFGenerator

June 28, 1999



“Diagram Conventions” on page 207

AFGenerator:FREQuency

Function	Sets/queries the frequency of the audio generator. The units (HZ|KHZ|MHZ|GHZ) are optional, if no units are specified then units default to HZ.
Setting	Range: 1 Hz to 20 kHz Resolution: .1 HZ
Query	Range: 1 Hz to 20 kHz Resolution: .1 HZ
*RST setting	1 KHZ
Programming Example `OUTPUT 714;”AFGENERATOR:FREQUENCY 1000” !Sets the audio generator frequency to 1000 Hz.`	

AFGenerator:PULSe[:STATe]

Function	Sets/queries the audio generator pulse state. The pulse state must be on when the test set's audio generator is used for audio stimulation during a decoded audio measurement. When the state is on, the audio signal from the test set is pulsed at a 10 Hz rate with a 50% duty cycle. The amplitude and frequency of the pulse is set with afgenerator commands. See “AFGenerator” on page 214.
Setting	Range: 0 | OFF | 1 |ON
Query	Range: 0|1
*RST setting	0|off
Programming Example	

```
OUTPUT 714;"AFGENERATOR:PULSE ON" !Sets the audio generator pulse to ON.
```

AFGenerator:VOLTage[:SAMPlitude]

Function	Sets /queries the amplitude of the audio generator in volts and turns the state to on. The units (V|MV) are optional, if no units are specified then units default to V.
Setting	Range: 0 - 9 v pk. Resolution: • .5mv pk. <= 1v pk. output • 5mv pk. > 1v pk. output
Query	Range: 0 - 9 v pk. Resolution: • .5mv pk. <= 1v pk. output • 5mv pk. > 1v pk. output
*RST setting	zero volts
Programming Example	

```
OUTPUT 714;"AFGENERATOR:VOLTAGE 2.1" !Sets the state to on and the output
                                     !voltage to 2.1 volts.
```

AFGenerator:VOLTage:AMPlitude

Function	Sets/queries the amplitude for the audio generator when the audio generator state is on. The units (V|MV) are optional, if no units are specified then units default to V.
Setting	Range: 0 - 9 v pk. Resolution: • .5mv pk. <= 1v pk. output • 5mv pk. > 1v pk. output
Query	Range: 0 - 9 v pk. Resolution: • .5mv pk. <= 1v pk. output • 5mv pk. > 1v pk. output
*RST setting	zero volts

Programming Example

```
OUTPUT 714;"AFGENERATOR:VOLTAGE:AMPLITUDE 1.414" !Sets the audio generator output
                                                !voltage to 1.414 volts peak.
```

AFGenerator:VOLTage:STATe

Function	Sets/queries the audio generator state
Setting	0 | OFF | 1 |ON
Query	0|1
*RST setting	0|off

Programming Example

```
OUTPUT 714;"AFGENERATOR:VOLTAGE:STATE ON" !Set the audio generator state to ON.
```

CALibration Subsystem

Description

The only user calibration that can be performed is for the IQ modulator. This calibration is required if the Baseband Generator or the Vector Output modules are serviced or swapped. The CALibration:IQ subsystem should not be used as part of frequent (i.e. daily, weekly or monthly) test set calibration.

Syntax Diagram and Command Descriptions

"CALibration"

CALibration

April 30, 1999

```
CALibration ──┬──> :IQ ─┬──────┬─? (returns 0 for pass or -340 for fail)──>┬─>
              │         └>[:1]─┘                                            │
              ├──> :IQ2? (returns 0 for pass or -340 for fail)─────────────>┤
              │                                                             │
              └──> :DATE ─┬─> <sp><YYYY,MM,DD> ────────────────────────────>┤
                          └─> ? ───────────────────────────────────────────>┘
```

"Diagram Conventions" on page 207

CALibration:IQ[:1]?

Function	Sets/queries the calibration of the IQ modulator for RF generator 1. It takes some time to complete calibration and can't be aborted except by cycling the power switch. • Calibrates the IQ modulator for RF generator 1. • Returns a value indicating success or failure of calibration.
Query	Range • 0 = Pass • –340 = Fail

Programming Example

```
OUTPUT 714;"CALIBRATION:IQ?" !Performs a calibration of the IQ modulator for
                             !RF generator 1 and returns a value indicating
                             !success or failure.
```

NOTE When the the calibration is done the test set display will display:

IQ Calibration completed successfully for modulator 1. Cycle power to continue.

CALibration:IQ2?

Function	Sets/queries the calibration of the IQ modulator for RF generator 2. It takes some time to complete calibration and can't be aborted except by cycling the power switch. • Calibrates the IQ modulator for RF generator 2. • Returns a value indicating success or failure of calibration.
Query	Range • 0 = Pass • –340 = Fail

Programming Example

```
OUTPUT 714;"CALLIBRATION:IQ2?" !Performs a calibration of the IQ modulator for
                               !RF generator 2 and returns a value indicating
                               !success or failure.
```

NOTE When the the calibration is done the test set display will display:

IQ Calibration completed successfully for modulator 1. Cycle power to continue.

CALibration:DATE

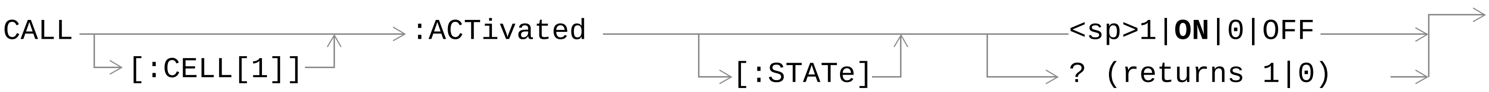
Function	Sets/queries the date of the last system calibration done to the test set not the IQ calibration date. Returns a comma separated list YYYY,MM,DD in that order.
Setting	Sets the system calibration date. Range • Year = 0000 to 9999 • Month = 01 to 12 • Day = 01 to 31
Query	Returns the date when system calibration was performed. Range • Year = 0000 to 9999 • Month = 1 to 12 • Day = 1 to 31

Programming Example

```
OUTPUT 714;"CALIBRATION:DATE 1999,01,04" !Sets the date of the last system
                                         !calibration year, month and day.
```

CALL:ACTivated

April 20, 1999



“Diagram Conventions” on page 207

CALL[:CELL]:ACTivated[:STATe]

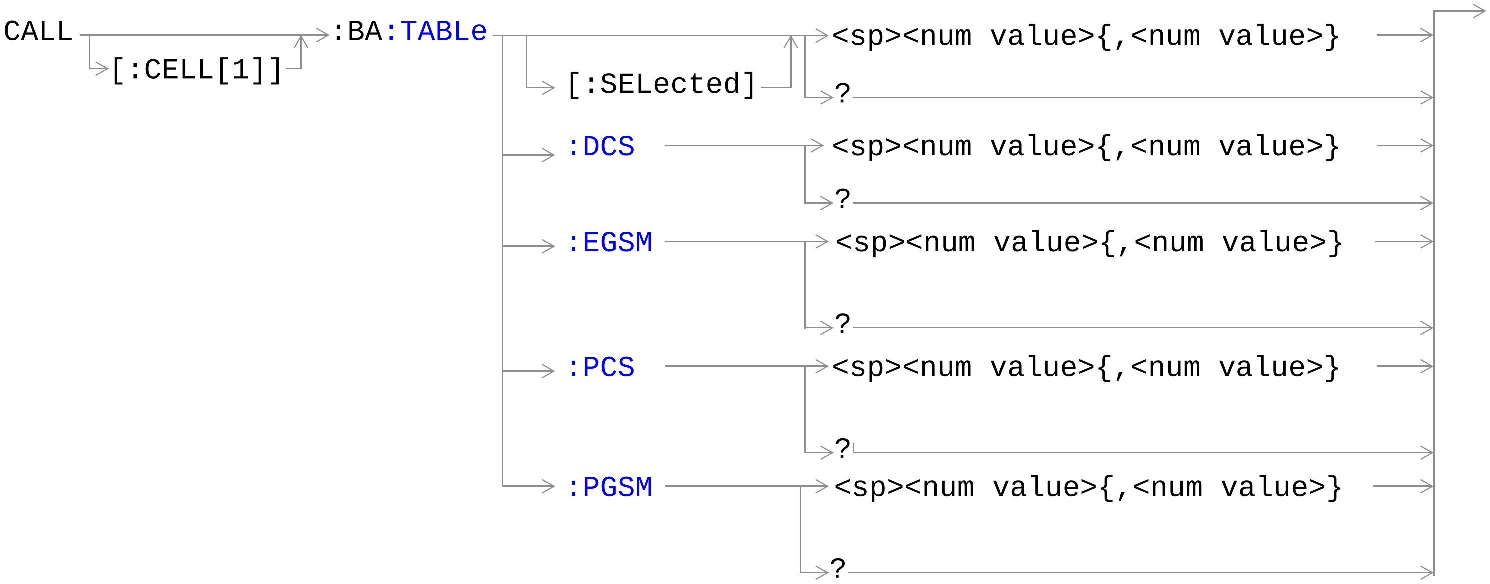
Function	Turns BS Emulator control of all signalling operations, uplink demodulation and downlink (BCH & TCH) generation on or off. Query form returns a 1 (state = on) or a 0 (state = off). When the test set’s operating mode is “test mode” or when the cell activated state is “off”, the burst type may need to be specified before the test set can synchronize to the input signal’s midamble. See “Expected Burst” on page 506.
Setting	range: 1 | ON | 0 | OFF
Query	range: 1 | 0
*RST Setting	1 (state = ON)
Related Topics	“Configuring the Broadcast Channel (BCH)” on page 491

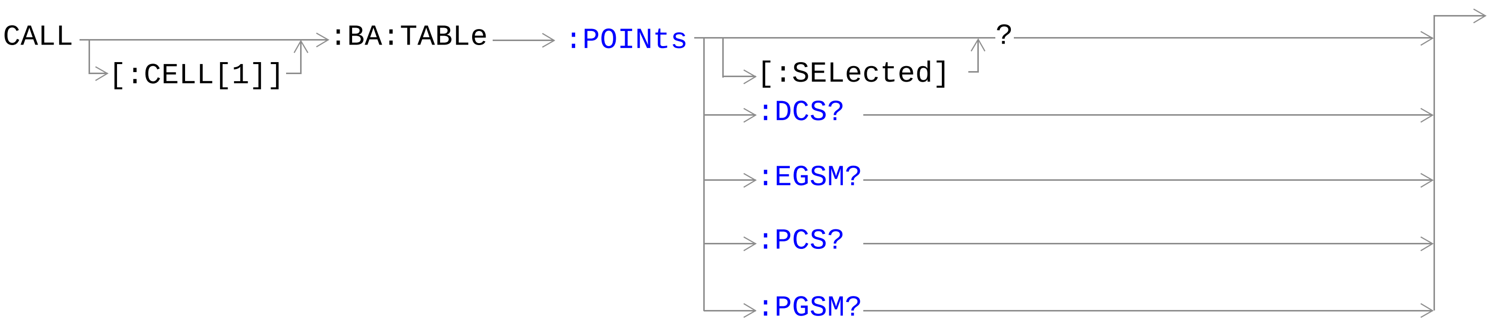
Programming Example

```
OUTPUT 714;”CALL:CELL:ACTIVATED:STATE OFF” !Turns all signalling operations,
                                           !uplink demodulation and downlink
                                           !(BCH & TCH) generation off.
```

CALL:BA

June 30, 1999





"Diagram Conventions" on page 207

CALL[:CELL]:BA:TABLe[:SELected]

Function	Sets/queries the BA Table entries for the selected broadcast band. Entries are set (value entered into table and state set to ON) using a comma separated list of 1 to 16 values. States of table entries not included in setting list are set to OFF. Sending a null list (no values) sets states of all table entries to OFF. Query returns a comma separated list of the table entries that are in the ON state. If states of all table entries are set to OFF, query returns 9.91E+37 (NAN).
Setting	Depends upon the selected broadcast band: range: • PGSM broadcast band range: 1 to 124 • EGSM broadcast band range: 0 to 124 | 975 to 1023 • DCS broadcast band range: 512 to 885 • PCS broadcast band range: 512 to 810 resolution: 1

Query	range: 0 to 9.91 E +37
*RST Setting	Depends upon the selected broadcast band: entries: • PGSM BA Table: 20, 975, 37, 124, 986, 1008, 1019, 7, 18, 30, 53, 64, 76, 87, 99, 110 • EGSM BA Table: 20, 1, 62, 124, 9, 18, 36, 45, 54, 63, 72, 81, 90, 99, 108, 117 • DCS BA Table:512, 698, 885, 537, 562, 587, 612, 637, 662, 712, 737, 762, 787, 812, 837, 862 • PCS BA Table:512, 660, 810, 530, 550, 570, 590, 610, 630, 650, 690, 710, 730, 750, 770, 790 states: • first entry = ON, all others = OFF

Programming Example

```
OUTPUT 714;”CALL:CELL:BA:TABLE:SELECTED 512,689,885” !Sets 3 table entries for the
                                                     !selected broadcast band.
                                                     !States of the remaining 13
                                                     !entries are set to OFF.
OUTPUT 714;”CALL:CELL:BA:TABLE:SELECTED” !Sets states of all table entries to OFF.
```

CALL[:CELL]:BA:TABLe:DCS

Function	Sets/queries the BA Table entries for the DCS broadcast band. Entries are set (value entered into table and state set to ON) using a comma separated list of 1 to 16 values. States of table entries not included in setting list are set to OFF. Sending a null list (no values) sets states of all table entries to OFF. Query returns a comma separated list of the table entries that are in the ON state. If states of all table entries are set to OFF, query returns NAN (9.91E+37).
Setting	range: 512 to 885 resolution: 1
Query	range: 0 to 9.91E+37
*RST Setting	entries: 512, 698, 885, 537, 562, 587, 612, 637, 662, 712, 737, 762, 787, 812, 837, 862 states: 512 = ON, all others = OFF

Programming Example

```
OUTPUT 714;”CALL:CELL:BA:TABLE:DCS 512,612,787” !Sets three BA table entries for
                                                !the DCS broadcast band. States
                                                !of the remaining 13 entries are
                                                !set to OFF.
OUTPUT 714;”CALL:CELL:BA:TABLE:DCS” !Sets states of all table entries to OFF.
```

CALL[:CELL]:BA:TABLe:EGSM

Function	Sets/queries the BA Table entries for the EGSM broadcast band. Entries are set (value entered into table and state set to ON) using a comma separated list of 1 to 16 values. States of table entries not included in setting list are set to OFF. Sending a null list (no values) sets states of all table entries to OFF. Query returns a comma separated list of the table entries that are in the ON state. If states of all table entries are set to OFF, query returns NAN (9.91E+37).
Setting	range: 0 to 124 | 975 to 1023 resolution: 1
Query	range: 0 to 9.91E+37
*RST Setting	entries: 20, 975, 37, 124, 986, 1008, 1019, 7, 18, 30, 53, 64, 76, 87, 99, 110 states: 20 = ON, all others = OFF

Programming Example

```
OUTPUT 714;”CALL:CELL:BA:TABLE:EGSM 120,975,1012” !Sets three BA table entries for
                                                  !the EGSM broadcast band. States
                                                  !of the remaining 13 entries are
                                                  !set to OFF.
OUTPUT 714;”CALL:CELL:BA:TABLE:EGSM” !Sets states of all table entries to OFF.
```

CALL[:CELL]:BA:TABLe:PCS

Function	Sets/queries the BA Table entries for the PCS broadcast band. Entries are set (value entered into table and state set to ON) using a comma separated list of 1 to 16 values. States of table entries not included in setting list are set to OFF. Sending a null list (no values) sets states of all table entries to OFF. Query returns a comma separated list of the table entries that are in the ON state. If states of all table entries are set to OFF, query returns NAN (9.91E+37).
Setting	range: 512 to 810 resolution: 1
Query	range: 0 to 9.91E+37
*RST Setting	entries: 512, 660, 810, 530, 550, 570, 590, 610, 630, 650, 690, 710, 730, 750, 770, 790 states: 512 = ON, all others = OFF

Programming Example

```
OUTPUT 714;”CALL:CELL:BA:TABLE:PCS 660,710,790” !Sets three BA table entries for
                                                !the PCS broadcast band. States
                                                !of the remaining 13 entries are
                                                !set to OFF.
OUTPUT 714;”CALL:CELL:BA:TABLE:PCS” !Sets states of all table entries to OFF.
```

CALL[:CELL]:BA:TABLe:PGSM

Function	Sets/queries the BA Table entries for the PGSM broadcast band. Entries are set (value entered into table and state set to ON) using a comma separated list of 1 to 16 values. States of table entries not included in setting list are set to OFF. Sending a null list (no values) sets states of all table entries to OFF. Query returns a comma separated list of the table entries that are in the ON state. If states of all table entries are set to OFF, query returns NAN (9.91E+37).
Setting	range: 1 to 124 resolution: 1
Query	range: 0 to 9.91E+37
*RST Setting	entries: 20, 1, 62, 124, 9, 18, 36, 45, 54, 63, 72, 81, 90, 99, 108, 117 states: 20 = ON, all others = OFF

Programming Example

```
OUTPUT 714;”CALL:CELL:BA:TABLE:PGSM 20,36,120” !Sets three BA Table entries for
                                               !the PGSM broadcast band. States
                                               !of the remaining 13 entries are
                                               !set to OFF.
OUTPUT 714;”CALL:CELL:BA:TABLE:PGSM” !Sets states of all BA Table entries to OFF.
```

CALL[:CELL]:BA:TABLe:POINts[:SELected]?

Function	Queries the number of entries that are in the ON state in the selected broadcast band's BA Table. This is the number of values that will be returned from the CALL[:CELL]:BA:TABLe[:SELected]? query. A return value of zero indicates that there are no table entries in the ON state.
Query	range: 0 to 16 resolution: 1
*RST Setting	1

Programming Example

```
OUTPUT 714;"CALL:CELL:BA:TABLE:POINTS:SELECTED?" !Queries the number of entries
                                                 !that are in the ON state in the
                                                 !selected broadcast band's BA Table.
```

CALL[:CELL]:BA:TABLe:POINts:DCS?

Function	Queries the number of entries that are in the ON state in the DCS broadcast band BA Table. This is the number of values that will be returned from the CALL[:CELL]:BA:TABLe:DCS? query. A return value of zero indicates that there are no table entries in the ON state.
Query	range: 0 to 16 resolution: 1
*RST Setting	1

Programming Example

```
OUTPUT 714;"CALL:CELL:BA:TABLE:POINTS:DCS?" !Queries the number of entries that are
                                            !in the ON state in the DCS broadcast
                                            !band BA Table.
```

CALL[:CELL]:BA:TABLe:POINts:EGSM?

Function	Queries the number of entries that are in the ON state in the EGSM broadcast band BA Table. This is the number of values that will be returned from the CALL[:CELL]:BA:TABLe:EGSM? query. A return value of zero indicates that there are no table entries in the ON state.
Query	range: 0 to 16 resolution: 1
*RST Setting	1

Programming Example

```
OUTPUT 714;"CALL:CELL:BA:TABLE:POINTS:EGSM?" !Queries the number of entries that
                                             !are in the ON state in the EGSM
                                             !broadcast band BA Table.
```

CALL[:CELL]:BA:TABLe:POINts:PCS?

Function	Queries the number of entries that are in the ON state in the PCS cellband BA Table. This is the number of values that will be returned from the CALL[:CELL]:BA:TABLe:PCS? query. A return value of zero indicates that there are no table entries in the ON state.
Query	range: 0 to 16 resolution: 1
*RST Setting	1

Programming Example

```
OUTPUT 714;"CALL:CELL:BA:TABLE:POINTS:PCS?" !Queries the number of entries that
                                            !are in the ON state in the PCS
                                            !broadcast band BA Table.
```

CALL[:CELL]:BA:TABLe:POINts:PGSM?

Function	Queries the number of entries that are in the ON state in the PGSM broadcast band BA Table. This is the number of values that will be returned from the CALL[:CELL]:BA:TABLe:PGSM? query. A return value of zero indicates that there are no table entries in the ON state.
Query	range: 0 to 16 resolution: 1
*RST Setting	1
Related Topics	See “Configuring the Broadcast Channel (BCH)” on page 491

Programming Example

```
OUTPUT 714;"CALL:CELL:BA:TABLE:POINTS:PGSM?" !Queries the number of entries that
                                             !are in the ON state in the PGSM
                                             !broadcast band BA Table.
```

CALL:BAND

December 1, 1999

```
CALL ──────────────> :BAND ──────────> <sp>DCS|EGSM|PCS|PGSM ──────────>
     └>[:CELL[1]]┘               └──>  ? (returns DCS|EGSM|PCS|PGSM) ──>
```

"Diagram Conventions" on page 207

CALL[:CELL]:BAND

Function	Defines which GSM-defined broadcast band the test set is configured for. This defines the kind of cell being emulated, either PGSM, EGSM, DCS or PCS. Setting the broadcast band will change the receiver control to auto. see "RFANalyzer:CONTrol:AUTO" on page 363
Setting	range: PGSM | EGSM | DCS | PCS
Query	range: PGSM | EGSM | DCS | PCS
*RST Setting	PGSM
Related Topics	Frequency Banded Parameter "Cell Band Parameter" on page 482.
Programming Example `OUTPUT 714;"CALL:CELL:BAND PGSM" !Configures the test set to emulate a PGSM cell.`	

CALL:BCCode

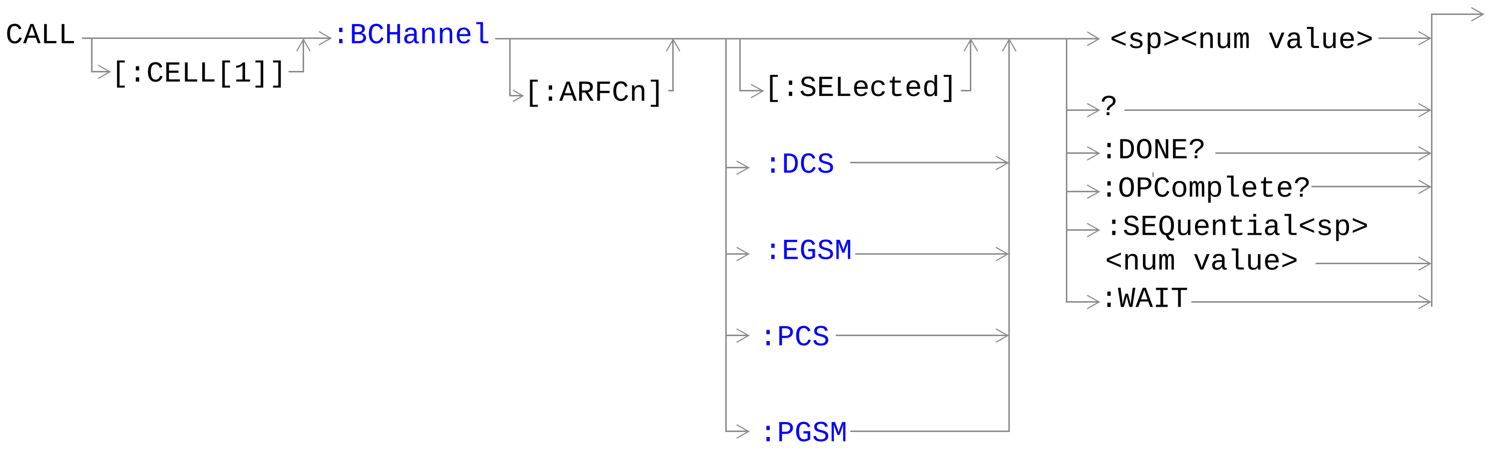
December 1, 1999

“Diagram Conventions” on page 207

CALL[:CELL]:BCCode

Function	Sets/queries the value of the Base Station Colour Code (BCC).
Setting	range: 0 to 7 resolution: 1
Query	range: 0 to 7 resolution: 1
*RST Setting	5
Related Topics	See “Configuring the Broadcast Channel (BCH)” on page 491.
Programming Example	
`OUTPUT 714;”CALL:CELL:BCCODE 4” !Sets the cell’s base station color code to 4.`	

CALL:BCHannel



"Diagram Conventions" on page 207

CALL[:CELL]:BCHannel[:ARFCn][:SELected]

Function	Sets/queries the Broadcast Channel number for the currently active (that is, the selected) broadcast band.
Setting	Depends upon the selected broadcast band. range: • PGSM broadcast band range: 1 to 124 • EGSM broadcast band range: 0 to 124 | 975 to 1023 • DCS broadcast band range: 512 to 885 • PCS broadcast band range: 512 to 810 resolution: 1
Query	Depends upon the selected broadcast band. range: • PGSM broadcast band range: 1 to 124 • EGSM broadcast band range: 0 to 124 | 975 to 1023 • DCS broadcast band range: 512 to 885 • PCS broadcast band range: 512 to 810 resolution: 1
*RST Setting	20

Programming Example

```
OUTPUT 714;"CALL:CELL:BCHANNEL:ARFCN:SELECTED 512" !Sets BCH ARFCN for the selected
                                                 !broadcast band to channel 512.
```

CALL[:CELL]:BCHannel[:ARFCn]:DCS

Function	Sets/queries the Broadcast Channel number for the DCS broadcast band.
Setting	range: 512 to 885 resolution: 1
Query	range: 512 to 885 resolution: 1
*RST Setting	512
Related Topics	“Configuring the Broadcast Channel (BCH)” on page 491.

Programming Example

```
OUTPUT 714;”CALL:CELL:BCHANNEL:ARFCN:DCS 810” !Sets BCH ARFCN for DCS broadcast
                                              !band to 810.
```

CALL[:CELL]:BCHannel[:ARFCn]:EGSM

Function	Sets/queries the Broadcast Channel number for the EGSM broadcast band.
Setting	range: 0 to 124 | 975 to 1023 resolution: 1
Query	range: 0 to 124 | 975 to 1023 resolution: 1
*RST Setting	20

Programming Example

```
OUTPUT 714;”CALL:CELL:BCHANNEL:ARFCN:EGSM 120” !Sets BCH ARFCN for EGSM broadcast
                                               !band to 120.
```

CALL[:CELL]:BCHannel[:ARFCn]:PCS

Function	Sets/queries the Broadcast Channel number for the PCS broadcast band.
Setting	range: 512 to 810 resolution: 1
Query	range: 512 to 810 resolution: 1
*RST Setting	512
Related Topics	“Configuring the Broadcast Channel (BCH)” on page 491.

Programming Example

```
OUTPUT 714;”CALL:CELL:BCHANNEL:ARFCN:PCS 800” !Sets BCH ARFCN for PCS broadcast
                                              !band to 800.
```

CALL[:CELL]:BCHannel[:ARFCn]:PGSM

Function	Sets/queries the Broadcast Channel number for the PGSM broadcast band.
Setting	range: 1 to 124 resolution: 1
Query	range: 1 to 124 resolution: 1
*RST Setting	20
Related Topics	“Configuring the Broadcast Channel (BCH)” on page 491.

Programming Example

```
OUTPUT 714;”CALL:CELL:BCHANNEL:ARFCN:PGSM 113” !Sets BCH ARFCN for PGSM broadcast
                                              !band to 113.
```

CALL:BURSt

April 20, 1999

CALL :BURSt:TYPE <sp>RACH|TSC0|TSC1|TSC2|TSC3|TSC4|**TSC5**|TSC6|TSC7

?

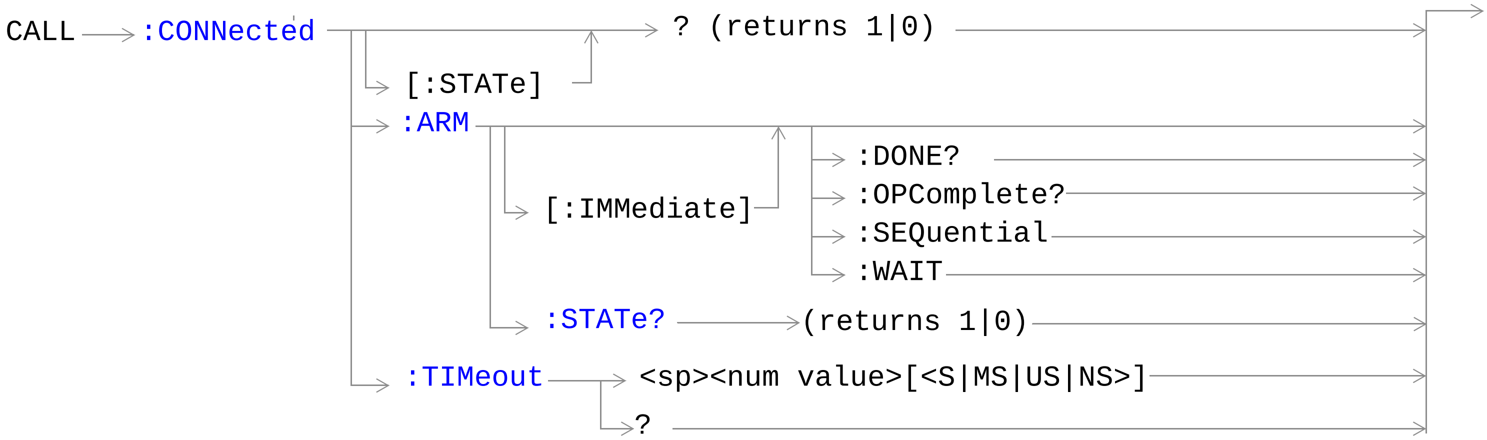
“Diagram Conventions” on page 207

CALL:BURSt:TYPE

Function	Sets/queries the burst type (midamble plus burst length) that will be used for measurement synchronization when the test set Operating Mode is set to Test mode or the Cell Activated State is set to OFF. When the test set’s operating mode is “test mode” or when the cell activated state is “off”, the burst type may need to be specified before the test set can synchronize to the input signal’s midamble. See “Expected Burst” on page 506.
Setting	range: RACH|TSC0|TSC1|TSC2|TSC3|TSC4|TSC5|TSC6|TSC7
Query	range: RACH|TSC0|TSC1|TSC2|TSC3|TSC4|TSC5|TSC6|TSC7
*RST Setting	TSC5
Related Topics	“Test Mode Operating Mode” on page 504.
Programming Example	

```
OUTPUT 714;”CALL:BURST:TYPE TSC2” !Sets TSC2 as the measurement synchronization
                                  !burst type for test mode operating mode and
                                  !cell activated OFF state.
```

CALL:CONNected



“Diagram Conventions” on page 207

CALL:CONNected[:STATe]?

<table>
<tr><td>Function</td><td>Queries the connected/disconnected state of the call. 1 is returned if the call is in the connected state. 0 is returned if the call is in the idle (that is, disconnected) state. If the call is in any state other than connected or idle, the query will hang until the call state transitions to the connected or idle state. When used in conjunction with the CALL:CONNected:ARM and CALL:CONNected:TIMeout commands, the CALL:CONNected:STATe? command allows the control program to synchronize to call connection/disconnection. See “Call Processing State Synchronization” on page 34.</td></tr>
<tr><td>Query</td><td>Range: 0 | 1</td></tr>
<tr><td>*RST Setting</td><td>0</td></tr>
<tr><td colspan="2">Programming Example
<pre>OUTPUT 714;"CALL:CONNECTED:STATE?" !Returns 1 if call connected,
                                  !0 if call disconnected.</pre></td></tr>
</table>

CALL:CONNected:ARM[:IMMediate]

Function	Sets (arms) the call-state-change detector. Arming the call-state-change detector allows the control program to tell the test set that it is expecting a change to the state of a call prior to initiating the state change. Once armed, The detector remains armed until there is a call state change to Idle or Connected from one of the transitory states. The call-state-change-detector is not disarmed by a call state change to one of the transitory states, nor is it disarmed by any transitions from Idle to Idle, or Connected to Connected. When used in conjunction with the CALL:CONNected:STATe? and the CALL:CONNected:TIMeout commands, the CALL:CONNected:ARM command allows the control program to synchronize to call connection/disconnection. See “Call Processing State Synchronization” on page 34.
Programming Example `OUTPUT 714;"CALL:CONNECTED:ARM:IMMEDIATE" !Arms the call-state-change detector.`	

CALL:CONNected:ARM:STATe?

Function	Queries the arm state of the call-state-change detector. This command never hangs and immediately returns a 1 if the call-state-change detector is armed and a 0 if it is not armed. See “Call Processing State Synchronization” on page 34.
Query	Range: 0 | 1
*RST Setting	0
Programming Example	

```
OUTPUT 714;"CALL:CONNECTED:ARM:STATE?" !Returns arm state of
                                       !call-state-change detector.
```

CALL:CONNected:TIMeout

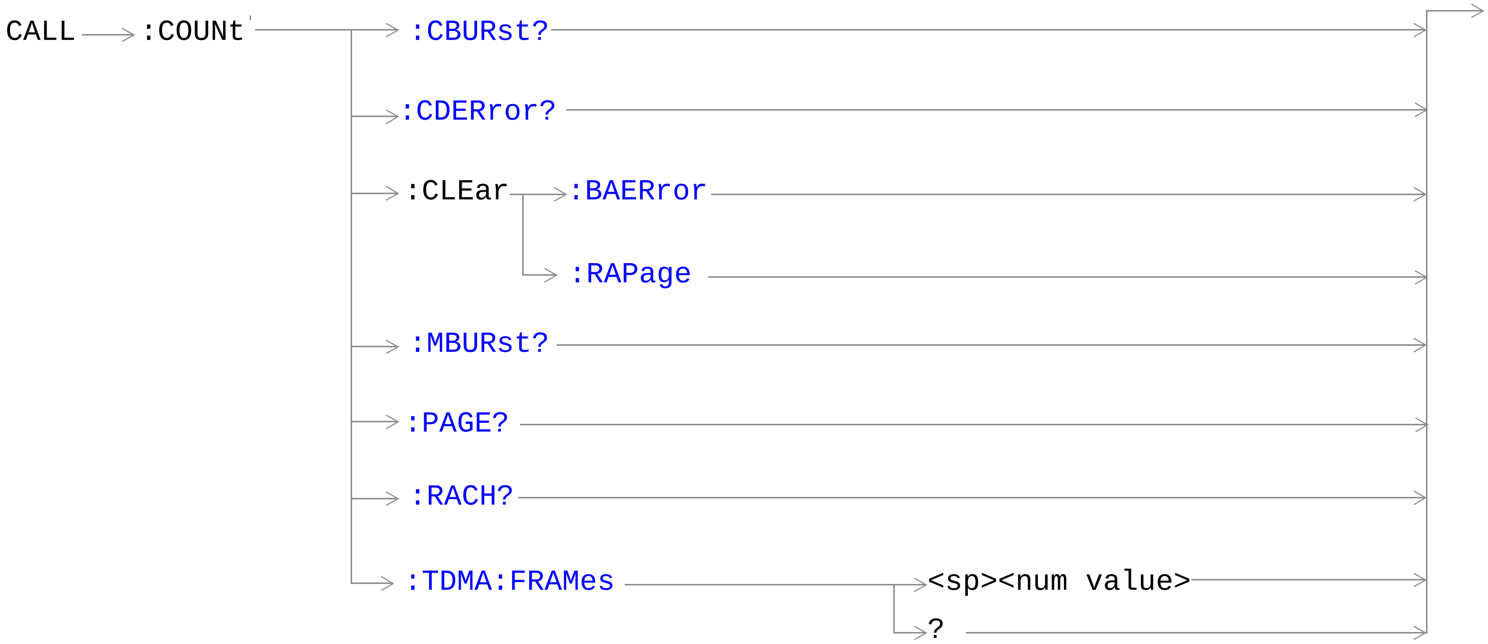
Function	Sets/queries the maximum time the test set will wait for a hanging CALL:CONNected:STATe? query to complete. Default setting units are seconds. To set timeout time in units other than seconds include optional unit specifier in command string. A timeout timer is started whenever the call-state-change-detector becomes armed or gets rearmed when already armed. The duration of this timeout is a set using the CALL:CONNected:TIMeout command and should be greater than the maximum amount of time the control program needs/wants to wait between arming the call-state-change detector and the connect/disconnect operation starting. Once the process starts and the call state has moved into one of the transitory states the GSM defined protocol timers take over and prevent the call state from staying in a transitory state forever. See "Call Processing State Synchronization" on page 34.
Setting	Range: 0 to 100 seconds Resolution: 0.1 seconds
Query	Range: 0 to 100 seconds Resolution: 0.1 seconds
*RST Setting	10 seconds
Related Topics	"Call Processing State Synchronization" on page 34
	"Call Processing Event Synchronization" on page 28

Programming Example

```
OUTPUT 714;"CALL:CONNECTED:TIMEOUT 3" !Sets the CALL:CONNected:STATe? query
                                      !timeout time to 3 seconds.

OUTPUT 714;"CALL:CONNECTED:TIMEOUT 500 MS" !Sets the CALL:CONNected:STATe? query
                                           !timeout time to 500 ms.
```

CALL:COUNt



"Diagram Conventions" on page 207

CALL:COUNt:CBURst?

Function	Queries the corrupt burst counter. The corrupt burst counter keeps track of the number of uplink bursts where power was detected but the expected midamble could not be found.
Query	Range: 0 to 99999 Resolution: 1
*RST Setting	0
Programming Example `OUTPUT 714;"CALL:COUNT:CBURST?" !Queries the corrupt burst counter.`	

CALL:COUNt:CDERror?

Function	Queries the channel decode error counter. The channel decode error counter keeps track of how many channel decoder errors have occurred. Channel decode errors include convolutional, FIRE, and block errors, but not CRC errors.
Query	Range: 0 to 99999 Resolution: 1
*RST Setting	0
Programming Example `OUTPUT 714;"CALL:COUNT:CDERROR?" !Queries the channel decode error counter.`	

CALL:COUNt:CLEAr:BAERror

Function	Sets the corrupt burst, missing burst, and decode error counters' count to zero.
Programming Example OUTPUT 714;"CALL:COUNT:CLEAR:BAERROR"	

CALL:COUNt:CLEAr:RAPage

Function	Sets the RACH and page counters' count to zero.
Programming Example OUTPUT 714;"CALL:COUNT:CLEAR:RAPAGE"	

CALL:COUNt:MBURst?

Function	Queries the missing burst counter. The missing burst counter keeps track of how many uplink bursts, that should have been there, were missing. The missing burst counter does not count idle frames as missing.
Query	Range: 0 to 99999 Resolution: 1
*RST Setting	0
Programming Example OUTPUT 714;"CALL:COUNT:MBURST?"	

CALL:COUNt:PAGE?

Function	Queries the page counter. The page counter keeps track of the number of pages sent by the base station (BS) emulator during a BS originated call setup.
Query	Range: 0 to 9999 Resolution: 1
*RST Setting	0
Programming Example OUTPUT 714;"CALL:COUNT:PAGE?"	

CALL:COUNt:RACH?

Function	Queries the RACH counter. The RACH counter keeps track of the number of RACH bursts received by the base station emulator during call setup attempts.
Query	Range: 0 to 9999 Resolution: 1
*RST Setting	0
Programming Example	

```
OUTPUT 714;"CALL:COUNT:RACH?"
```

CALL:COUNt:TDMA:FRAMes

Function	Sets/queries the Max Frames Allowed for Assignment field. The Max Frames Allowed for Assignment field specifies the maximum number of TDMA frames the mobile station is allowed to take, from the start of the assignment or handover command, for a channel assignment. This is only applicable to changes in TCH band, TCH ARFCN or TCH timeslot. Changes to any other TCH parameter will not cause an error to be generated if the number of frames taken to perform the change exceeds the setting of the Max Frames Allowed for Assignment field.
Setting	Range: 15 to 999 Resolution: 1
Query	Range: 15 to 999 Resolution: 1
*RST Setting	28
Programming Example	

```
OUTPUT 714;"CALL:COUNT:TDMA:FRAMES 15" !Sets the number of TDMA frames allowed
                                       !before transmitting the new TCH.
```

CALL Subsystem

Description

The CALL subsystem handles all the call processing functions including mobile station (MS) and CELL setup, control, and query functions.

Syntax Diagrams and Command Descriptions

CALL:END

```
CALL ──> :END ─────────────────────────────────>
              ├─> :DONE? (returns 1 or 0) ──────>
              ├─> :OPComplete? (returns 1) ─────>
              ├─> :SEQuential ──────────────────>
              └─> :WAIT ────────────────────────>
```

“Diagram Conventions” on page 207

CALL:END

Function	Overlapped command used to terminate the active call.

Programming Example

```
OUTPUT 714;”CALL:END” !Terminate the active call.
```

CALL:END:DONE?

Function	Query only command which returns a 1 if the previously issued overlapped CALL:END command is done, or a 0 if the previously issued overlapped CALL:END command is not done. This command does not terminate the active call. This command is used to determine if a previously issued overlapped command is done or not.
Query	range: 0|1
*RST Setting	1

Programming Example

```
OUTPUT 714;”CALL:END” !Send command to terminate active call.
LOOP
OUTPUT 714;”CALL:END:DONE?” !Send query to see if CALL:END command is done.
                            !Returns 1 if CALL:END command is finished.
                            !Returns 0 if CALL:END command is not finished.
ENTER 714; Callend_is_done
EXIT IF Callend_is_done
END LOOP
```

CALL:END:OPComplete?

Function	Query only command which places a 1 in the output queue when the previously issued overlapped CALL:END command is done. This command does not terminate the active call. This command is used to determine when a previously issued overlapped command is done.
Query	range: 1
*RST Setting	1

Programming Example

```
OUTPUT 714;”CALL:END” !Send command to terminate active call.
OUTPUT 714;”CALL:END:OPC?” !Send query to determine when CALL:END command is
                           !done.
ENTER 714; Callend_is_done !Program hangs here until CALL:END command
                           !is finished.
                           !When CALL:END is done a 1 is put in output queue, ENTER
                           !is satisfied and program continues execution.
```

CALL:END:SEQuential

Function	Terminate the active call but force the overlapped CALL:END command to execute as a sequential command. This command does terminate the active call. The :SEQuential modifier forces an overlapped command to execute as a sequential command.

Programming Example

```
OUTPUT 714;"CALL:END:SEQUENTIAL" !Terminate the active call with
                                 !sequential operation.
```

CALL:END:WAIT

Function	Terminate the active call but force the test set to process no more GPIB commands until the previously issued overlapped CALL:END command is finished. This command does not terminate the active call. This command is used to halt processing of GPIB commands from the test set's GPIB input buffer until the previously issued overlapped command is finished.
Related Topics	"Call Processing Event Synchronization" on page 28 "Call Processing State Synchronization" on page 34

Programming Example

```
OUTPUT 714;"CALL:END" ! Terminate the active call.
OUTPUT 714;"CALL:COUNT:CLEAR:BAERROR" !Clear the burst and decode
                                      !error counters.
OUTPUT 714;"CALL:COUNT:CLEAR:RAPAGE" !Clear the RACH and Page counters.
OUTPUT 714;"CALL:END:WAIT" !Wait here until CALL:END is finsihed.
OUTPUT 714;"CALL:ORIGINATE" !Originate a new call.
```

CALL:FUNCtion

```
CALL → :FUNCtion:DOWNlink ┬→ <sp>BCH|BCHTCH|CW ─────→┬→
                          └→ ? ──────────────────────→┘
```

"Diagram Conventions" on page 207

CALL:FUNCtion:DOWNlink

Function	Sets/queries the downlink signal configuration when Operating Mode = Test mode.
Setting	Range: BCH | BCHTCH | CW
Query	Range: BCH | BCHTCH | CW
*RST Setting	BCH
Related Topics	"Test Mode Operating Mode" on page 504
Programming Example	

```
OUTPUT 714;"CALL:FUNCTION:DOWNLINK BCHTCH"  !Sets Test Mode downlink
                                            !configuration to generate a
                                            !broadcast channel (BCH) and a
                                            !traffic channel (TCH).
```

CALL:IMEI

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```
CALL ——> :IMEI:AUTO ——————————————— <sp>1|ON|0|OFF ——> 
                                  └> ? (returns 1|0) ——>
```

“Diagram Conventions” on page 207

CALL:IMEI:AUTO

Function	Sets/queries whether or not the base station emulator should request the international mobile equipment identity (IMEI) on call setup.
Setting	Range: 1 | ON | 0 | OFF
Query	Range: 1|0
*RST Setting	1
Related Topics	“Configuring the Broadcast Channel (BCH)” on page 491
Programming Example OUTPUT 714;”CALL:IMEI:AUTO OFF” !Sets automatically get IMEI state to OFF.	

CALL:LACode

“Diagram Conventions” on page 207

CALL[:CELL]:LACode

Function	Sets/queries the value of the cell’s Location Area Code (LAC).
Setting	range: 0 to 65535 resolution: 1
Query	range: 0 to 65535 resolution: 1
*RST Setting	1
Related Topics	“Configuring the Broadcast Channel (BCH)” on page 491
Programming Example `OUTPUT 714;”CALL:CELL:LACODE 456” !Sets the cell’s location area code 456.`	

CALL:MCCode

"Diagram Conventions" on page 207

CALL[:CELL]:MCCode

Function	Sets/queries the value of the Mobile Country Code (MCC).
Setting	range: 0 to 999 resolution: 1
Query	range: 0 to 999 resolution: 1
*RST Setting	1
Related Topics	"Configuring the Broadcast Channel (BCH)" on page 491
Programming Example `OUTPUT 714;"CALL:CELL:MCCODE 4" !Sets the cell's mobile country code to 4.`	

CALL:MNCode

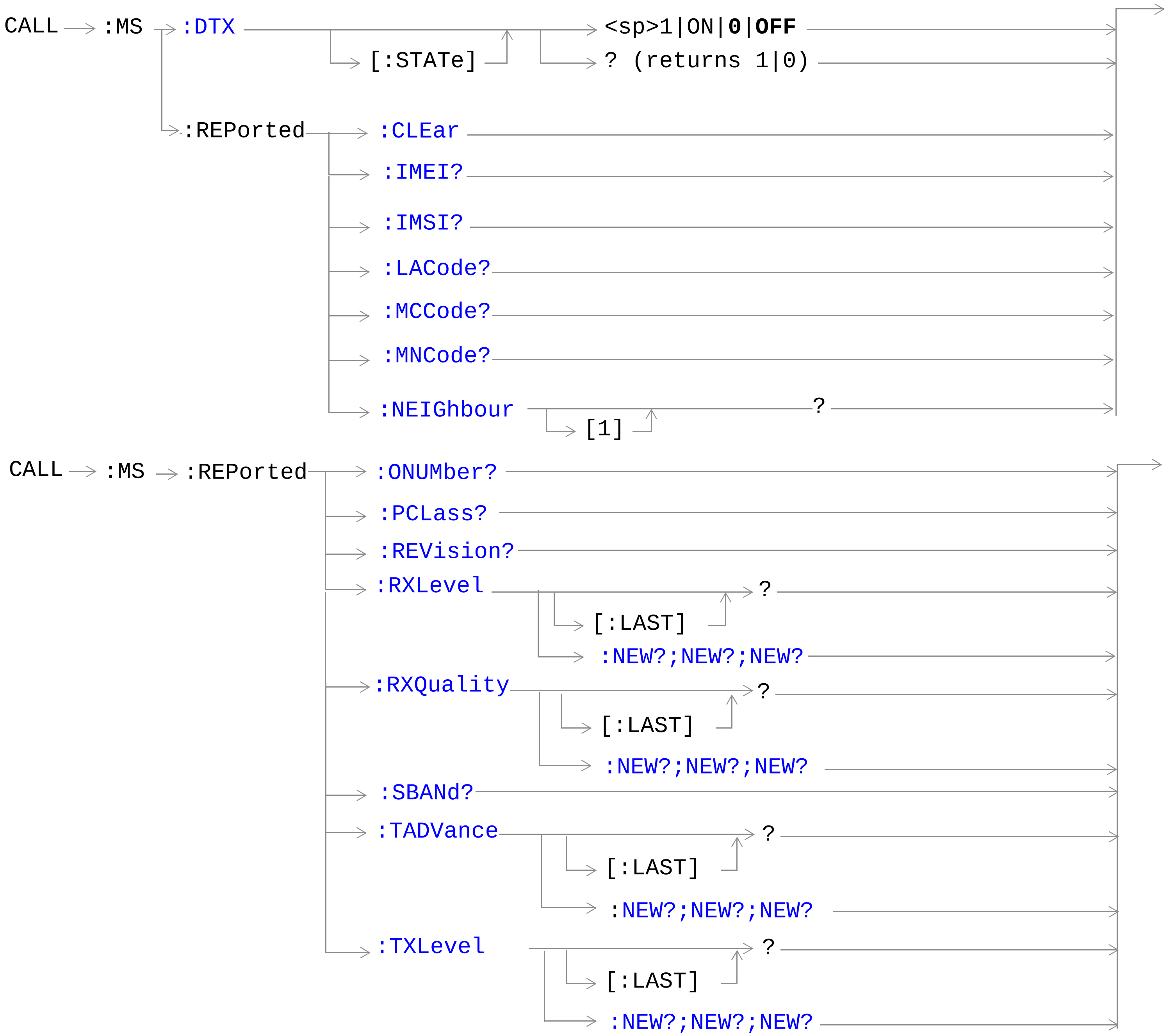
“Diagram Conventions” on page 207

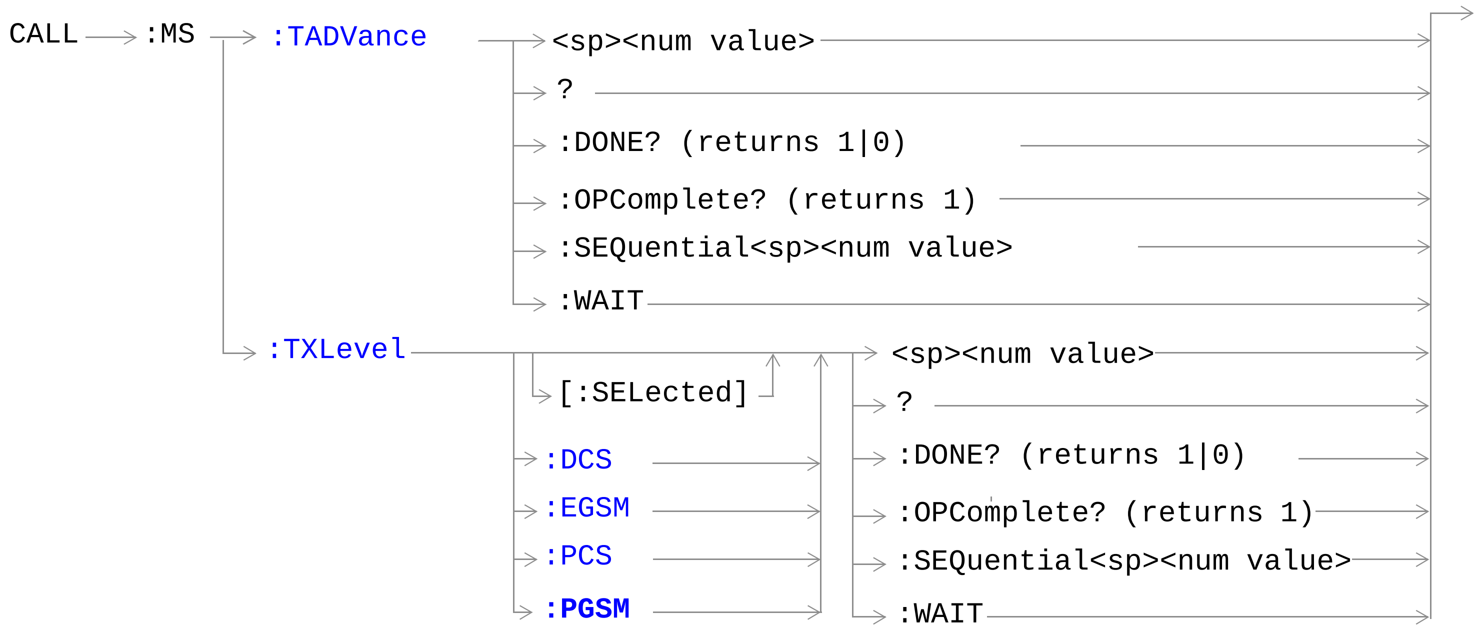
CALL[:CELL]:MNCode

Function	Sets/queries the value of the Mobile Network Code (MNC).
Setting	range: 0 to 99 resolution: 1
Query	range: 0 to 99 resolution: 1
*RST Setting	1
Related Topics	“Configuring the Broadcast Channel (BCH)” on page 491
Programming Example `OUTPUT 714;”CALL:CELL:MNCODE 45” !Sets the cell’s mobile network code to 45.`	

CALL:MS

July 1, 1999





"Diagram Conventions" on page 207

CALL:MS:DTX[:STATe]

Function	Turns mobile station Discontinuous Transmission (DTX) on or off. Query form returns a 1 (state = on) or a 0 (state = off). See "Configuring Mobile Station Operating Parameters" on page 497.
Setting	range: 1 | ON | 0 | OFF
Query	range: 0 | 1
*RST Setting	0 (state = OFF)

Programming Example

```
OUTPUT 714;"CALL:MS:DTX OFF" !Turns mobile station discontinuous
                             !transmission OFF.
```

CALL:MS:REPorted:CLEar

Function	Clears the mobile station SAACH reported items. The values of the four mobile reported items - that is, Timing Adv, Tx Level, Rx Level and Rx Qual - are set to 9.91E+37 (NAN).

Programming Example

```
OUTPUT 714;"CALL:MS:REPORTED:CLEAR"
```

CALL:MS:REPorted:IMEI?

Function	Query of the International Mobile Equipment Identity of the ME. ME is an MS without a SIM. This parameter is reported if the IMEI:AUTO state is ON, see "CALL:IMEI" on page 244 or the MS has no SIM.
Query	range: up to 15 decimal digits and "" resolution: 1
*RST Setting	"" (null string)

Programming Example

```
OUTPUT 714;"CALL:MS:REPORTED:IMEI?"
```

CALL:MS:REPorted:IMSI?

Function	Query of the International Mobile Subscriber Identity of the SIM in the MS.
Query	range: up to 15 decimal digits and "" resolution: 1
*RST Setting	"" (null string)

Programming Example

```
OUTPUT 714;"CALL:MS:REPORTED:IMSI?"
```

CALL:MS:REPorted:LACode?

Function	Query of the last Location Area Code the MS was camped on.
Range	0 to 65535 (default: NAN)
Data Type	Real
Query	range: 0 to 65535 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:LACODE?"`	

CALL:MS:REPorted:MCCode?

Function	Query of the last Mobile Country Code the MS was camped on.
Query	range: 0 to 999 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:MCCODE?"`	

CALL:MS:REPorted:MNCode?

Function	Query of the last Mobile Network Code the MS was camped on.
Query	range: 0 to 99 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:MNCODE?"`	

CALL:MS:REPorted:NEIGhbour[1]?

Function	This query will return 4 data items separated by commas for neighbour cell one. ARFCN, RFLEVEL,NCC,BCC are returned in that order.
Query	range: 1 to 1023 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example	

```
OUTPUT 714;"CALL:MS:REPORTED:NEIGHBOUR?"!Returns ARFCN,RFLEVEL,NCC,BCC in
                                        !that order.
```

CALL:MS:REPorted:ONUMber?

Function	Query the MS for the originated number keyed in on the MS.
Query	range: up to 21 ASCII characters and ““ resolution: 1
*RST Setting	““ (null string)
Programming Example	

```
OUTPUT 714;"CALL:MS:REPORTED:ONUMBER?"
```

CALL:MS:REPorted:PCLass?

Function	Query the MS for its Power Class mark.
Query	range: PGSM | EGSM = 1 to 5 and 9.91E+37 DCS | PCS = 1 to 3 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example	

```
OUTPUT 714;"CALL:MS:REPORTED:PCLASS?
```

CALL:MS:REPorted:REVIsion?

Function	Query the MS to determine which Phase of GSM standards it complies with.
Query	range: UNKNown | PHASe1 | PHASe2
*RST Setting	PHAS2
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:REVISION?"`	

CALL:MS:REPorted:RXLevel[:LAST]?

Function	Received level of the TCH in dB (relative to -110 dBm) which the MS measured during the last SACCH multiframe.
Query	range: 0 to 63 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:RXLEVEL:LAST?"`	

CALL:MS:REPorted:RXLevel:NEW?;NEW?;NEW?

Function	Queries the received level of the TCH in dB (relative to -110 dBm) which the MS measured. Each time the :NEW? query is sent the test set hangs until report results from that measurement period are sent. A hanging query that will not return until the MS reports a new SACCH message to test set. This will return 3 variables the first two must be ignored, the value from the third new query is valid data.
Query	range: 0 to 68 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:RXLEVEL:NEW?;NEW?;NEW?" !The third result is valid.`	

CALL:MS:REPorted:RXQuality[:LAST]?

Function	The MS reported quality of the signal used for the RX Level during the last SACCH report.
Query	range: 0 to 7 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:RXQUALITY:LAST?"`	

CALL:MS:REPorted:RXQuality:NEW?;NEW?;NEW?

Function	Queries the MS reported received quality from the SACCH report. Each time the :NEW? query is sent the test set hangs until report results from that measurement period are sent. A hanging query that will not return until the MS reports a new SACCH message to test set. This will return 3 variables the first two must be ignored, the value from the third new query is valid data.
Query	range: 0 to 7 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:RXQUALITY:NEW?;NEW?;NEW?" ! The third result is valid.`	

CALL:MS:REPorted:SBANd?

Function	Query for the frequency band supported by the MS.
Query	range: PGSM | EGSM | DCS | PCS | ""
*RST Setting	"" (null string)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:SBAND?"`	

CALL:MS:REPorted:TADVance[:LAST]?

Function	Query the MS for the last TCH Timing Advance actually used by the MS.
Query	range: 0 to 63 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:TADVANCE:LAST?"`	

CALL:MS:REPorted:TADVance:NEW?;NEW?;NEW?

Function	Queries the MS reported timing advance from the SACCH report. Each time the :NEW? query is sent the test set hangs until report results from that measurement period are sent. A hanging query that will not return until the MS reports a new SACCH message to test set. This will return 3 variables the first two must be ignored, the value from the third new query is valid data.
Query	range: 0 to 63 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:TADVANCE:NEW?;NEW?;NEW?" ! The third result is valid.`	

CALL:MS:REPorted:TXLevel[:LAST]?

Function	Query the MS for the last reported transmit level.
Query	range: 0 to 31 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;"CALL:MS:REPORTED:TXLEVEL:LAST?"`	

CALL:MS:REPORTED:TXLEVEL:NEW?;NEW?;NEW?

Function	Queries the MS reported transmit level from the SACCH report. Each time the :NEW? query is sent the test set hangs until report results from that measurement period are sent. A hanging query that will not return until the MS reports a new SACCH message to test set. This will return 3 variables the first two must be ignored, the value from the third new query is valid data.
Query	range: 0 to 31 and 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)

Programming Example

```
OUTPUT 714;"CALL:MS:REPORTED:TXLEVEL:NEW?;NEW?;NEW?" The third result is valid.
```

CALL:MS:TADVance

Function	Commands the MS what TCH timing advance to use on the uplink. Additional commands can be appended to aid in controller/Mobile Station synchronization. See "Call Processing Subsystem Overlapped Commands" on page 29.
Query	range: 0 to 63 resolution: 1
*RST Setting	zero

Programming Example

```
OUTPUT 714;"CALL:MS:TADVANCE 3" !Sets the MS TCH Timing Advance to 3 on
                                !the uplink.
```

CALL:MS:TXLevel[:SELected]

Function	Selects the MS uplink power control level for the band already selected. See "Frequency Banded Parameters" on page 481. Additional commands can be appended to aid in controller/Mobile Station synchronization. See "Call Processing Subsystem Overlapped Commands" on page 29.
Setting	range: 0 to 31 resolution: 1
Query	range: 0 to 31 resolution: 1
*RST Setting	Band: PGSM TXLevel: 15

Programming Example

```
OUTPUT 714;"CALL:MS:TXLEVEL:SELECTED 10"
```

CALL:MS:TXLevel:DCS

Function	Selects the MS uplink power control level for the DCS band. See "Frequency Banded Parameters" on page 481. Additional commands can be appended to aid in controller/Mobile Station synchronization. See"Call Processing Subsystem Overlapped Commands" on page 29.
Setting	range: 0 to 31 (default 10) resolution: 1
Query	range: 0 to 31 resolution: 1
*RST Setting	Band: PGSM TXLevel: 15
Programming Example `OUTPUT 714;"CALL:MS:TXLEVEL:DCS 8"`	

CALL:MS:TXLevel:EGSM

Function	Selects the MS uplink power control level for the EGSM band. See "Frequency Banded Parameters" on page 481. Additional commands can be appended to aid in controller/Mobile Station synchronization. See "Call Processing Subsystem Overlapped Commands" on page 29.
Setting	range: 0 to 31 (default 15) resolution: 1
Query	range: 0 to 31 resolution: 1
*RST Setting	Band: PGSM TXLevel: 15
Programming Example `OUTPUT 714;"CALL:MS:TXLEVEL:EGSM 20"`	

CALL:MS:TXLevel:PCS

Function	Selects the MS uplink power control level for the PCS band. See “Frequency Banded Parameters” on page 481. Additional commands can be appended to aid in controller/Mobile Station synchronization. See “Call Processing Subsystem Overlapped Commands” on page 29.
Setting	range: 0 to 31 (default 10) resolution: 1
Query	range: 0 to 31 resolution: 1
*RST Setting	Band: PGSM TXLevel: 15
Programming Example `OUTPUT 714;”CALL;MS;TXLEVEL:PCS 31”`	

CALL:MS:TXLevel:PGSM

Function	Selects the MS uplink power control level for the PGSM band. See “Frequency Banded Parameters” on page 481. Additional commands can be appended to aid in controller/Mobile Station synchronization. See “Call Processing Subsystem Overlapped Commands” on page 29.
Setting	range: 0 to 31 (default 15) resolution: 1
Query	range: 0 to 31 resolution: 1
*RST Setting	Band: PGSM TXLevel: 15
Programming Example `OUTPUT 714;”CALL:MS:TXLEVEL:PGSM 22”`	

CALL:NCCode

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"Diagram Conventions" on page 207

CALL[:CELL]:NCCode

Function	Sets/queries the Network Color Code. See "Configuring the Broadcast Channel (BCH)" on page 491.
Setting	range: 0 to 7 resolution: 1
Query	range: 0 to 7 resolution: 1
*RST Setting	1
Programming Example `OUTPUT 714;"CALL:CELL:NCCODE 2"`	

CALL:OPERating

April 20, 1999

```
CALL ──> :OPERating:MODE ──┬──> <sp>CELL|TEST ──────────────┬──>
                           └──> ? ──────────────────────────┘
```

"Diagram Conventions" on page 207

CALL:OPERating:MODE

Function	Sets/queries the operating mode (behavior) of the test set. See "Test Mode Operating Mode" on page 504 or "Active Cell Operating Mode" on page 489.
Setting	range: cell | test
Query	range: CELL | TEST
*RST Setting	CELL
Programming Example `OUTPUT 714;"CALL:OPERATING:MODE TEST" !Places the Test Set into Test Mode.`	

CALL:ORIGinate

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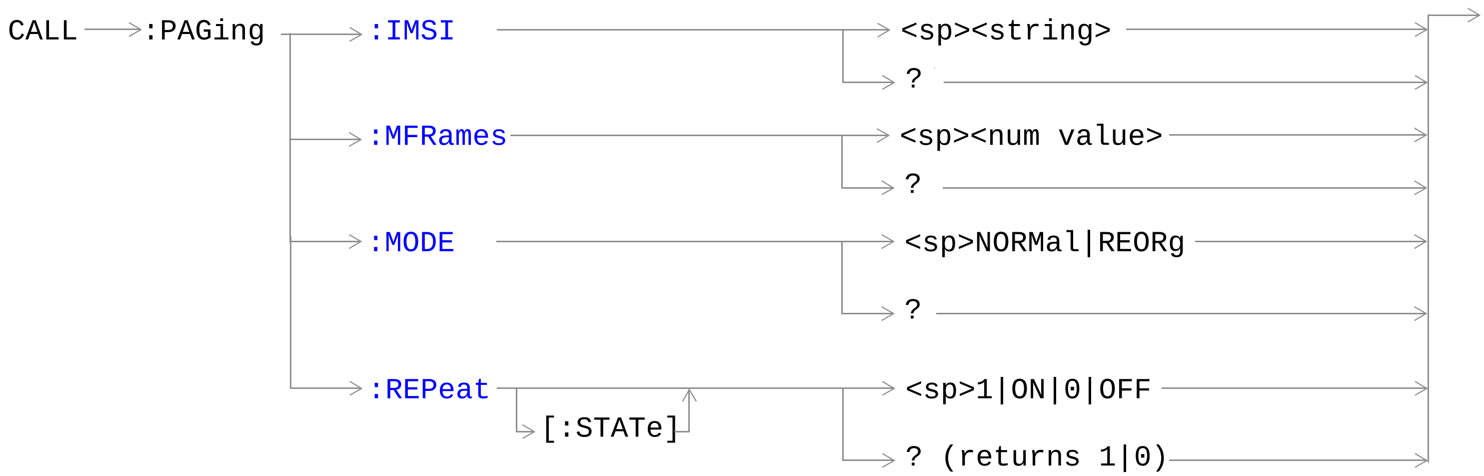
"Diagram Conventions" on page 207

CALL:ORIGinate

<table>
<tr><td>Function</td><td>Performs a BS Originated call. See "Call Processing Event Synchronization" on page 28.
Additional commands can be appended to aid in controller/Mobile Station synchronization.</td></tr>
<tr><td colspan="2">Programming Example
<code>OUTPUT 714;"CALL:ORIGINATE:SEQUENTIAL" !Orignates a base station call.</code>
<code>!Appending SEQUENTIAL to this command</code>
<code>!causes the command to be</code>
<code>!performed sequentially.</code></td></tr>
</table>

CALL:PAGing

July 1, 1999



"Diagram Conventions" on page 207

CALL:PAGing:IMSI

Function	Sets/queries the paging IMSI (International Mobile Subscriber Identity) field, used for paging the MS. The test set will stay in Active Cell Status (Setup Request), see "Call Processing State Synchronization" on page 34 until the paging IMSI is returned if the state is on. The paging IMSI is automatically updated by the test set during an MS originated call using the IMSI reported by the MS. If the MS has no SIM, the paging IMSI is left unchanged.
Setting	range: up to 15 decimal digits resolution: 1
Query	range: up to 15 decimal digits resolution: 1
*RST Setting	001012345678901
Programming Example	

```
OUTPUT 714;"CALL:PAGing:IMSI '01012345678901'"!Set paging IMSI
                                              !to 01012345678901.
```

CALL:PAGing:REPeat[:STATe]

Function	Sets/queries repeat paging state. When the state is ON paging repeats until the test set receives a RACH. When the state is off the test set returns the No response to page timer T3113 expiry. See “Fixed Timer Messages” on page 552.
Setting	0 | OFF | 1 | ON
Query	0 | 1
*RST Setting	0|OFF

Programming Example

```
OUTPUT 714;”CALL:PAGING:REPEAT:STATE ON” !Turns paging repeat ON.
```

CALL:PAGing:MODE

Function	Sets/queries the paging mode that the test set will use to page the MS. When paging mode is set to reorg, the test set will page the MS on the paging channel in the next available paging channel without waiting for the defined paging group. When paging mode is set to normal, the test set will page the MS on the correct paging subchannel defined by the mobile station’s paging group. Some mobile stations can be set to a discontinuous reception mode, (DRX), which configures the MS to look for a page in a pre-defined paging subchannel only.
Setting	range: REORg | NORMal
Query	range: REOR | NORM
*RST Setting	Reorg

Programming Example

```
OUTPUT 714;”CALL:PAGING:MODE REOR” ! MS will be sent a page on the
                                   ! next available paging subchannel
```

CALL:PAGing:MFRames

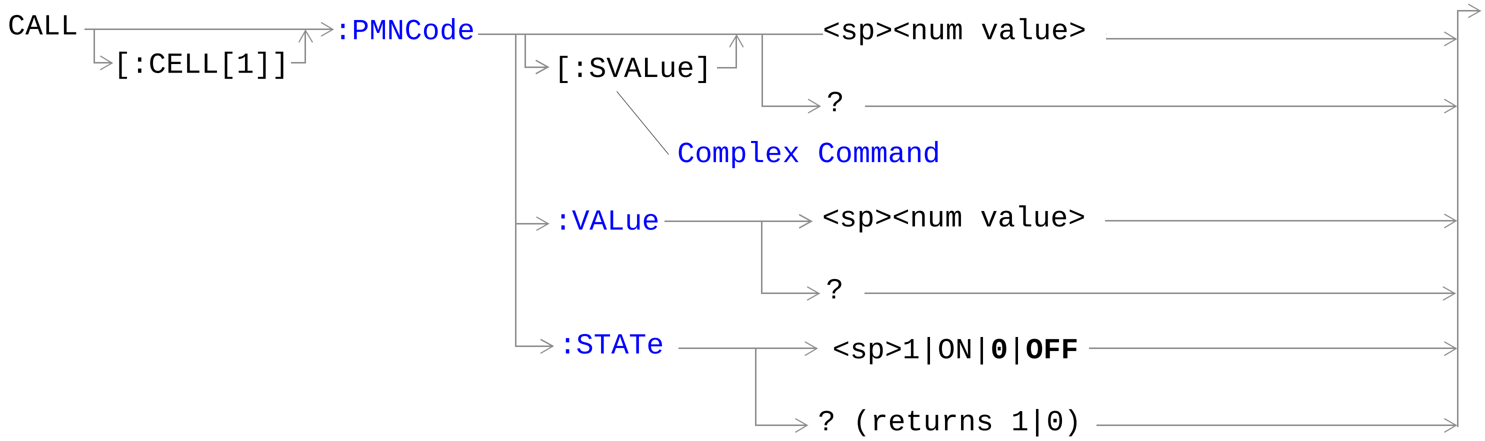
Function	Sets/queries the number of multiframes between paging subchannels. This parameter is used when the paging mode is normal. MFRames and IMSI are used to define the mobile station’s paging group. The paging group determines when an MS can expect a page if paging mode is normal.
Setting	range: 2 to 9 resolution: 1
Query	range: 2 to 9 resolution: 1
*RST Setting	2

Programming Example

```
OUTPUT 714;”CALL:PAGING:MFRAMES 5” ! Sets the number of multiframes
                                   ! between paging subchannels.
```

CALL:PMNCode

July 1, 1999



“Diagram Conventions” on page 207

CALL[:CELL]:PMNCode[:SVALue]

Function	Sets/queries the 3 digit mobile network code. This command is used for the PCS band only. This command sets the PMNCode state to ON. See “3 Digit MNC for PCS” on page 494.
Setting	range: 0 to 999 resolution: 1
Query	range: 0 to 999 resolution: 1
*RST Setting	1
Programming Example	

```
OUTPUT 714;”CALL:CELL:PMNCODE:SVALUE 798” !Sets the value to 798 and the state
                                         !to ON. Only used for PCS 1900 band.
```

CALL[:CELL]:PMNCode:VALue

Function	Sets/queries the 3 digit mobile network code value. This command is used for PCS band only. See "3 Digit MNC for PCS" on page 494.
Setting	range: 0 to 999 resolution: 1
Query	range: 0 to 999 resolution: 1
*RST Setting	1
Programming Example `OUTPUT 714;"CALL:CELL:PMNCODE 798" !Sets the 3 digit MNCode for PCS 1900 to 798.`	

CALL[:CELL]:PMNCode:STATe

Function	Sets/queries the MNC state. This command is used for the PCS band only. See "3 Digit MNC for PCS" on page 494.
Setting	range: 0 | OFF | 1 | ON
Query	range: 0 | OFF | 1 | ON
*RST Setting	OFF
Programming Example `OUTPUT 714;"CALL:CELL:PMNCODE:STATE ON"`	

CALL:POWer

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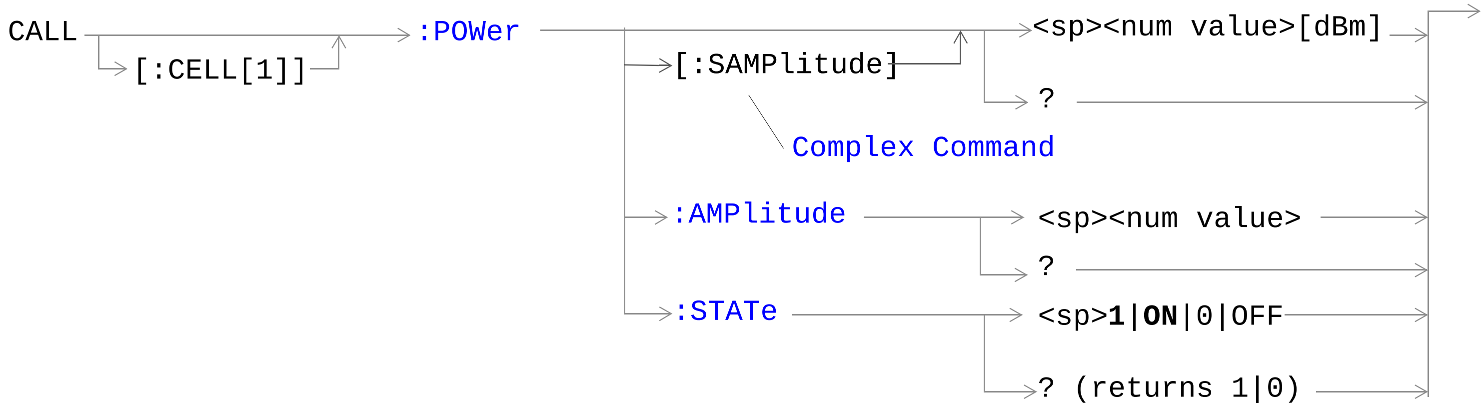


"Diagram Conventions" on page 207

CALL[:CELL]:POWer:AMPLitude[:SAMPlitude]

Function	Sets/queries the value for Cell Power and turns the state to ON. This is the same for BCH and TCH. The suffix dBm is optional. The Cell Power field is affected when there is an amplitude offset, see "Measurement Related Configuration" on page 540.
Setting	range: -10 dBm to -127 dBm resolution: .01 dBm
Query	range: -10 dBm to -127 dBm resolution: .01 dBm
*RST Setting	-85 dBm

Programming Example
`OUTPUT 714;"CALL:CELL:POWER:SAMPLITUDE -50dBm" !Sets the value to -50dBm`
`!and the state to ON.`	

CALL[:CELL]:POWer:AMPLItude

Function	Sets/queries the Cell Power of the test set, this is the same for BCH and TCH. The suffix dBm is optional. The Cell Power field is affected when there is an amplitude offset, see “Measurement Related Configuration” on page 540.
Setting	range: -10 dBm to -127 dBm resolution: .01 dBm
Query	range: -10 dBm to -127 dBm resolution: .01dBm
*RST Setting	-85 dBm

Programming Example

```
OUTPUT 714;”CALL:CELL:POWER:AMPLITUDE -50dBm” !Set the cell power from test
                                              !set to -50dBm.
```

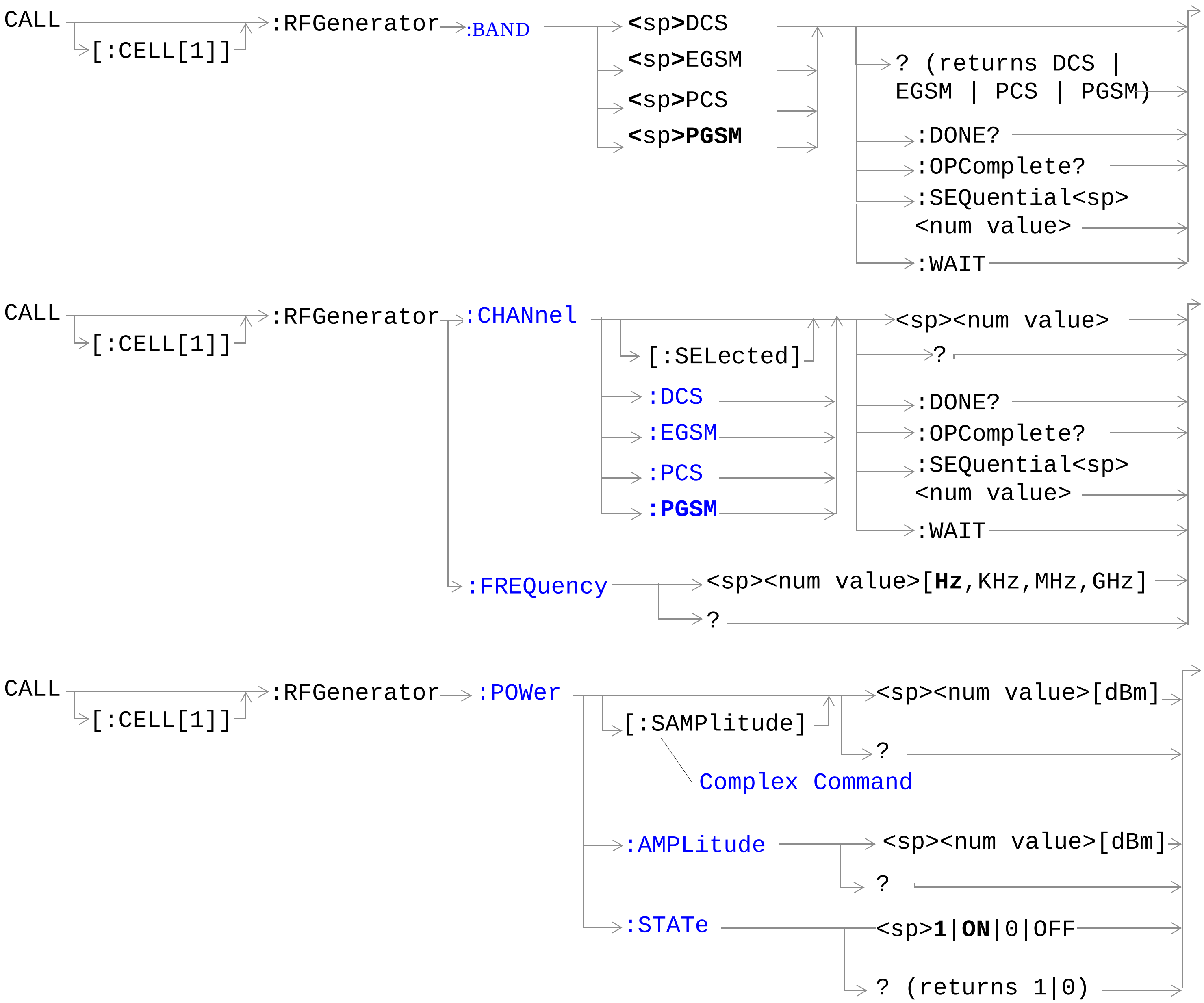
CALL[:CELL]:POWer:STATe

Function	Sets/queries the RF Power state.
Setting	range: 0 | OFF | 1 | ON
Query	range: 0 | OFF | 1 | ON
*RST Setting	ON

Programming Example

```
OUTPUT 714;”CALL:CELL:POWER:AMPLITUDE -50dBm” !Set the cell power from test
                                              !set to -50dBm.
```

CALL:RFGenerator



"Diagram Conventions" on page 207

CALL[:CELL]:RFGenerator:BAND

Function	Sets/queries the RF Gen Channel band. Operating mode = Test Mode and Downlink Function = CW. See “CW Test Function Behavior” on page 510. Additional commands can be appended to aid in controller/Mobile Station synchronization. See “Call Processing Subsystem Overlapped Commands” on page 29 for examples.
Setting	range: • DCS channels 512 to 885 • EGSM channels 975 to 1023 and 0 to 124 • PCS channels 512 to 810 • PGSM channels 1 to 124
Query	range: • DCS channels 512 to 885 • EGSM channels 975 to 1023 and 0 to 124 • PCS channels 512 to 810 • PGSM channels 1 to 124
*RST Setting	20 (PGSM band)
Programming Example `OUTPUT 714;”CALL:CELL:RFGENERATOR:BAND DCS” !Sets the RF Generator band to DCS.`	

CALL[:CELL]:RFGenerator:CHANnel[:SELected]

Function	Sets/queries the RF Gen Channel for the band already selected. Operating mode = Test Mode and Downlink Function = CW. See "CW Test Function Behavior" on page 510. Additional commands can be appended to aid in controller/Mobile Station synchronization. See "Call Processing Subsystem Overlapped Commands" on page 29 for examples.
Setting	range: • DCS channels 512 to 885 • EGSM channels 975 to 1023 and 0 to 124 • PCS channels 512 to 810 • PGSM channels 1 to 124
Query	range: • DCS channels 512 to 885 • EGSM channels 975 to 1023 and 0 to 124 • PCS channels 512 to 810 • PGSM channels 1 to 124
*RST Setting	20 (PGSM band)

Programming Example

```
OUTPUT 714;"CALL:CELL:RFGENERATOR:CHANNEL:SELECTED 512" !Sets the RF Generator
                                                      !channel to 512 for the
                                                      !band already selected.
```

CALL[:CELL]:RFGenerator:CHANnel:DCS

Function	Sets/queries the RF Gen Channel for the DCS band using the RF Generator. Operating mode = Test Mode and Downlink Function = CW. See “CW Test Function Behavior” on page 510. Additional commands can be appended to aid in controller/Mobile Station synchronization. See “Call Processing Subsystem Overlapped Commands” on page 29 for examples.
Setting	range: 512 to 885 (default 512) resolution: 1
Query	range: 512 to 885 resolution: 1
*RST Setting	20 (PGSM band)
Programming Example `OUTPUT 714;”CALL:CELL:RFGENERATOR:CHANNEL:DCS 512”`	

CALL[:CELL]:RFGenerator:CHANnel:EGSM

Function	Sets/queries the RF Gen Channel for the EGSM band using the RF Generator. Operating mode = Test Mode and Downlink Function = CW. See “CW Test Function Behavior” on page 510. Additional commands can be appended to aid in controller/Mobile Station synchronization. See “Call Processing Subsystem Overlapped Commands” on page 29 for examples.
Setting	range: 0 to 124 | 975 to 1023 (default: 20) resolution: 1
Query	range: 0 to 124 | 975 to 1023 resolution: 1
*RST Setting	20 (PGSM band)
Programming Example `OUTPUT 714;”CALL:CELL:RFGENERATOR:CHANNEL:EGSM 124”`	

CALL[:CELL]:RFGenerator:CHANnel:PCS

Function	Sets/queries the RF Gen Channel for the PCS band using the RF Generator. Operating mode = Test Mode and Downlink Function = CW. See “CW Test Function Behavior” on page 510. Additional commands can be appended to aid in controller/Mobile Station synchronization. See “Call Processing Subsystem Overlapped Commands” on page 29 for examples.
Setting	range: 512 to 810 (default: 512) resolution: 1
Query	range: 512 to 810 resolution: 1
*RST Setting	20 (PGSM band)
Programming Example `OUTPUT 714;”CALL:CELL:RFGENERATOR:CHANNEL:PCS 512”`	

CALL[:CELL]:RFGenerator:CHANnel:PGSM

Function	Sets/queries the RF Gen Channel for the PGSM band using the RF Generator. Operating mode = Test Mode and Downlink Function = CW. See “CW Test Function Behavior” on page 510. Additional commands can be appended to aid in controller/Mobile Station synchronization. See “Call Processing Subsystem Overlapped Commands” on page 29 for examples.
Setting	range: 1 to 124 (default: 20) resolution: 1
Query	range: 1 to 124 resolution: 1
*RST Setting	20 (PGSM band)
Programming Example `OUTPUT 714;”CALL:CELL:RFGENERATOR:CHANNEL:PGSM 124”`	

CALL[:CELL]:RFGenerator:FREQuency

Function	Sets/queries the RF Gen Frequency selection. Operating mode = Test Mode and Downlink Function = CW. See “CW Test Function Behavior” on page 510. The units (Hz|KHz|MHz|GHz) are optional, if no units are specified then units default to Hz.
Setting	range: 292 MHz to 2700 MHz resolution: 1
Query	range: 292 MHz to 2700 MHz resolution: 1
*RST Setting	939 MHz
Programming Example `OUTPUT 714;”CALL:CELL:RFGENERATOR:FREQUENCY 896.2MHZ”`	

CALL[:CELL]:RFGenerator:POWer[:SAMPLitude]

Function	Sets/queries the value for RF Gen Power and turns the state to ON. The suffix dBm is optional. Operating mode = Test Mode and Downlink Function = CW. See “CW Test Function Behavior” on page 510. The RF Gen Power field is affected when there is an amplitude offset, see “Measurement Related Configuration” on page 540.
Setting	range: -10 to -100 dBm resolution: .01 dBm
Query	range: -10 to -100 dBm resolution: .01 dBm
*RST Setting	-85 dBm
Programming Example `OUTPUT 714;”CALL:CELL:RFGENERATOR:POWER:SAMPLITUDE -50DBM”`	

CALL[:CELL]:RFGenerator:POWer:AMPLItude

Function	Set/queries Rf Gen Power. The suffix dBm is optional. Operating mode = Test Mode and Downlink Function = CW. see "CW Test Function Behavior" on page 510. The RF Gen Power field is affected when there is an amplitude offset, see "Measurement Related Configuration" on page 540.
Setting	range: -10 to -100 dBm resolution: .01 dBm
Query	range: -10 to -100 dBm resolution: .01 dBm
*RST Setting	-85 dBm
Programming Example	
OUTPUT 714;"CALL:CELL:RFGENERATOR:POWER:AMPLITUDE -50DBM"	

CALL[:CELL]:RFGenerator:POWer:STATe

Function	Sets/queries the RF Gen Power State. Operating mode = Test Mode and Downlink Function = CW. See "CW Test Function Behavior" on page 510.
Setting	range: 0 | OFF | 1 | ON
Query	range: 0 | OFF | 1 | ON
*RST Setting	ON
Programming Example	
OUTPUT 714;"CALL:CELL:RFGENERATOR:POWER:STATE OFF"	

CALL:SIGNaling

```
CALL ──>:SIGNaling──>:MS ──>:TXLevel──>:FACCH──>&lt;sp>&lt;1|ON|0|OFF>
                                              └>? (returns 1|0)
```

“Diagram Conventions” on page 207

CALL:SIGNaling:MS:TXLevel:FACCH

Function	Sets/queries the TX Level FACCH Signaling parameter. When TX Level FACCH Signaling is set to on, the base station emulator uses both a FACCH (Fast Associated Control CHannel) channel assignment and an update to the SACCH (Slow Associated Control CHannel) header to signal the mobile to change to a new power level. When TX Level FACCH Signaling is set to off, the base station emulator uses only an update to the SACCH header to signal the mobile to change to a new power level. A FACCH channel assignment message is not sent. This setting is useful if you want to update the SACCH header's TX Level field without performing a channel assignment. The setting of TX Level FACCH Signaling can be changed in either of the test set's two operating modes, Active Cell or Test mode.
Setting	range: 1|ON |0|OFF
Query	1|0
*RST Setting	1|ON
Programming Example `OUTPUT 714;"CALL:SIGNALING:MS:TXLEVEL:FACCH 0"`	

Related Topics

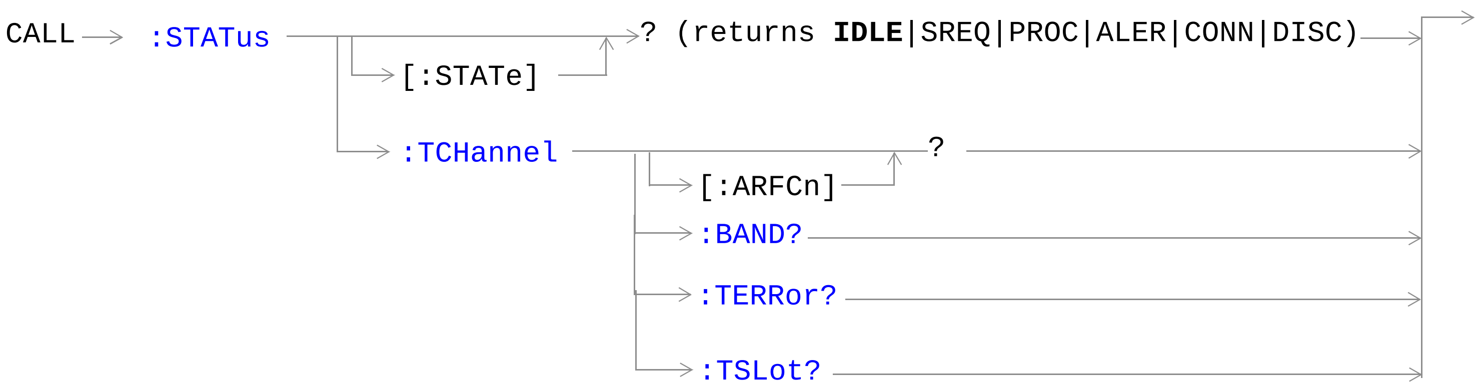
****

“Configuring the Broadcast Channel (BCH)” on page 491

****

CALL:STATus

July 12, 1999



"Diagram Conventions" on page 207

CALL:STATus[:STATe]?

Function	Query returns the status of the call. See "Call Processing State Synchronization" on page 34.
Setting	range: IDLE | SREQ | PROC |ALER | CONN | DISC
Query	range: IDLE | SREQ | PROC |ALER | CONN | DISC
*RST Setting	IDLE

Programming Example

```
OUTPUT 714;"CALL:STATUS:STATE?"
```

CALL:STATus:TCHannel[:ARFCN]?

Function	Query returns the TCH ARFCN for the current band. The CALL:STATUS:STATE must be connected, see “CALL:STATus[:STATe]?” on page 277.
Query	range: • DCS band, channels 512 to 885 • EGSM band, channels 975 to 1023 and 0 to 124 • PCS band, channels 512 to 810 • PGSM band, channels 1 to 124 • 9.91E+37 resolution: 1
*RST Setting	9.91E+37 (NAN)
Programming Example `OUTPUT 714;”CALL:STATUS:TCHANNEL:ARFCN?”`	

CALL:STATus:TCHannel:BAND?

Function	Query the current TCH band. See “Configuring the Traffic Channel (TCH)” on page 501. The CALL:STATUS:STATE must be connected, see “CALL:STATus[:STATe]?” on page 277.
Query	range: DCS | EGSM | PCS | PGSM | ””
*RST Setting	““ (null string)
Programming Example `OUTPUT 714;”CALL:STATUS:TCHANNEL:BAND?”`	

CALL:STATus:TCHannel:TERRor?

Function	Query returns the last burst timing error measurement. Indicates the worst case timing error of all bursts received in a reporting period. If all of the bursts reporting in a period are missing, the query returns 9.91E+37 (NAN). The reference for burst timing error measurements is with respect to the (downlink TCH slot) + (3 slot TX/RX delay [468.75 bits]) - (TCH Timing Advance). The CALL:STATUS:STATE must be connected, see “CALL:STATus[:STATe]?” on page 277. Burst timing error is continuously updated every 480 ms . Burst timing error is displayed in the Call Setup window.
Query	range: -8 to +30 T [T=48/13,000,000 seconds approximately 3.69 us] and 9.91E+37 resolution: .25 T [approximately .923 us]
*RST Setting	9.91E+37 (NAN)

Programming Example

```
OUTPUT 714;"CALL:STATUS:TCHANNEL:TERROR?" ! Returns Burst Timing Error.
```

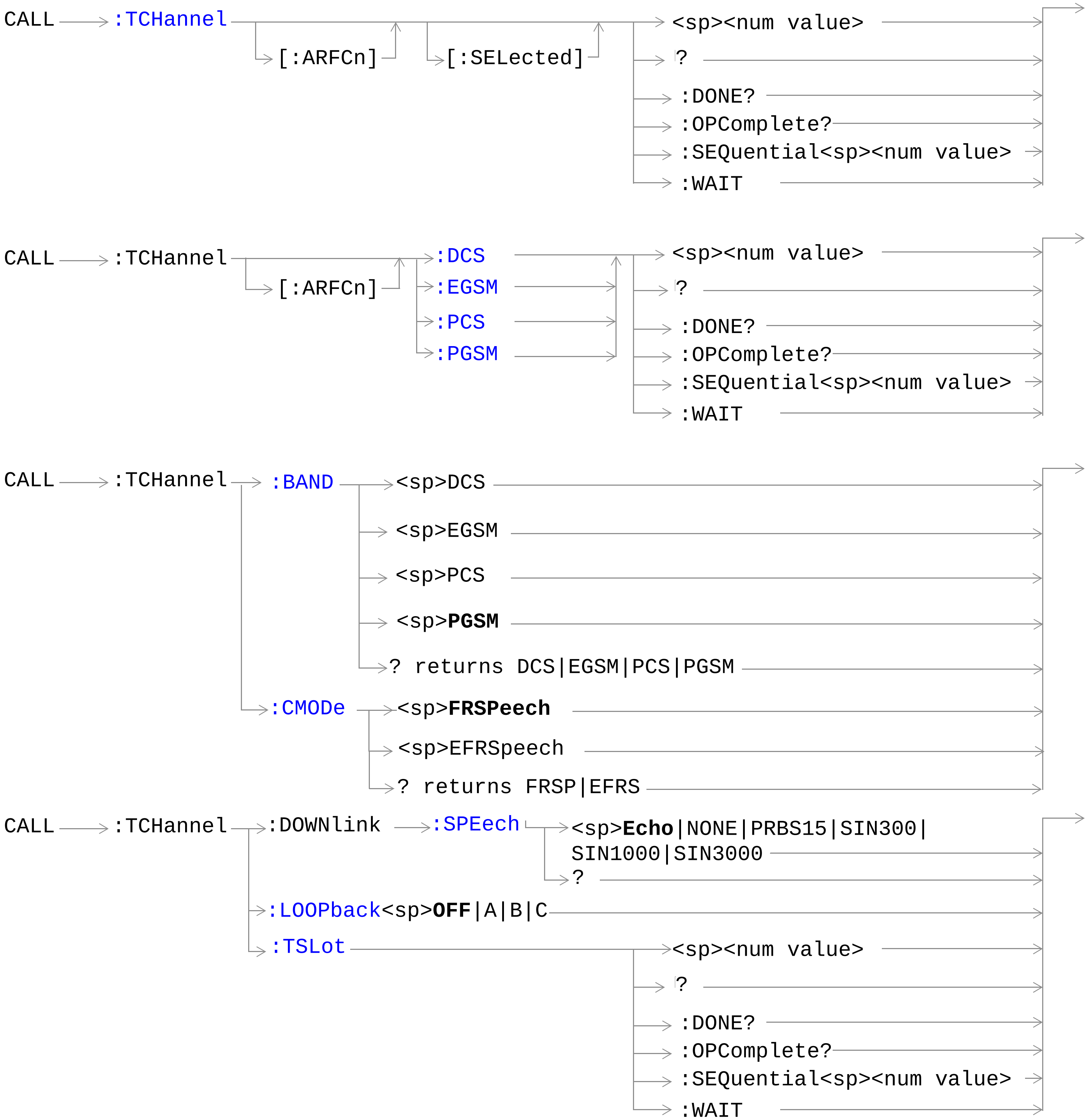
CALL:STATus:TCHannel:TSLot?

Function	Query the Timeslot that the BS Emulator is using for the TCH. See “Configuring the Traffic Channel (TCH)” on page 501. The CALL:STATUS:STATE must be connected, see “CALL:STATus[:STATe]?” on page 277.
Query	range: 3 | 4 | 5 | 9.91E+37
*RST Setting	9.91E+37 (NAN)

Programming Example

```
OUTPUT 714;"CALL:STATUS:TCHANNEL:TSLOT?"
```

CALL:TCHannel



“Diagram Conventions” on page 207

CALL:TCHannel[:ARFCn][:SELected]

Function	Sets/queries the channel number of downlink and uplink TCH for the band already selected. Additional commands can be appended to aid in controller/Mobile Station synchronization. See for examples.
Setting	range: • DCS band, channels 512 to 885 • EGSM band, channels 975 to 1023 and 0 to 124 • PCS band, channels 512 to 810 • PGSM band, channels 1 to 124 resolution: 1
Query	range: • DCS band, channels 512 to 885 • EGSM band, channels 975 to 1023 and 0 to 124 • PCS band, channels 512 to 810 • PGSM band, channels 1 to 124 resolution: 1
*RST setting	30 (PGSM band)

Programming Example

```
OUTPUT 714;"CALL:TCHANNEL:ARFCN:SELECTED 512" !Selects ARFCN of 512 on the
                                              !test set.
```

CALL:TCHannel[:ARFCn]:DCS

Function	Sets/queries the channel number for downlink and uplink TCH for DCS band. See “Configuring the Traffic Channel (TCH)” on page 501. TCH ARFCN may be set and queried when the CALL:STATUS:STATE is idle or connected, see “CALL:STATus[:STATe]?” on page 277. Additional commands can be appended to aid in controller/Mobile Station synchronization. See “Call Processing Subsystem Overlapped Command Synchronization Commands” on page 31 for examples.
Setting	range: 512 to 885 (default: 698) resolution: 1
Query	range: 512 to 885 resolution: 1
*RST setting	30 (PGSM band)

Programming Example

```
OUTPUT 714;"CALL:TCHANNEL:ARFCN:DCS 512"
```

CALL:TCHannel[:ARFCn]:EGSM

Function	Sets/queries channel number for downlink and uplink TCH for EGSM band. See "Configuring the Traffic Channel (TCH)" on page 501. TCH ARFCN may be set and queried when the CALL:STATUS:STATE is idle or connected, see "CALL:STATus[:STATe]?" on page 277. Additional commands can be appended to aid in controller/Mobile Station synchronization. See "Call Processing Subsystem Overlapped Command Synchronization Commands" on page 31 for examples.
Setting	range: 0 to 124 | 975 to 1023 (default: 30) resolution: 1
Query	range: 0 to 124 | 975 to 1023 resolution: 1
*RST Setting	30 (PGSM band)
Programming Example `OUTPUT 714;"CALL:TCHANNEL:ARFCN:EGSM 124"`	

CALL:TCHannel[ARFCN]:PCS

Function	Sets/queries channel number for downlink and uplink TCH for PCS band. See "Configuring the Traffic Channel (TCH)" on page 501. TCH ARFCN may be set and queried when the CALL:STATUS:STATE is idle or connected, see "CALL:STATus[:STATe]?" on page 277. Additional commands can be appended to aid in controller/Mobile Station synchronization. See "Call Processing Subsystem Overlapped Command Synchronization Commands" on page 31 for examples.
Setting	range: 512 to 810 (default: 698) resolution: 1
Query	range: 512 to 810 resolution: 1
*RST Setting	30 (PGSM band)
Programming Example `OUTPUT 714;"CALL:TCHANNEL:ARFCN:PCS 512"`	

CALL:TCHannel[:ARFCn]:PGSM

Function	Set channel number for downlink and uplink TCH for PGSM band. See “Configuring the Traffic Channel (TCH)” on page 501. TCH ARFCN may be set and queried when the CALL:STATUS:STATE is idle or connected, see “CALL:STATus[:STATe]?” on page 277. Additional commands can be appended to aid in controller/Mobile Station synchronization. See “Call Processing Subsystem Overlapped Command Synchronization Commands” on page 31 for examples.
Setting	range: 1 to 124 (default: 30) resolution: 1
Query	range: 1 to 124 resolution: 1
*RST Setting	30 (PGSM band)
Programming Example `OUTPUT 714;”CALL:TCHANNEL:ARFCN:PGSM 124”`	

CALL:TCHannel:BAND

Function	Sets/queries which GSM band the BS Emulator should use for the TCH. The test set may be queried for the current TCH band when the CALL:STATUS:STATE is idle or connected, see “CALL:STATus[:STATe]?” on page 277. The test set uses this command to perform a channel assignment, see “Programming a Dualband Handover” on page 121 when the MS will support the band and the CALL:STATUS:STATE is CONNected.
Setting	range: DCS | EGSM | PCS | PGSM bands resolution: 1
Query	range: DCS | EGSM | PCS | PGSM bands resolution: 1
*RST Setting	PGSM
Related Topic	Frequency Banded Parameters “Traffic Band Parameter” on page 482 .
Programming Example `OUTPUT 714;”CALL:TCHANNEL:BAND DCS”`	

CALL:TCHannel:CMODe

Function	Sets/queries which channel mode the mobile station should use for speech data. This setting is either full rate speech (FRSPeech) or enhanced full rate speech (EFRSpeech). See "Programming a Channel Mode Change" on page 119.
Setting	range: FRSPeech | EFRSpeech
Query	range: FRSP | EFRS
*RST Setting	FRSPeech
Programming Example `OUTPUT 714;"CALL:TCHANNEL:CMODE EFRSPEECH"`	

CALL:TCHannel:DOWNlink:SPEech

Function	Set which kind of Speech data is transmitted on the downlink TCH. See "Configuring the Traffic Channel (TCH)" on page 501 or "Fast Bit Error Measurement Description" on page 71 or "Test Mode Operating Mode" on page 504.
Setting	range: ECHO | NONE | PRBS15 | SIN300 | SIN1000 | SIN3000
Query	range: ECHO | NONE | PRBS15 | SIN300 | SIN1000 | SIN3000
*RST Setting	ECHO
Programming Example `OUTPUT 714;"CALL:TCHANNEL:DOWNLINK:SPEECH ECHO"`	

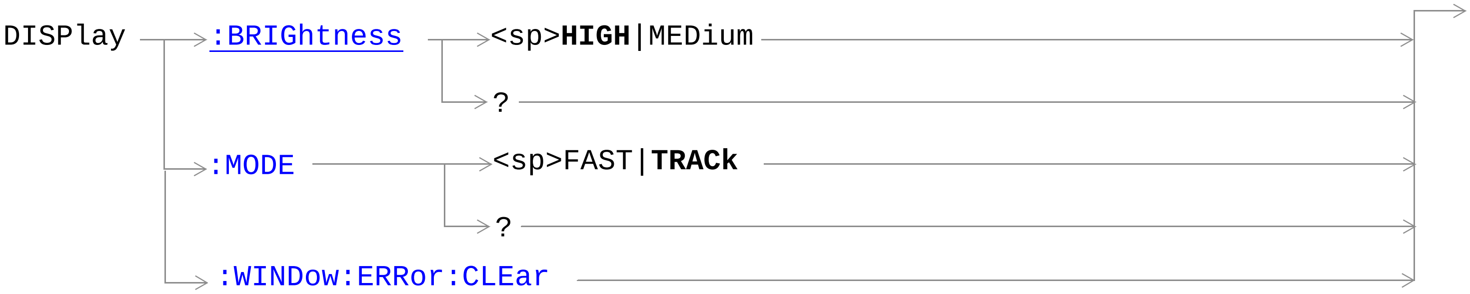
CALL:TCHannel:LOOPback

Function	Sets traffic channel loopback state and type for the MS. The loopback type must be set before a Fast Bit Error or a Bit Error measurement will function. The test set will automatically set the correct loopback type if the signalling loopback control is set to on, after the measurement the test set will automatically set the loopback to off. See "SETup:BERRor:SLControl" on page 381 or "SETup:FBERror:SLControl" on page 387. See "Fast Bit Error Measurement Description" on page 71 or "Bit Error Measurement Description" on page 50.
Setting	range: • OFF - Sets the TCH Loop state for the MS to OFF. The loop back is open. • A- Sets the TCH Loop state for the MS to type A. Full-rate speech TCH loopback with signaling of erased frames, (residual). • B- Sets the TCH Loop state for the MS to type B. Full-rate speech TCH loopback without signalling of erased frames, (non-residual). • C - Sets the TCH Loop state for the MS to type C. TCH burst by burst loopback.
*RST Setting	OFF
Programming Example `OUTPUT 714;"CALL:TCHANNEL:LOOPBACK C" !Sets loopback type.`	

CALL:TCHannel:TSLot

Function	Sets the Timeslot number used for downlink and uplink Traffic Channel. See "Configuring the Traffic Channel (TCH)" on page 501. Additional commands can be appended to aid in controller/Mobile Station synchronization. See "Call Processing Subsystem Overlapped Command Synchronization Commands" on page 31 for examples.
Setting	range: 3 | 4 | 5 resolution: 1
Query	range: 3 | 4 | 5 resolution: 1
*RST Setting	4
Programming Example `OUTPUT 714;"CALL:TCHANNEL:TSLOT 5" !Sets time slot number.`	

DISPlay



"Diagram Conventions" on page 207

DISPlay:BRIGhtness

Function	Sets/queries the test set's display brightness. A display backlight dimming feature lowers the display brightness after approximately 10 minutes without any manual user interaction with the test set. See "Display Backlight Dimming" on page 288.
Setting	Range: MEDium | HIGH
Query	Range: MED | HIGH
Factory setting	HIGH (this parameter is not affected by any reset operation and can only be changed by direct user access)
Programming Example `OUTPUT 714;"DISPLAY:BRIGHTNESS MEDIUM" !Sets display brightness to medium.`	

DISPlay:MODE

Function	Sets/queries the test set's display mode. See "Display Mode (Track/Fast)" on page 543.
Range	FAST|TRACK
Query	FAST | TRAC
*RST setting	TRACK
Programming Example `OUTPUT 714;"DISPLAY:MODE FAST" !Sets display mode to fast.`	

DISPlay:WINDow:ERRor:CLEar

Function	Clears the error message from the display screen but not from the Message Log.
Programming Example	
`OUTPUT 714;"DISPLAY:WINDOW:ERROR:CLEAR" !Clears an error message from the display.`	

DISPlay Subsystem

Description

The DISPlay subsystem is used to configure the test set's display mode or display brightness . Use of the DISPlay subsystem is not required to set or query any data or results.

Display Backlight Dimming

The test set's display brightness parameter has two settings at this time, high and medium. The life of the display's backlight will be maximized when brightness is set to medium. The test set has an auto dimming feature that will lower the display brightness automatically if approximately 10 minutes pass without a key being pressed on the test set's front panel. The display will return to the brightness level shown in the Display Brightness field when the test set is set to local and any front panel key is pressed. There is no other user control for this feature.

Syntax Diagram and Command Descriptions

"DISPlay"

FETCh? Subsystem

Description

The FETCh? query is a function that allows users to query results from a measurement that was previously INITiated or READ. It does NOT begin a measurement. If no measurement is in progress it will return the integrity and measurement values from the last measurement made, or return an integrity of No Result Available and results of NAN. If a measurement is in process, the query will hang until the results are available, or the measurement fails or times out. The exact results returned with a FETCh? will depend on the specific measurement. A measurement may have a number of different results or combination of results for a FETCh?. The FETCh? queries are intended to be used to provide overlapped operation access to measurement results from the test set. When used along with SETup and INITiate commands , FETCh? is the primary way for the user to retrieve measurement results. In order to use the test set's concurrent test capabilities the overlapped commands of INITiate and FETCh? must be used. Overlapped commands allow the user to send commands and not wait for completion.

Syntax Diagrams and Command Descriptions

"FETCh:AAUDio" on page 290

"FETCh:BERRor" on page 294

"FETCh:DAUDio" on page 302

"FETCh:DPOWer" on page 306

"FETCh:FBERror" on page 308

"FETCh:IQTuning" on page 311

"FETCh:ORFSpectrum" on page 315

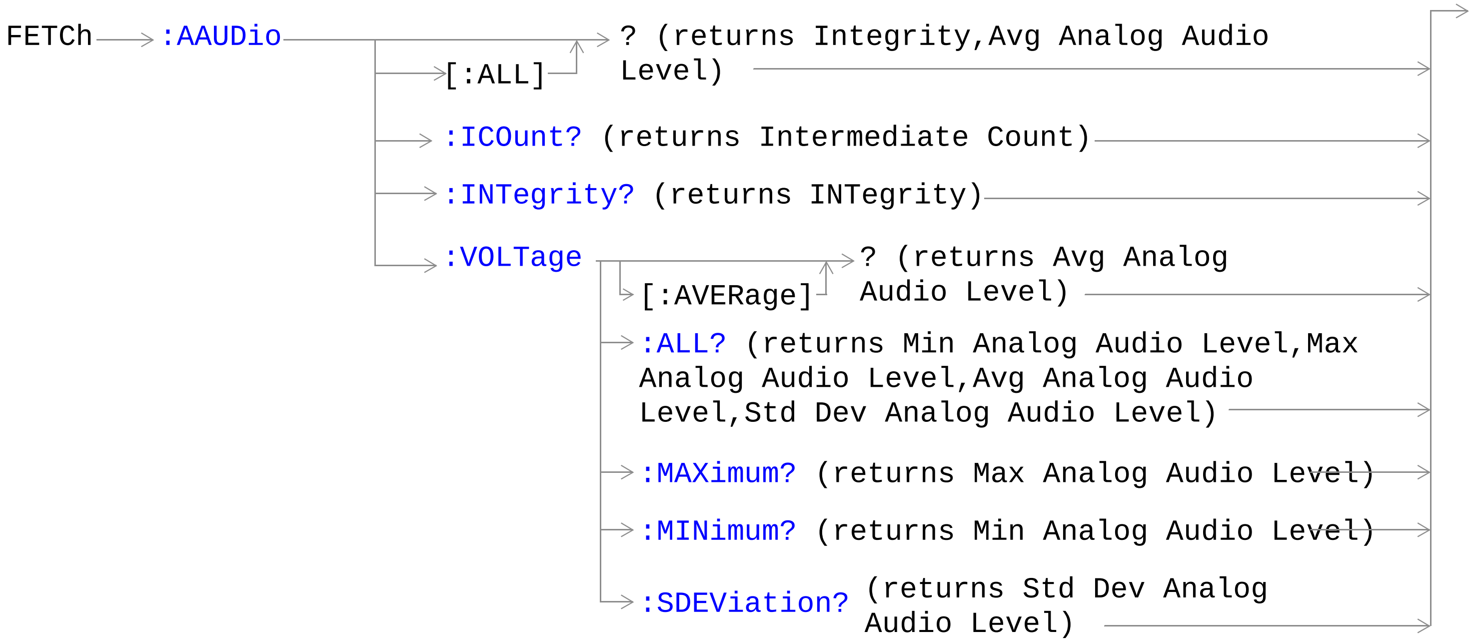
"FETCh:PFERror" on page 322

"FETCh:PVTime" on page 328

"FETCh:TXPower" on page 340

FETCh:AAUDio

December 1, 1999



"Diagram Conventions" on page 207

FETCh:AAUDio[:ALL]?

Function	Queries the analog audio measurement results. This query returns an integrity indicator and average analog audio level. Values are returned in a comma-separated list. If the analog audio multi-measurement count field is off, the level returned by this command is displayed in the Analog Audio In Level field. If the analog audio multi-measurement count is on, the level returned by this command is displayed in the Analog Audio Average field.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Analog audio level • Range: 10 mV_{rms} to 20 V_{rms} • Resolution: 0.1 mV_{rms}

FETCh:AAUDio:ICOunt?

Function	Queries the intermediate count of analog audio multi-measurements completed. This value is not displayed on the test set.
Query	Range: 1 to 999 Resolution: 1

FETCh:AAUDio:INTegrity?

Function	Queries the integrity indicator for the last analog audio measurement completed. Zero indicates a normal measurement. See "Integrity Indicator" on page 126 for descriptions of non-zero integrity indicators.
Query	Range: 0 to 16 Resolution: 1

FETCh:AAUDio:VOLTage[:AVERage]?

Function	Queries the average analog audio level. Value is returned in units of V_{rms}. If the analog audio multi-measurement count field is off, the level returned by this command is displayed in the Analog Audio In Level field. If the analog audio multi-measurement count is on, the level returned by this command is displayed in the Analog Audio Average field
Query	Range: 10 mV_{rms} to 20 V_{rms} Resolution: 0.1 mV_{rms}

FETCh:AAUDio:VOLTage:ALL?

Function	Queries the analog audio multi-measurement minimum, maximum, average and standard deviation. Values are returned in a comma-separated list The values returned are displayed in the Analog Audio Minimum, Maximum, Average, and Std. Dev. fields, which are displayed when the Analog Audio multi-measurement count is not off.
Query	Minimum • Range: 10 mV_{rms} to 20 V_{rms} • Resolution: 0.1 mV_{rms} Maximum • Range: 10 mV_{rms} to 20 V_{rms} • Resolution: 0.1 mV_{rms} Average • Range: 10 mV_{rms} to 20 V_{rms} • Resolution: 0.1 mV_{rms} Standard deviation • Range: 0 V to 14.14214 V • Resolution: 0.01 mV

FETCh:AAUDio:VOLTage:MAXimum?

Function	Queries the analog audio multi-measurement maximum analog audio voltage. The value returned is displayed in the Analog Audio Maximum field, which is displayed when the analog audio multi-measurement count is not off.
Query	Range: 10 mV_{rms} to 20 V_{rms} Resolution: 0.1 mV_{rms}

FETCh:AAUDio:VOLTage:MINimum?

Function	Queries the analog audio multi-measurement minimum analog audio voltage The value returned is displayed in the Analog Audio Minimum field, which is displayed when the analog audio multi-measurement count is not off.
Query	Range: 10 mV_{rms} to 20 V_{rms} Resolution: 0.1 mV_{rms}

FETCh:AAUDio:VOLTage:SDEViation?

Function	Queries the analog audio multi-measurement standard deviation. The value returned is displayed in the Analog Audio Std Dev. field, which is displayed when the Analog Audio multi-measurement count is not off.
Query	Range: 0 V to 14.14214 V Resolution: 0.01 mV

FETCh:BERRor

December 1, 1999

FETCh :BERRor [:ALL] ? (returns integrity,bits tested, bit error ratio, bit error count)

BITS? (returns the number of bits tested)

TYPEIA? (returns the number of TypeIA bits tested)

TYPEIB? (returns the number of TypeIB bits tested)

TYPEII? (returns the number of TypeII bits tested)

:DELay? (returns speech frame delay count)

:FULL? (returns integrity, bits tested, bit error ratio, bit error count for TypeIA TypeIB, and TypeII bits)

:ICOunt? (returns intermediate count)

:INTegrity? (returns integrity)

FETCh→:BERRor→:COUNt
→? (returns bit error count)
→[:BITS]
→:CRC? (returns CRC bit error count for non-residual type measurements)
→:FE? (returns frame erasure (FE) bit error count for residual type measurements)
→TYPEIA? (returns the number of TypeIA bits in error)
→TYPEIB? (returns the number of TypeIB bits in error)
→TYPEII? (returns the number of TypeII bits in error)

FETCh→:BERRor→:RATio
→? (returns bit error count)
→[:BITS]
→:CRC? (returns CRC bit error count for non-residual type measurements)
→:FE? (returns frame erasure (FE) bit error count for residual type measurements)
→TYPEIA? (returns the ratio of TypeIA bits in error)
→TYPEIB? (returns the ratio of TypeIB bits in error)
→TYPEII? (returns the ratio of TypeII bits in error)

“Diagram Conventions” on page 207

FETCh:BERRor[:ALL]?

Function	Queries the bit error measurement. Query returns integrity indicator, bits tested, bit error ratio, and bit error count. (A similar query, “FETCh:BERRor:FULL?” on page 299, returns the same results but for all bit types simultaneously.) See “Bit Error Measurement Description” on page 50.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Bits tested • Range: 0 to 999,131 and 9.91 E+37 (NAN) • Resolution: 1 Bit error ratio • Range: 0 to 100 and 9.91 E+37 (NAN) • Resolution: 0.01 Bit error count • Range: 1 to 999,131 and 9.91 E+37 (NAN) • Resolution: 1

FETCh:BERRor:BITS?

Function	Queries the number of bits actually tested. This query only returns the result of the bit type set using the SETup:BERRor[:TYPE] command. The number of bits actually tested will exceed the number requested because the test set rounds up the number requested to the nearest number that results in an integral number of speech frames. One speech frame is 132 bits. The test set measures complete a speech frame and it is queried for bits. See “Bit Error Measurement Description” on page 50
Query	Bits tested • Range: 0 to 999,131 and 9.91 E+37 (NAN) • Resolution: 1
*RST Setting	10,000

FETCh:BERRor:BITS:TYPEIA|TYPEIB|TYPEII?

Function	Queries the number of bits which have been tested. This query allows you to select the bit type you want to query; either Type Ia, Type Ib or Type II. See "Bit Error Measurement Description" on page 50
Query	Range for Type Ia: 0 to 999,000 and 9.91 E+37 (NAN) Range for Type Ib: 0 to 2,637,369 and 9.91 E+37 (NAN) Range for Type II: 0 to 1,558,440 and 9.91 E+37 (NAN) Resolution: 1

FETCh:BERRor:COUNt[:BITS]?

Function	Queries the number of bits that were in error during the last bit error test. See "Bit Error Measurement Description" on page 50 The manual user must set the measurement unit to count.
Query	Range: 1 to 999,131 and 9.91 E+37 (NAN) Resolution: 1

FETCh:BERRor:COUNt:CRC?

Function	Queries the number of bad cyclic redundancy checks (CRCs) for a non-residual measurement type, loopback type B test. See "Bit Error Measurement Description" on page 50 The mobile station re-transmits the CRC it received from the test set on the uplink. A bad CRC occurs when the CRC transmitted by the test set does not match what is received back from the mobile station. The manual user must set the measurement unit to count.
Query	Range: 0 to 19,980 and 9.91 E+37 (NAN) Resolution: 1

FETCh:BERRor:COUNt:FE?

Function	Queries the number of frames erased during a residual measurement type, looback type A test. The manual user must set the measurement's unit to count.
Query	Range: 0 to 19,980 and 9.91 E+37 (NAN) Resolution: 1

FETCh:BERRor:COUNt:TYPEIA|TYPEIB|TYPEII?

Function	Queries the number of bits in error. This query allows you to select the bit type you want to query; either Type Ia, Type Ib or Type II. See “Bit Error Measurement Description” on page 50
Query	Range for Type Ia: 0 to 999,000 and 9.91 E+37 (NAN) Range for Type Ib: 0 to 2,637,369 and 9.91 E+37 (NAN) Range for Type II: 0 to 1,558,440 and 9.91 E+37 (NAN) Resolution: 1

FETCh:BERRor:DELay?

Function	Queries the delay (in speech frames) that the test set used during the last bit error measurement to correlate uplink information bits with downlink information bits. This value is displayed in the Speech Frames Delay field. This value can be determined automatically, or manually set by the user. See “SETup:BERRor:MANual:DELay” on page 381 and “SETup:BERRor:LDControl:AUTO” on page 380. Refer also to the “Bit Error Measurement Description” on page 50 for a description of frame delay and how it is used in the bit error measurement.
Query	Range: 0 to 15 and 9.91 E+37 (NAN) Resolution: 1
*RST Setting	Auto

FETCh:BERRor:FULL?

Function	Queries the bit error measurement. Returns Integrity Indicator see "Integrity Indicator" on page 126, Bits Tested, Bit Error Ratio and Bit Error Count for Type Ia, Type Ib and Type II bits. (A similar query, "FETCh:BERRor[:ALL]?" on page 296, returns the same results but only for the bit type previously set using the SETup:BERRor[:TYPE] command.) See "Bit Error Measurement Description" on page 50
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Type Ia Bits tested • Range: 0 to 999,000 and 9.91E+37 (NAN) • Resolution: 1 Type Ia Bit error ratio • Range: 0 to 100 and 9.91E+37 (NAN) • Resolution: 0.01 Type Ia Bit error count • Range: 0 to 999,000 and 9.91E+37 (NAN) • Resolution: 1 Type Ib Bits tested • Range: 0 to 2,637,369 and 9.91E+37 (NAN) • Resolution: 1 Type Ib Bit error ratio • Range: 0 to 100 and 9.91E+37 (NAN) • Resolution: 0.01 Type Ib Bit error count • Range: 0 to 2,637,369 and 9.91E+37 (NAN) • Resolution: 1 Type II Bits tested • Range: 0 to 15,584,400 and 9.91E+37 (NAN) • Resolution: 1 Type II Bit error ratio • Range: 0 to 100 and 9.91E+37 (NAN) • Resolution: 0.01 Type II Bit error count • Range: 0 to 1,558,440 and 9.91E+37 (NAN) • Resolution: 1

FETCh:BERRor:ICOunt?

Function	Queries the intermediate count of bits tested (measurement progress report). See “Measurement Progress Report” on page 132
Query	Range: 0 to 999 Resolution: 1

FETCh:BERRor:INTegrity?

Function	Returns the integrity indicator value for the last bit error measurement performed. Zero indicates a normal result. See “Integrity Indicator” on page 126 for descriptions of non-zero integrity indicators.
Query	Range: 0 to 16 Resolution: 1

FETCh:BERRor:RATio[:BITS]?

Function	Queries the ratio of bits in error to the number of bits tested during the last bit error test and returns it as a percentage. See “Bit Error Measurement Description” on page 50 The manual user must set the measurement unit to %.
Query	Range: 1 to 100 and 9.91 E+37 (NAN) Resolution: 0.01

FETCh:BERRor:RATio:CRC?

Function	Queries the ratio of bad cyclic redundancy checks (CRCs) to the total number of CRCs received for a non-residual measurement type, loboack type B test and returns it as a percentage. See “Bit Error Measurement Description” on page 50 The mobile station re-transmits the CRC it received from the test set on the uplink. A bad CRC occurs when the CRC transmitted by the test set does not match what is received back from the mobile station. The manual user must set the measurement’s unit to %.
Query	Range: 0 to 100 and 9.91 E+37 (NAN) Resolution: 0.01

FETCh:BERRor:RATio:FE?

Function	Queries the ratio of erased frames to the total number of frames received for a residual measurement type, looback type A test and returns them as a percentage. See "Bit Error Measurement Description" on page 50 The manual user must set the measurement's unit to %.
Query	Range: 0 to 100 and 9.91 E+37 (NAN) Resolution: 0.01

FETCh:BERRor:RATio:TYPEIA|TYPEIB|TYPEII?

Function	Queries the number of bits in error to the number of bits tested. This query allows you to select the bit type you want to query; either Type Ia, Type Ib or Type II. The result is returned as a percentage. See "Bit Error Measurement Description" on page 50
Query	Range: 0 to 100 and 9.91 E+37 (NAN) Resolution: 0.01

FETCh:DAUDio

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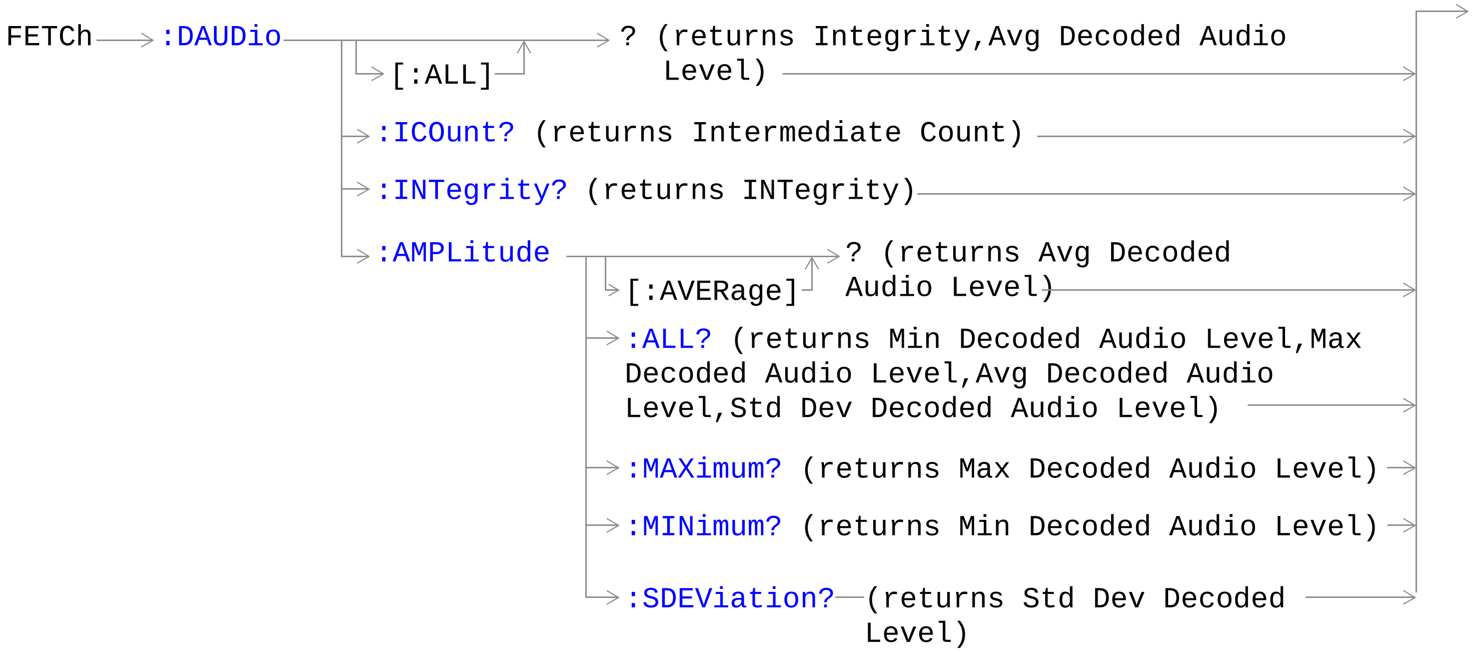


"Diagram Conventions" on page 207

FETCh:DAUDio[:ALL]?

Function	Queries integrity indicator and average decoded audio results. Values are returned in a comma-separated list.
Query	Integrity indicator: • Range: 0 to 16 • Resolution: 1 Decoded audio: • Range: 0 to 100% • Resolution: 0.01% FS

FETCh:DAUDio:ICOunt?

Function	Queries the intermediate count of decoded audio multi-measurements completed. This value is not displayed on the test set.
Query	Range: 1 to 999 Resolution: 1

FETCh:DAUDio:INTegrity?

Function	Queries the integrity indicator for the last decoded audio measurement completed. Zero indicates a normal measurement. See “Integrity Indicator” on page 126 for descriptions of non-zero integrity indicators.
Query	Range: 0 to 16 Resolution: 1

FETCh:DAUDio:AMPLitude[:AVERage]?

Function	Queries the average decoded audio result from an uplink speech level measurement in percent full scale. If the decoded audio multi-measurement count field is off, the level returned by this command is displayed in the Decoded Audio Level field. If the decoded audio multi-measurement count is on, the level returned by this query is displayed in the Average field
Query	Range: 0 to 100% Resolution: 0.01% FS

FETCh:DAUDio:AMPLitude:ALL?

Function	Queries the decoded audio multi-measurement minimum, maximum, average and standard deviation. Values are returned in a comma-separated list. The values returned are displayed in the Minimum, Maximum, Average, and Std. Dev. fields, which are displayed when the decoded audio multi-measurement count is not off.
Query	Minimum: • Range: 0 to 100% • Resolution: 0.01% FS Maximum: • Range: 0 to 100% • Resolution: 0.01% FS Average: • Range: 0 to 100% • Resolution: 0.01% FS Standard deviation: • Range: 0 to 71% • Resolution: 0.001% FS

FETCh:DAUDio:AMPLitude:MAXimum?

Function	Queries the decoded audio multi-measurement maximum decoded audio voltage. The value returned is displayed in the Decoded Audio Maximum field, which is displayed when the decoded audio multi-measurement count is not off.
Query	Range: 0 to 100% Resolution: 0.01% FS

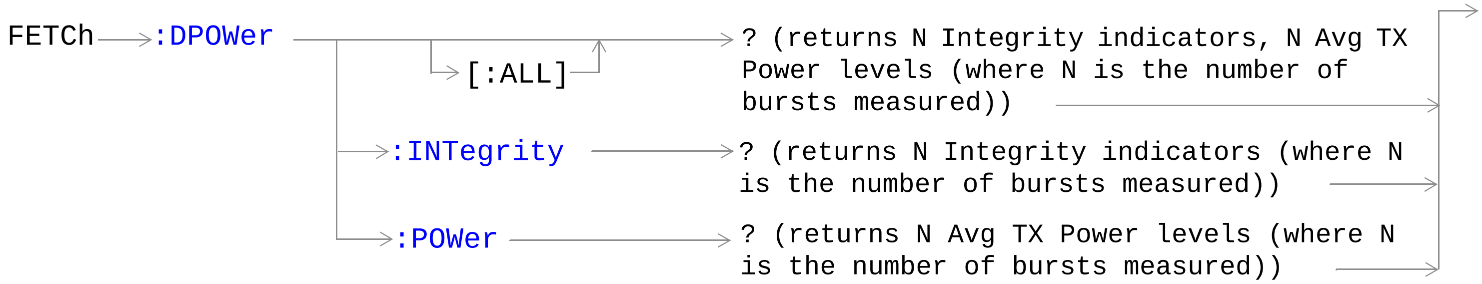
FETCh:DAUDio:AMPLitude:MINimum?

Function	Queries the decoded audio multi-measurement minimum decoded audio voltage The value returned is displayed in the Decoded Audio Minimum field, which is displayed when the decoded audio multi-measurement count is not off.
Query	Range: 0 to 100% Resolution: 0.01% FS

FETCh:DAUDio:AMPLitude:SDEViation?

Function	Queries the decoded audio multi-measurement standard deviation. The value returned is displayed in the Decoded Audio Std Dev. field, which is displayed when the Decoded Audio multi-measurement count is not off.
Query	Range: 0 to 71% Resolution: 0.001% FS

FETCh:DPOWer



"Diagram Conventions" on page 207

FETCh:DPOWer[:ALL]?

Function	Queries the Dynamic Power measurement results. Query returns N integrity indicators and N average TX power levels (where N is the number of bursts measured). To set the number of bursts you want to measure, use "SETup:DPOWer:COUNt:NUMBer" on page 397.
Query	Integrity indicators for each individual burst • Range: 0 to 16 • Resolution: 1 Average TX power levels for each individual burst • Range: -100 to +100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dBm

FETCh:DPOWer:INTegrity?

Function	Returns N integrity indicators (where N is the number of bursts measured). To set the number of bursts you want to measure, use "SETup:DPOWer:COUNt:NUMBer" on page 397.
Query	Range: 0 to 16 Resolution: 1

FETCh:DPOWer:POWer?

Function	Queries the average TX power levels for the Dynamic Power measurement. Returns N average power levels (where N is the number of bursts measured. To set the number of bursts you want to measure, see “SETup:DPOWer:COUNt:NUMBer” on page 397.
Query	Range: -100 to +100 dB and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:FBERror

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```
FETCh → :FBERror → ? (returns Integrity,Fast Bit Error Rate
          [:ALL]     Bits Tested, FBER Ratio, FBER Count)
        → :BITS? (returns number of bits tested)
        → :COUNt? (returns number of bits failed)
        → :DELay? (returns TDMA frame delay)
        → :ICOunt? (returns Intermediate Count)
        → :INTegrity? (returns INTegrity)
        → :RATio? (returns bit error ratio)
```

“Diagram Conventions” on page 207

FETCh:FBERror[:ALL]?

Function	Queries the fast bit error measurement. Query returns integrity indicator, bits tested, bit error ratio, and bit error count. Bit error ratio is displayed in the Fast Bit Error field. The other values returned by this query are not available on the front panel display.
Query	Integrity indicator: • Range: 0 to 16 • Resolution: 1 Bits tested: • Range: 1 to 999,455 and 9.91 E+37 (NAN) • Resolution: 1 Bit error ratio: • Range: 0 to 100 and 9.91 E+37 (NAN) • Resolution: 0.01 Fast bit error count: • Range: 1 to 999,455 and 9.91 E+37 (NAN) • Resolution: 1

FETCh:FBERror:BITS?

Function	Queries the total number of information bits tested during the last fast bit error measurement. See "SETup:FBERror:COUNt" on page 386
	Queries the total number of information bits tested during the last fast bit error measurement. See "SETup:FBERror:COUNt" on page 386 This value is not available on the front panel display.
Query	Range: 1 to 999,455 and 9.91 E+37 (NAN) Resolution: 1

FETCh:FBERror:COUNt?

Function	Queries the number of information bits that were deemed errors during the last fast bit error test. This value is not available on the front panel display.
Query	Range: 1 to 999,455 and 9.91 E+37 (NAN) Resolution: 1

FETCh:FBERror:DELay?

Function	Queries the delay (in TDMA frames) the test set used during the last fast bit error measurement to correlate uplink information bits with downlink information bits. This value is displayed in the TDMA Frame Delay field. This value can be determined automatically, or set by the user. See "SETup:FBERror:MANual:DELay" on page 387 and "SETup:FBERror:LDControl:AUTO" on page 386 for setting this value manually. Refer also to the "Fast Bit Error Measurement Description" on page 71 for a description of frame delay and how it is used in the fast bit error measurement.
Query	Range: 0 to 26 and 9.91 E+37 Resolution: 1

FETCh:FBERror:ICOunt?

Function	Queries the intermediate count (measurement progress report) of bits tested
Query	Range: 0 to 999,455 and 99.9 E+37

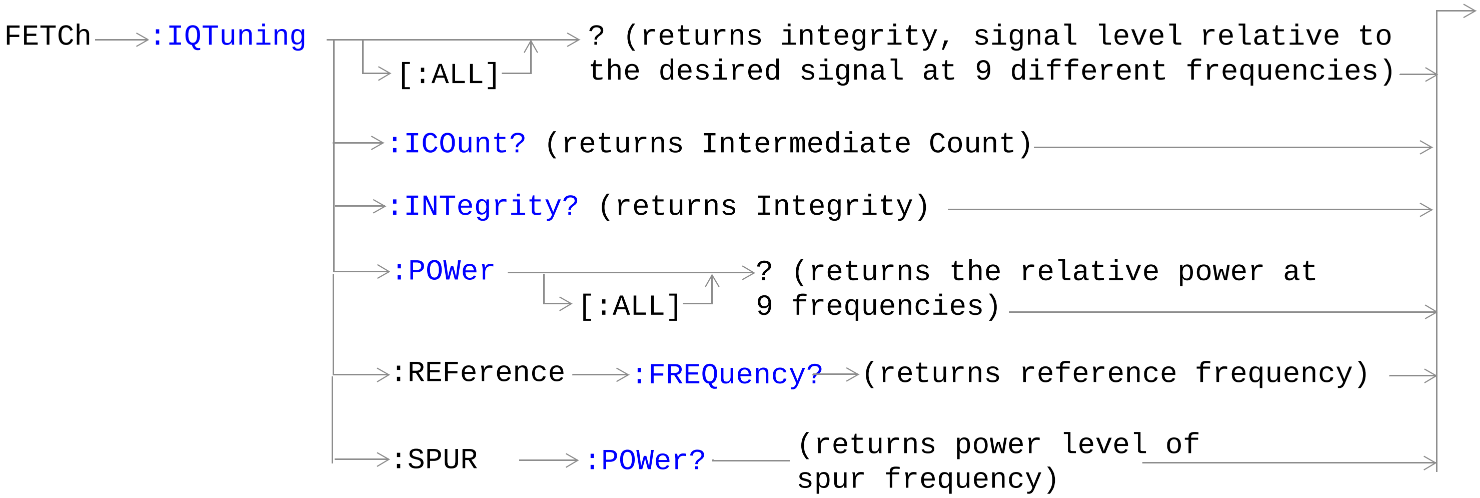
FETCh:FBERror:INTegrity?

Function	Returns the integrity indicator value for the last fast bit error measurement performed. Zero indicates a normal result. See "Integrity Indicator" on page 126 for descriptions of non-zero integrity indicators.
Query	Range: 0 to 16 Resolution: 1

FETCh:FBERror:RATio?

Function	Queries the ratio of bits deemed bad to total bits tested during the last fast bit error measurement performed.
Query	Range: 0 to 100 and 9.99 E+37 Resolution: 0.01

FETCh:IQTuning



“Diagram Conventions” on page 207

FETCh:IQTuning[:ALL]?

Function	Queries the I/Q Tuning measurement results. Query returns the integrity indicator and the relative power level at the following offset frequencies: carrier frequency, ±67.7083 kHz, ±135.417 kHz, ±203.125 kHz, ±270.833 kHz. The spur measurement result is also returned.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Signal level relative to the desired signal at 9 different frequencies • Range: -100 to +100 dB and 9.91 E+37 (NAN) • Resolution: 0.01 dB The order of the signal level results are: • -270.833 kHz • -203.125 kHz • -135.417 kHz • -67.7083 kHz • carrier frequency • +67.7083 kHz • +135.417 kHz • +203.125 kHz • +270.833 kHz Relative power of the spur frequency: • Range: -100 to +100 dB and 9.91E+37 (NAN) • Resolution: 0.01 dB

FETCh:IQTuning:ICOunt?

Function	Queries the intermediate number of I/Q Tuning multi-measurements completed.
Query	Range: 0 to 999 Resolution: 1

FETCh:IQTuning:INTegrity?

Function	Returns the integrity indicator value for the last I/Q Tuning measurement performed. Zero indicates a normal result.
Query	Range: 0 to 16 Resolution: 1

FETCh:IQTuning:POWer[:ALL]?

Function	Queries the I/Q Tuning measurement results. Query returns the relative power level at the following offset frequencies: carrier frequency, ±67.7083 kHz, ±135.417 kHz, ±203.125 kHz, ±270.833 kHz. The spur measurement result is also returned.
Query	Signal level relative to the desired signal at 9 different frequencies • Range: -100 to +100 dB and 9.91 E+37 (NAN) • Resolution: 0.01 dB The order of the signal level results are: • -270.833 kHz • -203.125 kHz • -135.417 kHz • -67.7083 kHz • carrier frequency • +67.7083 kHz • +135.417 kHz • +203.125 kHz • +270.833 kHz Relative power of the spur frequency: • Range: -100 to +100 dB and 9.91E+37 (NAN) • Resolution: 0.01 dB

FETCh:IQTuning:REFerence:FREQuency?

Function	Queries the offset frequency being used as the reference for the measurement.
Query	NEG67KHZ|ZEROKHZ|POS67KHZ|UNKNOWN

FETCh:IQTuning:SPUR:POWer?

Function	Queries the relative power level of the spur frequency.
Query	Range: -100 to +100 dB and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:ORFSpectrum

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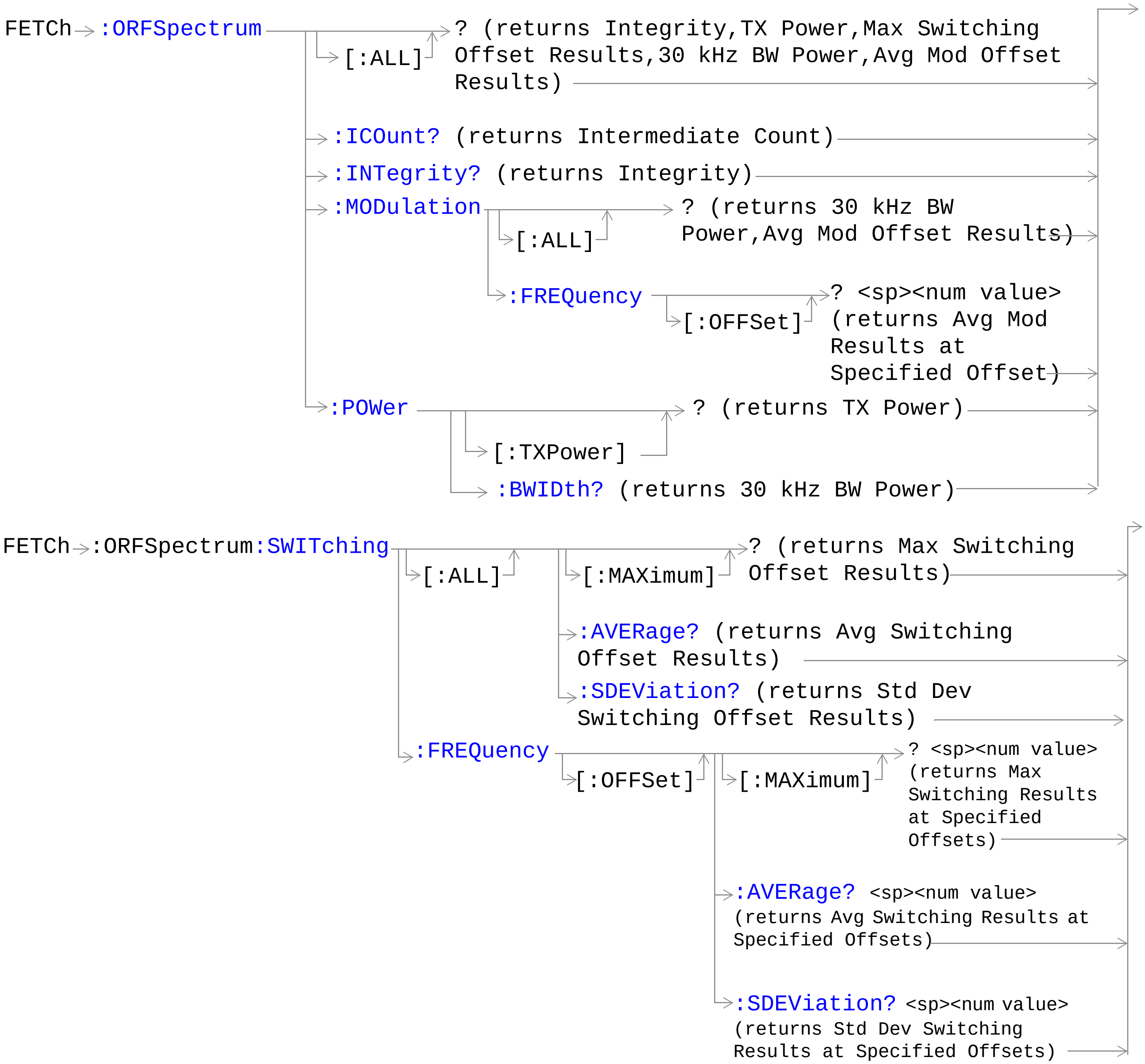

“Diagram Conventions” on page 207

FETCh:ORFSpectrum[:ALL]?

Function	Queries integrity indicator, TX carrier power, up to eight comma-separated output RF spectrum due to switching (max) results, 30 kHz bandwidth power, and up to 22 output RF spectrum due to modulation (average) results. The "SETup:ORFSpectrum:SWITching:FREQuency[:OFFSet]" command sets up the number of output RF spectrum due to switching offsets that are turned on and their frequency values. The "SETup:ORFSpectrum:SWITching:FREQuency:POINts?" queries the number of output RF spectrum due to switching points that are turned on, indicating the number of output RF spectrum due to switching (max) values to expect when you FETCh results. The "SETup:ORFSpectrum:MODulation:FREQuency[:OFFSet]" command sets up the number of output RF spectrum due to modulation offsets that are turned on and their frequency values. The "SETup:ORFSpectrum:MODulation:FREQuency:POINts?" command queries the number of output RF spectrum due to modulation points that are turned on, indicating the number of output RF spectrum due to modulation (average) values to expect when you FETCh results.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 TX Carrier Power • Range: –100 dBm to +100 dBm and 9.91 E+37 • Resolution: 0.01 dB Output RF Spectrum Due to Switching (Max) • Range: –100 dBm to +100 dBm and 9.91 E+37 • Resolution: 0.01 dB 30 kHz Bandwidth Power • Range: –100 dBm to +100 dBm and 9.91 E+37 • Resolution: 0.01 dB Output RF Spectrum due to Modulation (Average) • Range: –200 dB to +100 dB and 9.91 E+37 • Resolution: 0.01 dB

FETCh:ORFSpectrum:ICOunt?

Function	Queries the intermediate count of ORFS multi-measurements completed. This number will climb to the number returned by "SETup:ORFSpectrum:ICOunt:MAXimum?" on page 408.
Query	Range: 0 to 29971 Resolution: 1

FETCh:ORFSpectrum:INTegrity?

Function	Queries the integrity indicator for the output RF spectrum analyzer measurement. Zero indicates a normal result. See “Integrity Indicator” on page 126 for descriptions of non-zero integrity indicators.
Query	Range: 0 to 16 Resolution: 1

FETCh:ORFSpectrum:MODulation[:ALL]?

Function	Queries TX Carrier Power, 30 kHz BW Power, and up to 22 comma-separated output RF spectrum due to modulation (average) results The “SETup:ORFSpectrum:MODulation:FREQuency[:OFFSet]” command sets up the number of output RF spectrum due to modulation offsets that are turned on and their frequency values. The “SETup:ORFSpectrum:MODulation:FREQuency:POINts?” command queries the number of output RF spectrum due to modulation points that are turned on, indicating the number of output RF spectrum due to modulation (average) values to expect when you FETCh output RF spectrum due to modulation results.
Query	TX Carrier Power • Range: –100 dBm to +100 dBm and 9.91 E+37 • Resolution: 0.01 dB 30 kHz Bandwidth Power • Range: –100 dBm to +100 dBm and 9.91 E+37 • Resolution: 0.01 dB Output RF Spectrum due to Modulation (Average) • Range: –200 dB to +100 dB and 9.91 E+37 • Resolution: 0.01 dB

FETCh:ORFSpectrum:MODulation:FREQuency[:OFFSet]?

Function	Queries the ORFS due to modulation measurement, allowing frequency offset values to be appended to the command. Returns ORFS due to modulation (average) measurements at the frequencies listed, in the order they are listed. Frequencies must have a one-to-one correspondence to ORFS due to modulation frequency offsets that are currently turned on. Frequencies must be separated by commas. (See “SETup:ORFSpectrum:MODulation:FREQuency[:OFFSet]” for the command that turns on frequency offsets.) Each frequency value is (optionally) followed by: HZ | KHZ | MHZ | GHZ . The default units are HZ (hertz).
Query	Range: –200 dB to +100 dB and 9.91 E+37 Resolution: 0.01 dB

Programming Example

```
OUTPUT 714;"FETCH:ORFSPECTRUM:MODULATION:FREQUENCY:OFFSET? 200 KHZ, 400 KHZ"
!Returns the ORFS due to modulation (average) measurement
!results at the 200 kHz and 400 kHz offsets only, assuming
these offsets are turned on.
```

FETCh:ORFSpectrum:POWer?

Function	Returns the TX carrier power measurement result from the last ORFS measurement. This measurement is made using the method described in the “Transmit Power Measurement Description” on page 108.
Query	Range: –100 dBm to +100 dBm and NAN. Resolution: 0.01 dB

Programming Example

```
OUTPUT 714;"FETCH:ORFSPECTRUM:POWER:TXPOWER?" !Returns TX carrier power.
```

FETCh:ORFSpectrum:POWer:BWIDth?

Function	Queries the ORFS 30 kHz bandwidth power measurement. See “Output RF Spectrum Measurement Description” on page 77
Query	Range: –100 dBm to +100 dBm and NAN. Resolution: 0.01 dB

FETCh:ORFSpectrum:SWITChing[:ALL][:MAXimum]?

Function	Queries output RF spectrum due to switching (maximum) measurement results at all frequency offsets currently turned on (there can be up to eight). The “SETup:ORFSpectrum:SWITching:FREQuency[:OFFSet]” command sets up the number of output RF spectrum due to switching offsets that are turned on and their frequency values. The “SETup:ORFSpectrum:SWITching:FREQuency:POINts?” queries the number of output RF spectrum due to switching points that are turned on, indicating the number of output RF spectrum due to switching (max) values to expect when you FETCh results.
Query	Range: –100 dBm to +100 dBm and 9.91 E+37 Resolution: 0.01 dB

Programming Example

```
OUTPUT 714;"FETCH:ORFSPECTRUM:SWITCHING:ALL:MAXIMUM?"  !Returns the ORFS due to
                                                       !switching (maximum)
                                                       !measurement results at
                                                       !all frequency offsets
                                                        !currently turned on.
```

FETCh:ORFSpectrum:SWITChing[:ALL]:AVERage?

Function	Queries output RF spectrum due to switching (average) measurement results at all frequency offsets currently turned on (there can be up to eight). The “SETup:ORFSpectrum:SWITching:FREQuency[:OFFSet]” command sets up the number of output RF spectrum due to switching offsets that are turned on and their frequency values. The “SETup:ORFSpectrum:SWITching:FREQuency:POINts?” queries the number of output RF spectrum due to switching points that are turned on, indicating the number of output RF spectrum due to switching values to expect when you FETCh results.
Query	Range: –100 dBm to +100 dBm and 9.91 E+37 Resolution: 0.01 dB

Programming Example

```
OUTPUT 714;"FETCH:ORFSPECTRUM:SWITCHING:ALL:AVERAGE?"  !Returns the ORFS due to
                                                       !switching (average)
                                                       !measurement results at
                                                       !all frequency offsets
                                                               !currently turned on.
```

FETCh:ORFSpectrum:SWITChing:FREQuency[:OFFSet][:MAXimum]?

Function	Queries the ORFS due to switching measurement, allowing frequency offset values to be appended to the command. Returns ORFS due to switching (maximum) measurements at the frequencies listed, in the order they are listed. Frequencies must have a one-to-one correspondence to ORFS due to switching frequency offsets that are currently turned on. Frequencies must be separated by commas. (See “SETup:ORFSpectrum:SWITching:FREQuency[:OFFSet]” for the command that turns on frequency offsets.) Each value is (optionally) followed by: HZ | KHZ | MHZ | GHZ . The default units are HZ (hertz).
Query	Range: –100 dB to +100 dB and 9.91 E+37 Resolution: 0.01 dB

Programming Example

```
OUTPUT 714;”FETCH:ORFSPECTRUM:SWITCHING:FREQUENCY:OFFSET:MAXIMUM? 200 KHZ,
400 KHZ” !Returns the ORFS due to switching (maximum) measurement results
         !at the 200 kHz and 400 kHz offsets only, assuming these offsets are
         !turned on
```

FETCh:ORFSpectrum:SWITChing:FREQuency[:OFFSet]:AVERage?

Function	Queries the ORFS due to switching measurement, allowing frequency offset values to be appended to the command. Returns ORFS due to switching (average) measurements at the frequencies listed, in the order they are listed. Frequencies must have a one-to-one correspondence to ORFS due to switching frequency offsets that are currently turned on. Frequencies must be separated by commas. (See “SETup:ORFSpectrum:SWITching:FREQuency[:OFFSet]” for the command that turns on frequency offsets.) Each value is (optionally) followed by: HZ | KHZ | MHZ | GHZ . The default units are HZ (hertz).
Query	Range: –100 dB to +100 dB and 9.91 E+37 Resolution: 0.01 dB

Programming Example

```
OUTPUT 714;”FETCH:ORFSPECTRUM:SWITCHING:FREQUENCY:OFFSET:AVERAGE? 200 KHZ,
400 KHZ” !Returns the ORFS due to switching (average) measurement results at the
         !200 kHz and 400 kHz offsets only, assuming these offsets are turned on.
```

FETCh:ORFSpectrum:SWITChing:FREQuency[:OFFSet]:SDEViation?

Function	Queries the ORFS due to switching measurement, allowing frequency offset values to be appended to the command. Returns ORFS due to switching (standard deviation) measurements at the frequencies listed, in the order they are listed. Frequencies must have a one-to-one correspondence to ORFS due to switching frequency offsets that are currently turned on. Frequencies must be separated by commas. (See “SETup:ORFSpectrum:SWITching:FREQuency[:OFFSet]” for the command that turns on frequency offsets.) Each value is (optionally) followed by: HZ | KHZ | MHZ | GHZ . The default units are HZ (hertz).
Query	Range: 0 dB to +150 dB and 9.91 E+37 Resolution: 0.001 dB

Programming Example

```
OUTPUT 714;"FETCH:ORFSPECTRUM:SWITCHING:FREQUENCY:OFFSET:STDEVIATION? 200 KHZ, 400 KHZ"
!Returns the ORFS due to switching (standard deviation) measurement
         !results at the 200 kHz and 400 kHz offsets only, assuming these
         !offsets are turned on.
```

FETCh:ORFSpectrum:SWITChing[:ALL]:SDEViation?

Function	Queries output RF spectrum due to switching (standard deviation) measurement results at all frequency offsets currently turned on (there can be up to eight). The “SETup:ORFSpectrum:SWITching:FREQuency[:OFFSet]” command sets up the number of output RF spectrum due to switching offsets that are turned on and their frequency values. The “SETup:ORFSpectrum:SWITching:FREQuency:POINts?” queries the number of output RF spectrum due to switching points that are turned on, indicating the number of output RF spectrum due to switching values to expect when you FETCh results.
Query	Range: –100 dBm to +100 dBm and 9.91 E+37 Resolution: 0.01 dB

Programming Example

```
OUTPUT 714;"FETCH:ORFSPECTRUM:SWITCHING:ALL:SDEVIATION?"  !Returns the ORFS due
                                                          !to switching
                                                          !(standard
                                                          !deviation)
                                                          !measurement
                                                          !results at all
                                                          !frequency offsets
                                                          !currently turned on.
```

FETCh:PFERror

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```
FETCh :PFERror
    [:ALL]? (returns Integrity,Max rms Phase Error,Max Peak Phase Error,Worst Freq Error)
    :FERRor
        [:WORSt]? (returns Worst Freq Error)
        :ALL? (returns Min Freq Error,Max Freq Error,Avg Freq Error,Worst Freq Error)
        :AVERage? (returns Avg Freq Error)
        :MAXimum? (returns Max Freq Error)
        :MINimum? (returns Min Freq Error)
    :ICOunt? (returns Intermediate Count)
    :INTegrity? (returns Integrity)

FETCh :PFERror
    :PEAK
        [:MAXimum]? (returns Max Peak Phase Error)
        :ALL? (returns Min Peak Phase Error,Max Peak Phase Error,Avg Peak Phase Error)
        :AVERage? (returns Avg Peak Phase Error)
        :MINimum? (returns Min Peak Phase Error)
    :RMS
        [:MAXimum]? (returns Max rms Phase Error)
        :ALL? (returns Min rms Phase Error,Max rms Phase Error, Avg rms Phase Error)
        :AVERage? (returns Avg rms Phase Error)
        :MINimum? (returns Min rms Phase Error)
```

"Diagram Conventions" on page 207

FETCh:PFERor[:ALL]?

Function	Queries integrity indicator, maximum rms phase error, maximum peak phase error and worst frequency error.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Maximum rms Phase Error • Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) • Resolution: 0.01 degrees Maximum Peak Phase Error • Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) • Resolution: 0.01 degrees Worst Frequency Error • Range: –750 kHz to +750 kHz and 9.91 E+37 (NAN) • Resolution: 0.1 kHz

Programming Example

```
OUTPUT 714;"FETCH:PFERROR:ALL?" !Returns integrity, maximum rms phase error,
                                !maximum peak phase error and worst
                                !frequency error.
```

FETCh:PFERror:FERRor[:WORSt]?

Function	Queries the frequency error from the individual multi-measurements that is furthest from 0 Hz. If the most positive and the most negative frequency errors are the same, the positive value will be returned.
Query	Range: –750 kHz to +750 kHz and 9.91 E+37 (NAN) Resolution: 0.1 kHz

FETCh:PFERror:FERRor:ALL?

Function	Queries minimum, maximum, average, and worst frequency error, in Hz. The minimum frequency error is the value closest to negative infinity from the last multi-measurement cycle. The maximum frequency error is the value closest to positive infinity from the last multi-measurement cycle.
Query	Minimum Frequency Error • Range: –750 kHz to +750 kHz and 9.91 E+37 (NAN) • Resolution: 0.1 kHz Maximum Frequency Error • Range: –750 kHz to +750 kHz and 9.91 E+37 (NAN) • Resolution: 0.1 kHz Average Frequency Error • Range: –750 kHz to +750 kHz and 9.91 E+37 (NAN) • Resolution: 0.1 kHz Worst Frequency Error • Range: –750 kHz to +750 kHz and 9.91 E+37 (NAN) • Resolution: 0.1 kHz

Programming Example

```
OUTPUT 714;"FETCH:PFERROR:FERROR:ALL?" !Returns minimum, maximum, average and
                                       !worst frequency error results.
```

FETCh:PFERror:FERRor AVERage?

Function	Queries the single or average (from a multi-measurement) frequency error measurement result, in Hz.
Query	Range: –750 kHz to +750 kHz and 9.91 E+37 (NAN) Resolution: 0.1 kHz

FETCh:PFERror:FERRor: MAXimum?

Function	Queries the maximum (from a multi-measurement) frequency error measurement result, in Hz.
Query	Range: –750 kHz to +750 kHz and 9.91 E+37 (NAN) Resolution: 0.1 kHz

FETCh:PFERror:FERRor:MINimum?

Function	Queries the minimum (from a multi-measurement) frequency error measurement result, in Hz.
Query	Range: –750 kHz to +750 kHz and 9.91 E+37 (NAN) Resolution: 0.1 kHz

FETCh:PFERror:ICOunt?

Function	Queries the intermediate count of phase and frequency multi-measurements completed. This number will increase to the value returned by “SETup:PFERror:COUNt:NUMBer” on page 417.
Query	Range: 0 to 999 Resolution: 1

FETCh:PFERror:INTegrity?

Function	Queries the integrity indicator for the phase and frequency error measurement. Zero indicates a normal result. See “Integrity Indicator” on page 126 for descriptions of non-zero integrity indicators.
Query	Range: 0 to 16 Resolution: 1

FETCh:PFERror:PEAK[:MAXimum]?

Function	Queries the maximum (from a multi-measurement) peak phase error result, in degrees.
Query	Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) Resolution: 0.01 degrees

FETCh:PFERror:PEAK:ALL?

Function	Queries the minimum, maximum, and average peak phase error measurement result, in degrees.
Query	Minimum Peak Phase Error • Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) • Resolution: 0.01 degrees Maximum Peak Phase Error • Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) • Resolution: 0.01 degrees Average Peak Phase Error • Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) • Resolution: 0.01 degrees
Programming Example `OUTPUT 714;"FETCH:PFERROR:PEAK:ALL?" !Returns minimum, maximum, and average peak phase error results.`	

FETCh:PFERror:PEAK:AVERage?

Function	Queries the single or average (from a multi-measurement) peak phase error measurement result, in degrees.
Query	Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) Resolution: 0.01 degrees

FETCh:PFERror:PEAK:MINimun?

Function	Queries the minimum (from a multi-measurement) peak phase error measurement result, in degrees.
Query	Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) Resolution: 0.01 degrees

FETCh:PFERror:rms[:MAXimum]?

Function	Queries the Maximum (from a multi-measurement) rms phase error measurement result, in degrees.
Query	Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) Resolution: 0.01 degrees
Programming Example `OUTPUT 714;"FETCH:PFERROR:rms:MAXIMUM?" !Returns the maximum rms phase error.`	

FETCh:PFERror:rms:ALL?

Function	Queries the minimum, maximum, and average rms phase error measurement result, in degrees.
Query	Minimum rms Phase Error • Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) • Resolution: 0.01 degrees Maximum rms Phase Error • Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) • Resolution: 0.01 degrees Average rms Phase Error • Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) • Resolution: 0.01 degrees

Programming Example
`OUTPUT 714;"FETCH:PFERROR:rms:ALL?" !Returns minimum, maximum, and average`
`!rms phase error.`	

FETCh:PFERror:rms:AVERage?

Function	Queries the single or average (from a multi-measurement) rms phase error measurement result, in degrees.
Query	Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) Resolution: 0.01 degrees

FETCh:PFERror:rms:MINimum?

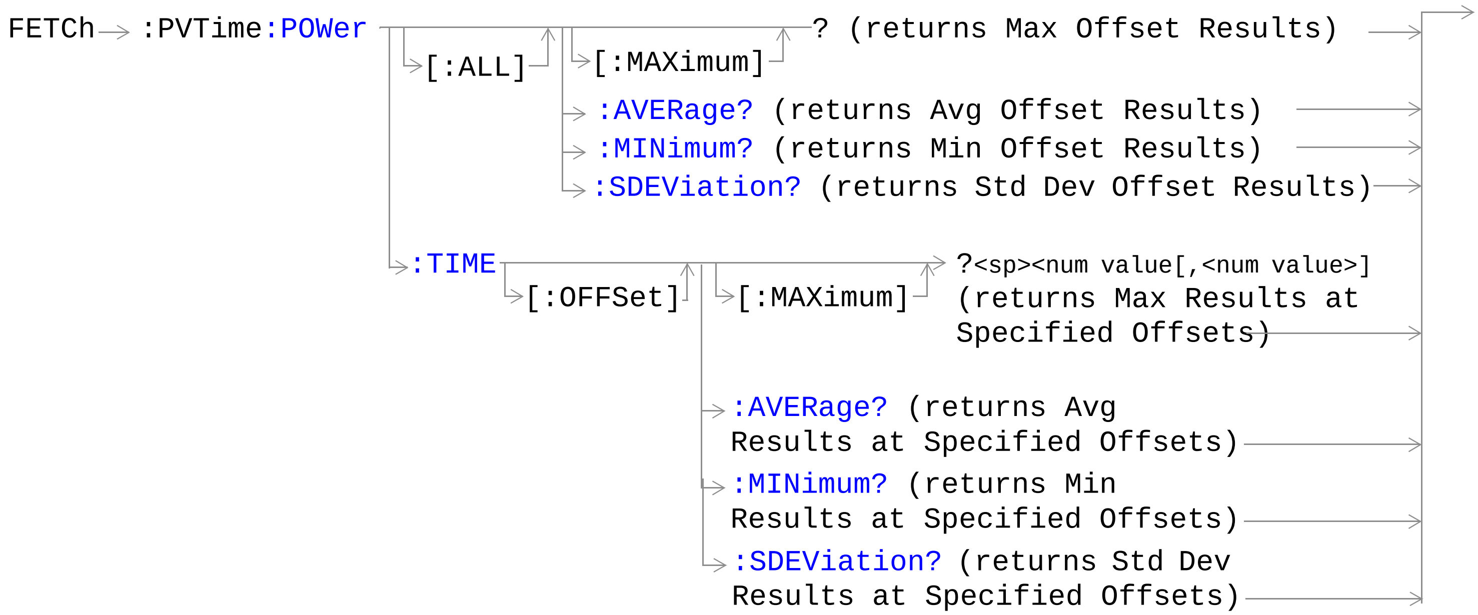
Function	Queries the minimum (from a multi-measurement) rms phase error measurement result, in degrees.
Query	Range: 0 degrees to 180 degrees and 9.91 E+37 (NAN) Resolution: 0.01 degrees

FETCh:PVTime

December 1, 1999

```
FETCh :PVTime ? (returns Integrity,Mask Pass/Fail,Avg TX
              Power,Max Offset Results)
      [:ALL]
      :ICOunt? (returns Intermediate Count)
      :INTegrity? (returns Integrity)
  :TXPower ? (returns Avg TX Power)
      [:AVERage]
      :ALL? (returns Min TX Power,Max TX
      Power,Avg TX Power,Std Dev TX Power)
      :MAXimum? (returns Max TX Power)
      :MINimum? (returns Min TX Power)
      :SDEViation? (returns Std Dev TX Power)

FETCh :PVTime:MASK ? (returns Mask Pass/Fail)
      [:FAIL]
      :ALL? (returns Mask Pass/Fail,Mask Upper
      Margin,Mask Upper Margin Time,
      Mask Lower Margin,Mask Lower Margin Time)
      :LOWer ? (returns Mask Lower
             Margin)
          [:MARGin]
          :TIME? (returns Mask Lower Margin Time)
      :UPPer ? (returns Mask Upper
             Margin)
          [:MARGin]
          :TIME? (returns Mask Upper Margin Time)
```



"Diagram Conventions" on page 207

FETCh:PVTime[:ALL]?

Function	Queries integrity indicator, mask pass/fail indicator, power versus time (PvT) transmit power (average), and PvT power (maximum) at up to 12 time offsets. The number of PvT measurement offsets that will be returned can be queried using the "SETup:PVTime:TIME:POINts?" on page 424. The time offsets are set up using the command "SETup:PVTime:TIME[:OFFSet]" on page 423.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Power versus time mask pass/fail • Range: 0 (pass) or 1 (fail) and 9.91 E+37 (NAN) Power versus time TX carrier power • Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dB Power versus time power (maximum) • Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dB

FETCh:PVTime:TXPower:ALL?

Function	Queries power versus time carrier power (average), power versus time carrier power (minimum), power versus time carrier power (maximum), and power versus time carrier power (standard deviation).
Query	Power versus time carrier power (average) • Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dB Power versus time carrier power (minimum) • Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dB Power versus time carrier power (maximum) • Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dB Power versus time carrier power (standard deviation) • Range: 0 dB to 100 dB and 9.91 E+37 (NAN) • Resolution: 0.001 dB

FETCh:PVTime:TXPower:MINimum?

Function	Queries power versus time carrier power (minimum).
Query	Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:PVTime:TXPower:MAXimum?

Function	Queries power versus time carrier power (maximum).
Query	Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:PVTime:TXPower[:AVERage]?

Function	Queries power versus time carrier power (average).
Query	Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:PVTime:TXPower:SDEViation?

Function	Queries power versus time carrier power (standard deviation).
Query	Range: 0 dB to 100 dB and 9.91 E+37 (9.91 E+37 (NAN)) Resolution: 0.001 dB

FETCh:PVTime:MASK:ALL?

Function	Queries the power versus time measurement mask pass/fail indicator and the following worst case margins: • Upper limit margin time • Upper limit margin result • Lower limit margin time • Lower limit margin result Margin time is the point in time, relative to burst bit 0, that corresponds with the worst case measurement result (the measurement with the least difference between measured power and the power level boundary specified by the power versus time mask). See the “Typical GSM PvT Measurement” on page 93. Margin result is the difference between the measured power and the power level boundary specified by the power versus time mask. See the “Typical GSM PvT Measurement” on page 93.

Query	Power versus time mask pass/fail • Range: 0 (pass) or 1 (fail) and 9.91 E+37 (NAN) Power versus time upper limit margin time worst case result • Range: –50 µs to 593 µs and 9.91 E+37 (NAN) • Resolution: 1 ns Power versus time upper limit margin worst case result: • Range: –100 dB to 0 dB and 9.91 E+37 (NAN) • Resolution: 0.01 dB Power versus time lower limit margin time worst case result • Range: –50 µs to 593 µs and 9.91 E+37 (NAN) • Resolution: 1 ns Power versus time lower limit margin worst case result • Range: –100 dB to 0 dB and 9.91 E+37 (NAN) • Resolution: 0.01 dB

FETCh:PVTime:MASK[:FAIL]?

Function	Queries power versus time measurement mask pass/fail indicator.
Query	Range: 0 (pass) or 1 (fail) and 9.91 E+37 (NAN)

FETCh:PVTime:MASK:UPPer[:MARGin]?

Function	Queries the power versus time measurement upper limit margin worst case result. The upper limit margin, worst case result is the power versus time measurement with the least difference between measured power and the power level boundary specified by the power versus time mask. See the “Typical GSM PvT Measurement” on page 93.
Query	Range: –100 dB to 0 dB and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:PVTime:MASK:UPPer:TIME?

Function	Queries the power versus time measurement’s upper limit margin time, worst case result. The upper limit margin time result is the point in time, relative to bit 0 in the GSM burst, that corresponds with the worst case measurement result (the measurement with the least difference between measured power and the upper power level boundary specified by the power versus time mask). See the “Typical GSM PvT Measurement” on page 93.
Query	Range: –50 µs to 593 µs and 9.91 E+37 (NAN) Resolution: 1 ns

FETCh:PVTime:MASK:LOWer[:MARGin]?

Function	Queries the power versus time measurement’s lower limit margin, worst case result. The lower limit margin, worst case result is the power versus time measurement with the least difference between measured power and the lower power level boundary specified by the power versus time mask. See the “Typical GSM PvT Measurement” on page 93.
Query	Range: –100 dB to 0 dB and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:PVTime:MASK:LOWer:TIME?

Function	Queries the power versus time measurement's lower limit margin time, worst case result. The lower limit margin time result is the point in time, relative to bit 0 in the GSM burst, that corresponds with the worst case measurement (the measurement with the least difference between measured power and the lower power level boundary specified by the power versus time mask). See the "Typical GSM PvT Measurement" on page 93.
Query	Range: –50 µs to 593 µs and 9.91 E+37 (NAN) Resolution: 1 ns

FETCh:PVTime:POWer[:ALL]:MINimum?

Function	Queries the minimum power levels, from a number of multi-measurements, at each user-settable time offset that is currently turned on. Power levels are relative to the power versus time carrier power measurement. The "SETup:PVTime:TIME[:OFFSet]" command sets up the number of offsets that are turned on and their time values. The "SETup:PVTime:TIME:POINts?" queries the number of offset points that are turned on, indicating the number of values to expect when you send this command.
Query	Range: –100 dBc to +10 dBc and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:PVTime:POWer[:ALL][:MAXimum]?

Function	Queries the maximum power levels, from a number of multi-measurements, at each user-settable time offset that is currently turned on. Power levels are relative to the power versus time carrier power measurement. The "SETup:PVTime:TIME[:OFFSet]" command sets up the number of offsets that are turned on and their time values. The "SETup:PVTime:TIME:POINts?" queries the number of offset points that are turned on, indicating the number of values to expect when you send this command.
Query	Range: –100 dBc to +10 dBc and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:PVTime:POWer[:ALL]:AVERage?

Function	Queries the average power levels, from a number of multi-measurements, at each user-settable time offset that is currently turned on. Results are relative to the power versus time carrier power measurement. The “SETup:PVTime:TIME[:OFFSet]” command sets up the number of offsets that are turned on and their time values. The “SETup:PVTime:TIME:POINts?” queries the number of offset points that are turned on, indicating the number of values to expect when you send this command.
Query	Range: –100 dBc to +10 dBc and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:PVTime:POWer[:ALL]:SDEViation?

Function	Queries the standard deviation, from a number of multi-measurements, at each user-settable time offset that is currently turned on. The “SETup:PVTime:TIME[:OFFSet]” command sets up the number of offsets that are turned on and their time values. The “SETup:PVTime:TIME:POINts?” queries the number of offset points that are turned on, indicating the number of values to expect when you send this command.
Query	Range: 0 dBc to +100 dBc and 9.91 E+37 (NAN) Resolution: 0.001 dB

FETCh:PVTime:POWer:TIME[OFFSet]:MINimum?

Function	Queries the minimum power levels, from a number of multi-measurements, at each user-settable time offset appended to this command. Specified time values must correspond to user-settable time offsets that are currently turned on, and must be rounded to the same values. (9.91 E+37 (NAN) will be returned for specified offsets that do not correspond to offsets currently turned on). Power levels are relative to the power versus time carrier power measurement. The "SETup:PVTime:TIME[:OFFSet]" command sets up the number of offsets that are turned on and their time values. Measurements will be returned by this query in the same order they are listed in the command.
Query	Power levels: • Range: –100 dBc to +10 dBc and 9.91 E+37 (NAN) • Resolution: 0.01 dB Time offsets: • Range: Up to 12 time offset values, corresponding to entries in the Power vs Time table of user-defined time offsets currently turned on. The default units are s (seconds). • Resolution: Rounded to the same value as displayed in the Power vs Time table and returned by the "SETup:PVTime:TIME[:OFFSet]" query.

Programming Example

```
OUTPUT 714;"FETCH:PVTIME:POWER:TIME:OFFSET:MINIMUM? 0 US, 570.8 US"
!Returns the !minimum of power versus time measurements at the 0.0 ms and
!570.8 ms offsets.
```

FETCh:PVTime:POWer:TIME[:OFFSet][:MAXimum]?

Function	Queries the maximum power levels, from a number of multi-measurements, at each user-settable time offset appended to this command. Specified time values must correspond to user-settable time offsets that are currently turned on, and must be rounded to the same values. (9.91 E+37 (NAN) will be returned for specified offsets that do not correspond to offsets currently turned on). Power levels are relative to the power versus time carrier power measurement. The “SETup:PVTime:TIME[:OFFSet]” command sets up the number of offsets that are turned on and their time values. Measurements will be returned by this query in the same order they are listed in the command.
Query	Power levels: • Range: –100 dBc to +10 dBc and 9.91 E+37 (NAN) Resolution: 0.01 dB Time offsets: • Range: Up to 12 time offset values, corresponding to entries in the Power vs Time table of user-defined time offsets currently turned on. The default units are s (seconds). • Resolution: Rounded to the same value as displayed in the Power vs Time table and returned by the “SETup:PVTime:TIME[:OFFSet]” query.

Programming Example

```
OUTPUT 714;"FETCH:PVTIME:POWER:TIME:OFFSET:MAXIMUM? 0 US, 570.8 US"
!Returns the maximum of power versus time measurements at the 0.0 ms
!and 570.8 ms offsets.
```

FETCh:PVTime:POWer:TIME[:OFFSet]:AVERage?

Function	Queries the average power levels, from a number of multi-measurements, at each user-settable time offset appended to this command. Specified time values must correspond to user-settable time offsets that are currently turned on, and must be rounded to the same values. (9.91 E+37 (NAN) will be returned for specified offsets that do not correspond to offsets currently turned on). Power levels are relative to the power versus time carrier power measurement. The "SETup:PVTime:TIME[:OFFSet]" command sets up the number of offsets that are turned on and their time values. Measurements will be returned by this query in the same order they are listed in the command.
Query	Power levels: • Range: –100 dBc to +10 dBc and 9.91 E+37 (NAN) Resolution: 0.01 dB Time offsets: • Range: Up to 12 time offset values, corresponding to entries in the Power vs Time table of user-defined time offsets currently turned on. The default units are s (seconds). • Resolution: Rounded to the same value as displayed in the Power vs Time table and returned by the "SETup:PVTime:TIME[:OFFSet]" query.

Programming Example

```
OUTPUT 714;"FETCH:PVTIME:POWER:TIME:OFFSET:AVERAGE? 0 US, 570.8 US"
!Returns the average of power versus time measurements at the
!0.0 ms and 570.8 ms offsets.
```

FETCh:PVTime:POWer:TIME[:OFFSet]:SDEViation?

Function	Queries the standard deviation, from a number of multi-measurements, at each user-settable time offset appended to this command. Specified time values must correspond to user-settable time offsets that are currently turned on, and must be rounded to the same values. (9.91 E+37 (NAN) will be returned for specified offsets that do not correspond to offsets currently turned on). Power levels are relative to the power versus time carrier power measurement. The "SETup:PVTime:TIME[:OFFSet]" command sets up the number of offsets that are turned on and their time values. Measurements will be returned by this query in the same order they are listed in the command.
Query	Power levels: • Range: 0 dBc to +100 dBc and 9.91 E+37 (NAN) • Resolution: 0.001 dB Time offsets: • Range: Up to 12 time offset values, corresponding to entries in the Power vs Time table of user-defined time offsets currently turned on. The default units are s (seconds). • Resolution: Rounded to the same value as displayed in the Power vs Time table and returned by the "SETup:PVTime:TIME[:OFFSet]" query.

Programming Example

```
OUTPUT 714;"FETCH:PVTIME:POWER:TIME:OFFSET:SDEVIATION? 0 US, 570.8 US"
!Returns the standard deviation of power versus time measurements
at the 0.0 ms and 570.8 ms offsets.
```

FETCh:PVTime:ICOunt?

Function	Queries the intermediate count of power versus time multi-measurements completed.
Query	Range: 0 to 999 Resolution: 1

FETCh:PVTime:INTegrity?

Function	Queries the integrity indicator for the power versus time measurement. Zero indicates a normal result. See "Integrity Indicator" on page 126 for descriptions of non-zero integrity indicators.
Query	Range: 0 to 16 Resolution: 1

FETCh:TXPower

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```
FETCh :TXPower ──┬─────────────────────► ? (returns Integrity,Avg TX Power)
                 │ └► [:ALL] ┘
                 ├► :ICOunt? (returns Intermediate Count)
                 ├► :INTegrity? (returns Integrity)
                 └► :POWer ──┬──────────────► ? (returns Avg TX Power)
                             │ └► [:AVERage] ┘
                             ├► :ALL? (returns Min TX Power,Max TX
                             │  Power,Avg TX Power,Std Dev TX Power)
                             ├► :MAXimum? (returns Max TX Power)
                             ├► :MINimum? (returns Min TX Power)
                             └► :SDEViation? (returns Std Dev TX Power)
```

"Diagram Conventions" on page 207

FETCh:TXPower[:ALL]?

Function	Queries integrity indicator and average transmit power. A value of zero for the integrity indicator is normal. See “Integrity Indicator” on page 126 for non-zero integrity indicators.
Query	Integrity: • Range: 0 to 16 • Resolution: 1 Transmit power: • Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dB

FETCh:TXPower:ICOunt?

Function	Queries the intermediate count of transmit power measurements completed.
Query	Range: 1 to 999 Resolution: 1

FETCh:TXPower:INTegrity?

Function	Queries the integrity indicator. Zero indicates normal. For non-zero integrity indicators, refer to “Integrity Indicator” on page 126
Query	Range: 0 to 16 Resolution: 1

FETCh:TXPower:POWer[:AVERage]?

Function	Queries average transmit power.
Query	Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:TXPower:POWer:ALL?

Function	Queries average, minimum, maximum and standard deviation of transmit power multi-measurement results.
Query	Average: • Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dB Minimum: • Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dB Maximum: • Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dB Standard deviation: • Range: 0 dB to 100 dB and 9.91 E+37 (NAN) • Resolution: 0.001 dB

FETCh:TXPower:POWer:MAXimum?

Function	Queries maximum transmit power results from a multi-measurement.
Query	Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:TXPower:MINimum?

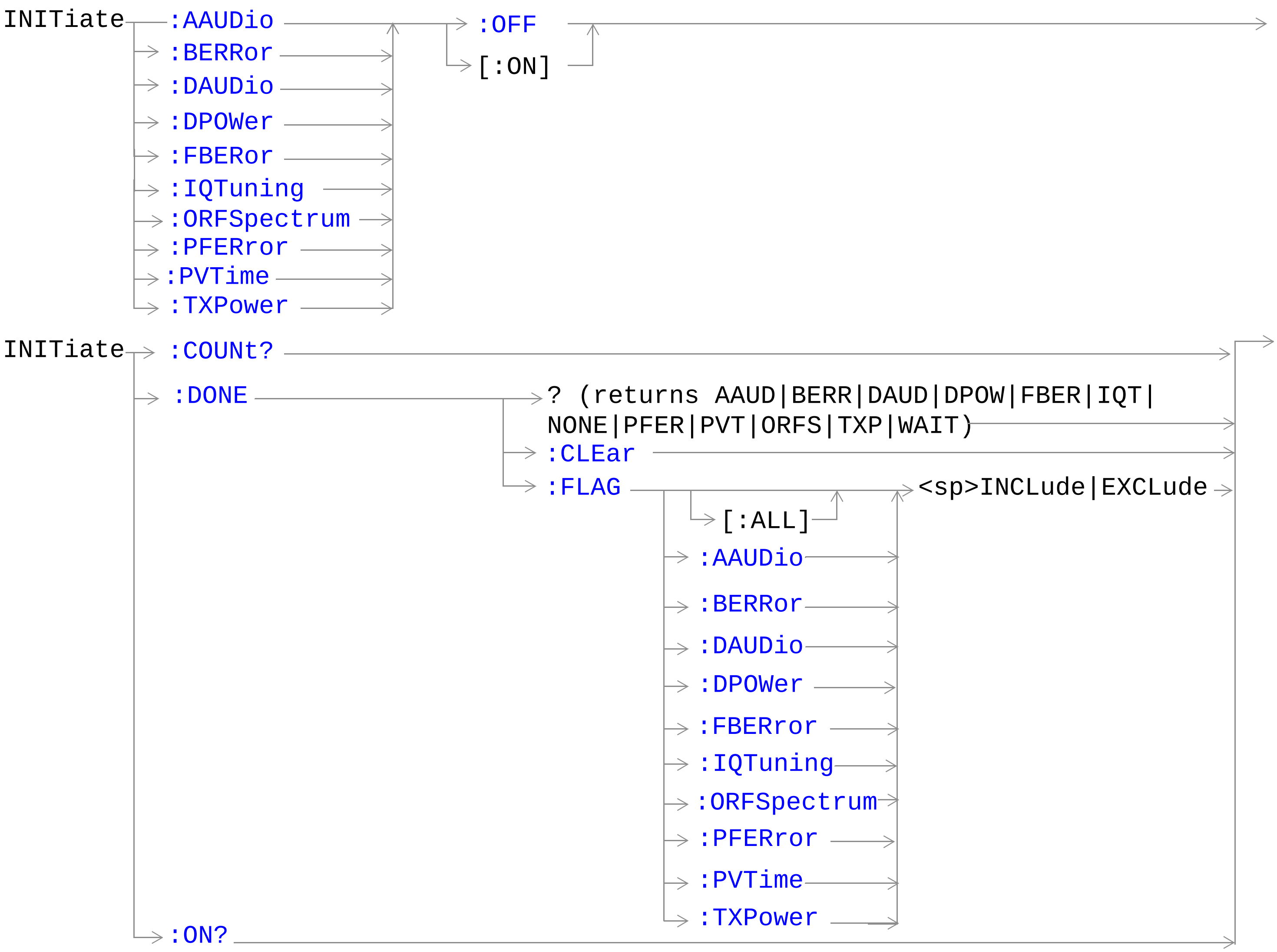
Function	Queries minimum transmit power results from a multi-measurement.
Query	Range: –100 dBm to 100 dBm and 9.91 E+37 (NAN) Resolution: 0.01 dB

FETCh:TXPower:SDEViation?

Function	Queries the standard deviation from a transmit power multi-measurement.
Query	Range: 0 dB to 100 dB and 9.91 E+37 (NAN) Resolution: 0.001 dB

INITiate

December 1, 1999



"Diagram Conventions" on page 207

INITiate:<measurement mnemonic>[:ON]

Function	Starts measurements with the test set. The INITiate command is associated with the SETup command, and the FETCh? command, see “SETup Subsystem” on page 395 and “FETCh? Subsystem” on page 289. One or more measurements may be initiated on the same program line. See “Concurrent Measurements” on page 124. This command is also used to activate a measurement. See “INITiate Programming Examples (how INIT commands are used)” on page 349.

Programming Example

```
OUTPUT 714;”INITIATE:TXPOWER:ON” !Initiates a TX Power measurement.
OUTPUT 714;”INITIATE:TXPOWER;PFERROR:ON” !Initiates TX Power and
!phase and frequency error measurements.
OUTPUT 714;”INITIATE:PVTIME;ORFSPECTRUM;FBERROR:ON” !Initiates power
!versus time output RF spectrum, and fast bit error rate measurements.
```

INITiate:<measurement mnemonic>:OFF

Function	Deactivates the selected measurement. See “Measurement States” on page 147. Only one measurement can be deactivated at a time, to stop one or more measurements and leave them in the active state, see “ABORt” on page 210.

Programming Example

```
OUTPUT 714;”INITIATE:TXPOWER:OFF” !Deactivates TX power measurement.
```

INITiate:COUNt?

Function	Queries the number of measurements that have been initiated (that are activate). See “Measurement States” on page 147.
Query	Range: 0 to 10 Resolution: 1

INITiate:DONE?

Function	Queries (one at a time) which measurements if any are available or have timed out. See"Measurement Event Synchronization" on page 133 for how to use this command. See "Measurement States" on page 147 to understand the test set's measurement states. See "INITiate:DONE:FLAG<measurement mnemonic>" on page 347 for include or exclude commands
Query	Range: NONE | TXP | PVT | PFER | ORFS | AAUD | DAUD | DPOW | FBER | BERR | IQT | WAIT

INITiate:DONE:CLEar

Function	Clears the done flag from all measurements. See"INITiate:DONE?" on page 346.
Programming Example	

```
OUTPUT 714;"INITIATE:DONE:CLEAR" !clears done flag.
```

INITiate:DONE:FLAG[:ALL]

Function	Specifies that all measurements are considered, (included or excluded) when the DONE? query is sent. If a measurements trigger arm, see "Trigger Arm (Single or Continuous) Description" on page 147, has been left in continuous mode, the done flag for that measurement will toggle between DONE and WAIT, see "INITiate:DONE?" on page 133. The INITiate:DONE? query will probably not be able to catch the measurement at the instant it is done, therefore the measurement will never appear to be done. If a measurement trigger arm must be left in continuous mode the user should (exclude) it, using this command, from the INITiate:DONE? query results. Once the INITiate:DONE:FLAG has been set to EXCLude for a measurement, the user must send the INCLude command for that measurement in oder to query that measurement with, the INITiate:DONE? query. The test set will not reset any (excluded measurement) to be an (included measurement) with any form of preset, see "Preset Descriptions" on page 513.
Setting	Range • INCLude: include all measurements • EXCLude: exclude all measurements
Programming Example	

```
OUTPUT 714;"INITIATE:DONE:FLAG:ALL EXCLUDE" !Excludes all measurements from
                                            !contributing the INITIATE:DONE?
                                            !query, see "INITiate:DONE?" on
                                            !page 6.
```

INITiate:DONE:FLAG<measurement mnemonic>

Function	Specifies which measurements are considered, (included or excluded) when the DONE? query is sent. If a measurements trigger arm, see “Trigger Arm (Single or Continuous) Description” on page 147, has been left in continuous mode, the done flag for that measurement will toggle between DONE and WAIT, see “INITiate:DONE?” on page 133. The INITiate:DONE? query will probably not be able to catch the measurement at the instant it is done, therefore the measurement will never appear to be done. If a measurement trigger arm must be left in continuous mode the user should (exclude) it, using this command, from the INITiate:DONE? query results. Once the INITiate:DONE:FLAG has been set to EXCLude for a measurement, the user must send the INCLude command for that measurement in order to query that measurement with, the INITiate:DONE? query. The test set will not reset any (excluded measurement) to be an (included measurement) with any form of preset, see “Preset Descriptions” on page 513.
Setting	Range • INCLude :AAUDio | :BERRor | :DAUDio | :DPOWer | :FBERror | :IQTuning | :ORFSpectrum | :PFERror | :PVTime |:TXPower • EXCLude :AAUDio | :BERRor | :DAUDio | :DPOWer | :FBERror | :IQTuning | :ORFSpectrum | :PFERror | :PVTime |:TXPower
Related Topics	“INITiate:DONE?” .

Programming Example

```
OUTPUT 714;”INITIATE:DONE:FLAG:AAUDIO EXCLUDE” !excludes AAUDIO measurements
                                             !from contributing the
                                             !INIATIATE:DONE? query.
```

INITiate:ON?

Function	Queries the names of the measurements (none, one, or more than one) that are ON in a comma separated list of measurement mnemonics. See “INITiate:<measurement mnemonic>[:ON]” on page 345.
Query	Range: AAUD | BERR | DAUD | DPOW | FBER | IQT | ORFS | PFER | PVT | TXP | NONE

Display Brightness

Description

This parameter allows the user to adjust the brightness of the test set's display. The test set's display screen has two brightness settings:

- medium brightness
- high brightness

Example

```
OUTPUT 714;"DISPLAY:BRIGHTNESS MEDIUM" ! sets screen brightness to medium.
```

Related Topics

****

"DISPlay:BRIGhtness" on page 286

****

INITiate Subsystem

Syntax Diagrams and Command Descriptions

"INITiate" on page 344

Description

INITiate Command Functions

The INITiate subsystem is used to:

- Start (activate) individual or multiple (concurrent) measurements.
- Turn individual measurements off.
- Determine the number of measurements currently active (INIT:COUNT?).
- Determine the names of the measurements currently active (INIT:ON?).
- Determine which measurements are finished (INIT:DONE?).

What Happens When a Measurement is INITiated?

When a measurement is started using INITiate commands, a new measurement cycle is started. If the selected measurement is currently in a measurement cycle, it is aborted. Also, if a timeout is specified, the timeout period is begun.

NOTE The INITiate subsystem is derived from SCPI, but has some modifications to make it more compatible with the manual operation of the test set. Most notably, the choice of single or continuous measurement triggering is made using the SETup subsystem.

INITiate Programming Examples (how INIT commands are used)

The INITiate command is used to start measurements. INITiate commands allow multiple measurements to be started without waiting for other measurement processes to complete. For example, the following code starts the Transmit Power and PFER measurements, and then uses the INITiate:DONE? command in a loop to query the status of these measurements, see "Measurement Event Synchronization" on page 133.

When the measurements are done, the FETCh command is used to acquire the results, and the results are entered into variables in the controlling application. The program ends when the INITiate:DONE? command returns the string "NONE" indicating that all initiated measurements have gone through the measuring state see "Measurement States" on page 147.

NOTE Trigger arming for each measurement is controlled in the SETup subsystem. The choices are single or continuous. The best practice (during remote operation) is to use single measurement mode. This simplifies the tasks of starting concurrent measurements, then using the INIT subsystem commands to determine which measurements are ready to be FETChed.

```
10 OUTPUT 714;"SETup:ALL:CONTinuous:OFF" ! selects single measurement mode
20 OUTPUT 714;"INITiate:TXPower;PFERror" ! starts TX power/phase frequency error measurement
30 LOOP
40 OUTPUT 714;"INITiate:DONE?" !query to find out if any measurements are done
50 ENTER 714;Meas_complete$
60 SELECT Meas_complete$
70 CASE "TXP" !tests for the string "TXP" which would indicate TX power measurement is done
80 OUTPUT 714;"FETCh:TXPower:POWer?" !Queries average TX power measurement
90 ENTER 714;Avg_tx_power
100 CASE "PFER"!tests for the string "PFER" which would indicate phase/frequency error measurement is done
110 OUTPUT 714;"FETCh:PFERror:RMS?" !Queries PFER maximum phase error measurement
120 ENTER 714;Max_phs_error
130 END SELECT
140 EXIT IF Meas_complete$ = "NONE"
150 END LOOP
160 END
```

INITiate commands should be sent only when the test set has finished performing any operations, such as handovers, that require settling. For example, the following code performs a handover to a new traffic channel using the :SEQ (sequential) appendage, then initiates a TX power measurement.

```
OUTPUT 714;"CALL:TCH:SEQ 65"
!Hands over traffic channel to channel 65, waits for process to complete before accepting next command

OUTPUT 714;"INITiate:TXPower"
!Initiates TX power measurement
```

READ

December 1, 1999

READ
- :AAUDio [:ALL] ? (returns Integrity, Avg Analog Audio Level)
- :BERRor [:ALL] ? (returns Integrity, Bits Tested, Bit Error Ratio, Bit Error Count)
  - FULL ? (returns Integrity, Bits Tested, Bit Error Ratio, Bit Error Count for all types)
- :DAUDio [:ALL] ? (returns Integrity,Avg Decoded Audio Level)
- :DPOWer [:ALL] ? (returns N Integrity indicators, N Avg TX Power levels (where N is the number of bursts measured))
- :FBERror [:ALL] ? (returns Integrity, Bits Tested, Bit Error Ratio, Fast Bit Error Count)

READ
- :IQTuning [:ALL] ? (returns Integrity, signal level relative to the desired signal at 9 different frequencies, plus the spur)
- :ORFSpectrum [:ALL] ? (returns Integrity,TX Power,Max Switching Offset Results,30 kHz BW Power,Avg Mod Offset Results)
- :PFERror [:ALL] ? (returns Integrity, Max RMS Phase Error,Max Peak Phase Error,Worst Freq Error)
- :PVTime [:ALL] ? (returns Integrity, Max Pass/Fail, Avg PvT TX Power,Max Offset Results)
- :TXPower [:ALL] ? (returns Integrity, Avg TX Power)

"Diagram Conventions" on page 207

READ:AAUDio[:ALL]?

Function	Queries (initiates and fetches) one analog audio measurement as a sequential operation. Returns Integrity Indicator, see “Integrity Indicator” on page 126 and analog audio (average). The FETCh command should be used to obtain other measurement results. See “FETCh:AAUDio” on page 290.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Analog audio (average) • Range: 0 to 20 volts • Resolution: 0.1mv

READ:BERRor[:ALL]?

Function	Queries (initiates and fetches) one RX bit error measurement as a sequential operation. Returns Integrity Indicator see “Integrity Indicator” on page 126, Bits Tested, Bit Error Ratio and Bit Error Count for the bit type set using the SETup:BERRor[:TYPE] command. (A similar query, “READ:BERRor:FULL?” on page 353, returns the same results but for all bit types simultaneously.) The FETCh command should be used to obtain other measurement results. See “FETCh:BERRor” on page 294.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Bits tested • Range: 0 to (<RX bits to test +131) and 9.91E+37 (NAN) • Resolution: 1 Bit error ratio • Range: 0 to 100 and 9.91E+37 (NAN) • Resolution: 1 Bit error count • Range: 0 to (<RX bits to test +131) and 9.91E+37 (NAN) • Resolution: 1

READ:BERRor:FULL?

Function	Queries (initiates and fetches) one RX bit error measurement as a sequential operation. Returns Integrity Indicator, see "Integrity Indicator" on page 126, Bits Tested, Bit Error Ratio and Bit Error Count for Type Ia, Type Ib and Type II. (A similar query, "READ:BERRor[:ALL]?" on page 352, returns the same results but only for the bit type previously set using the SETup:BERRor[:TYPE] command.) The FETCh command should be used to obtain other measurement results. See "FETCh:BERRor" on page 294.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Type Ia Bits tested • Range: 0 to 999000 and 9.91E+37 (NAN) • Resolution: 1 Type Ia Bit error ratio • Range: 0 to 100 and 9.91E+37 (NAN) • Resolution: 0.01 Type Ia Bit error count • Range: 0 to 999000 and 9.91E+37 (NAN) • Resolution: 1 Type Ib Bits tested • Range: 0 to 2637369 and 9.91E+37 (NAN) • Resolution: 1 Type Ib Bit error ratio • Range: 0 to 100 and 9.91E+37 (NAN) • Resolution: 0.01 Type Ib Bit error count • Range: 0 to 2637369 and 9.91E+37 (NAN) • Resolution: 1 Type II Bits tested • Range: 0 to 15584400 and 9.91E+37 (NAN) • Resolution: 1 Type II Bit error ratio • Range: 0 to 100 and 9.91E+37 (NAN) • Resolution: 0.01 Type II Bit error count • Range: 0 to 1558440 and 9.91E+37 (NAN) • Resolution: 1

READ:DAUDio[:ALL]?

Function	Queries (initiates and fetches) one decoded audio (uplink speech level) measurement as a sequential operation. Returns Integrity Indicator see “Integrity Indicator” on page 126 and decoded audio (average). The FETCh command should be used to obtain other measurement results. See “FETCh:DAUDio” on page 302.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Decoded audio (average) • Range: 0 to 100% FS (full scale) • Resolution: 0.01% FS

READ:DPOWer[:ALL]?

Function	Queries the Dynamic Power measurement results. Query returns N integrity indicators and N average TX power levels (where N is the number of bursts measured). To set the number of bursts you want to measure, use “SETup:DPOWer:COUNt:NUMBer” on page 397.
Query	Integrity indicators for each individual burst • Range: 0 to 16 • Resolution: 1 Average TX power levels for each individual burst • Range: -100 to +100 dBm and 9.91 E+37 (NAN) • Resolution: 0.01 dBm

READ:FBERror[:ALL]?

Function	Queries (initiates and fetches) one fast bit error measurement as a sequential operation. Returns Integrity Indicator see “Integrity Indicator” on page 126, Bits Tested, Bit Error Ratio, and Fast Bit Error Count using mobile station burst-by-burst looback (type C loopback). The FETCh command should be used to obtain other measurement results. See “FETCh:FBERror” on page 308.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Bits tested • Range: 0 to (RX Fast BER bits to test + 455) and 9.91E+37 (NAN) • Resolution: 1 Bit error ratio • Range: 0 to 100 and 9.91E+37 (NAN) • Resolution: 1 Fast bit error count • Range: 0 to (RX Fast BER bits to test + 455) and 9.91E+37 (NAN) • Resolution: 1

READ:IQTuning[:ALL]?

Function	Queries (initiates and fetches) the I/Q Tuning measurement results. Query returns the integrity indicator and the relative power level at the following offset frequencies: carrier frequency, ±67.7083 kHz, ±135.417 kHz, ±203.125 kHz, ±270.833 kHz. The spur measurement result is also returned. The FETCh command should be used to return other measurement results. See “FETCh:IQTuning” on page 311.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Signal level relative to the desired signal at 9 different frequencies • Range: -100 to +100 dB and 9.91 E+37 (NAN) • Resolution: 0.01 dB The order of the signal level results are: • -270.833 kHz • -203.125 kHz • -135.417 kHz • -67.7083 kHz • carrier frequency • +67.7083 kHz • +135.417 kHz • +203.125 kHz • +270.833 kHz Relative power of the spur frequency: • Range: -100 to +100 dB and 9.91E+37 (NAN) • Resolution: 0.01 dB

READ:ORFSpectrum[:ALL]?

Function	Queries (initiates and fetches) one output RF spectrum measurement as a sequential operation. Returns Integrity Indicator see “Integrity Indicator” on page 126, TX Power, Output RF Spectrum due to Switching (Max), 30 kHz Bandwidth Power, and Output RF Spectrum due to Modulation (Average). The FETCh command should be used to obtain other measurement results. See “FETCh:ORFSpectrum” on page 315.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 TX power • Range: –100 to +100 dBm and 9.91E+37 (NAN) • Resolution: 0.01 dB Output RFspectrum due to switching (Max) • Range: 0 to 8 comma separated values –100 to +100 dBm and 9.91E+37 (NAN) • Resolution: 0.01 dB 30 kHz bandwidth power • Range: –100 to +100 dBm and 9.91E+37 (NAN) • Resolution: 0.01 dB Output RF spectrum due to modulation (average) • Range: 0 to 22 comma separated values –200 to +100 dBm and 9.91E+37 (NAN) • Resolution: 0.01 dB

READ:PFERror[:ALL]?

Function	Queries (initiates and fetches) one Phase and Frequency Error measurement as a sequential operation. Returns Integrity Indicator see "Integrity Indicator" on page 126, RMS Phase Error (Max), Peak Phase Error(Max), Frequency Error (Worst). The FETCh command should be used to obtain other measurement results. See "FETCh:PFERror" on page 322. Worst frequency error (negative or positive) is the value furthest from zero.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 rms phase error (max) • Range: 0 to 180 degrees and 9.91E+37 (NAN) • Resolution: 0.01 dB Peak phase error (max) • Range: 0 to 180 degrees and 9.91E+37 (NAN) • Resolution: 0.01 degrees Frequency error (worst) • Range: –750 kHz to +750 kHz and 9.91E+37 (NAN) • Resolution: 0.01 Hz

READ:PVTime?

Function	Queries (initiates and fetches) one power versus time measurement as a sequential operation. Returns Integrity Indicator see “Integrity Indicator” on page 126, Mask pass/fail, power versus time transmit power and up to 12 power versus time offset (max) results. The FETCh command should be used to obtain other measurement results. See “FETCh:PVTime” on page 328.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Mask pass/fail • Range: 0 | 1 and 9.91E+37 (NAN) Power versus time transmit power • Range: –100 to +100 dBm and 9.91E+37 (NAN) • Resolution: 0.01 dB Power versus time offset (max) • Range: Up to 12 comma-separated power versus time values returned with max power = –100 dBc to +100 dBc (relative to power versus time carrier power) and 9.91E+37 (NAN) • Resolution: 0.01 dB

READ:TXPower[:ALL]?

Functions	Queries (initiates and fetches) one TX power measurement as a sequential operation. Returns Integrity Indicator see “Integrity Indicator” on page 126 and transmit power (average). The FETCh command should be used to obtain other measurement results. See “FETCh:TXPower” on page 340.
Query	Integrity indicator • Range: 0 to 16 • Resolution: 1 Transmit power (average) • Range: –100 to +100 dBm and 9.91E+37 (NAN) • Resolution: 0.01 dB

READ? Subsystem

Syntax Diagram and Command Descriptions

"READ"

Description

The READ? command provides a sequential method to make measurements and retrieve the results. READ? will hang the GPIB bus until the measurement is completed, or until the timeout value has been exceeded. Associated SETup commands (for each measurement) are used with the READ? command to retrieve desired measurement results in a sequential manner.

Sending a READ? command is equivalent to an INITiate/FETCh cycle for a measurement. A READ? command executes an abort action on that measurement followed by an INITiate and a FETCH?.

READ? commands can be mixed with FETCH? queries in order to make combinations of sequential and overlapped operations. One measurement can be issued a READ? command (sequential), and the next measurement can be issued INITiate/FETCh? commands (overlapped), if necessary.

The advantage of using the READ? commands to obtain measurement results, as opposed to the INITiate/FETCh method is:

- It is simpler. Fewer commands are required to obtain measurement results.

Some disadvantages of using READ? over INITiate and FETCh are:

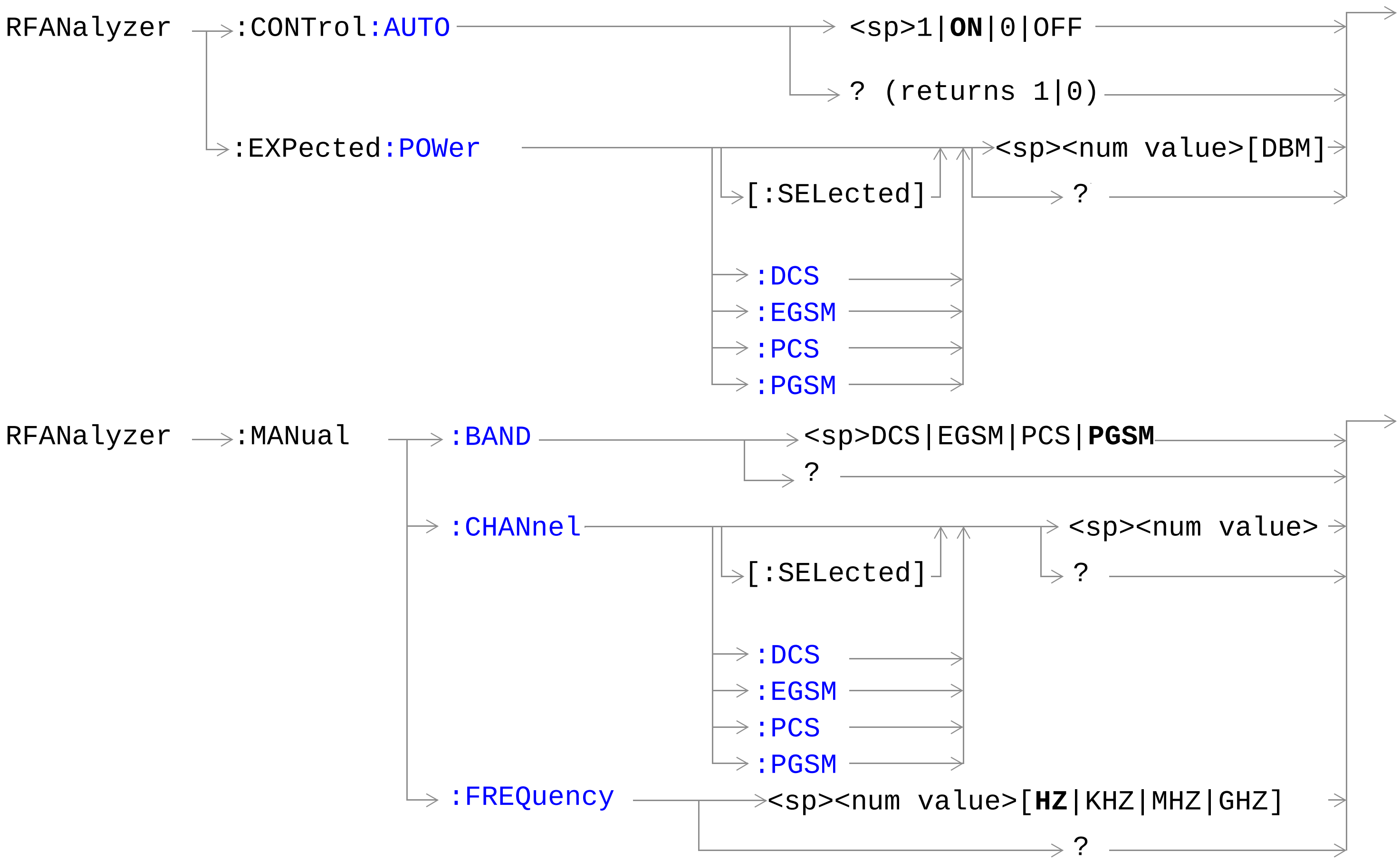
- The test set does not process any additional GPIB commands until the requested measurement results are available.
- The sequential nature of the READ? command does not allow the user to make concurrent measurements. Concurrent measurements require the overlapped commands INITiate, DONE? and FETCh? .
- The READ? command does not provide measurement results such as statistics that are available using the INITiate/FETCh method.
- The READ? commands have pre-defined measurement results. If additional results are needed from a measurement they may be obtained with a FETCh? query.

NOTE Trigger arming for each measurement is controlled in the SETup subsystem. Best practice during remote operation is to set trigger arm to single (Continuous Off).

Program Example - READ:TXPower?

```
OUTPUT 714;"READ:TXPower?" !Starts TX power measurement. As soon as the
                           !measurement cycle has completed, the test set
                           !provides the TX power measurement results to the
                           !controlling application.
ENTER 714;integrity, tx_carrier_power !Enters the integity indicator and
                                      !TX carrier power measurement into
                                      !controlling application.
```

RFANalyzer



“Diagram Conventions” on page 207

RFANalyzer:CONTrol:AUTO

Function	Sets/queries the test set's receiver control. The measuring receiver is under the control of the test set's base station emulator (auto) or under the control of the user (manual). see "Receiver Control" on page 498 Setting the manual band will change the receiver control to manual. see "RFANalyzer:MANual:BAND" on page 366 Setting the manual channel in the band that is currently active will change the receiver control to manual. see"RFANalyzer:MANual:CHANnel[:SELected]" on page 366 Setting the manual frequency will change the receiver control to manual. see "RFANalyzer:MANual:FREQuency" on page 369 Setting the broadcast band will change the receiver control to auto. See "CALL:BAND" on page 227
Setting	Manual = 0 | OFF , Auto = 1 | ON (default ON)
Query	0 | 1
*RST setting	0 | on

Programming Example

```
OUTPUT 714;"RFANALYZER:CONTROL:CONTROL:AUTO 0" !Sets receiver control to manual.
```

RFANalyzer:EXPected:POWer[:SELected]

Function	Sets/queries the power level in DBM that the mobile station is expected to transmit for the selected band. The units DBM are optional. The test set will set up its input signal path to measure this power level when a user is in manual control. See "Expected Power" on page 500.
Setting	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see "Measurement Related Configuration" on page 540 Resolution: .01 DBM
Query	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see "Measurement Related Configuration" on page 540 Resolution: .01 DBM
*RST setting	Sets the receiver control to auto Band: PGSM Expected Power: +13DBM

Programming Example

```
OUTPUT 714;"RFANALYZER:EXPECTED:POWER:SELECTED 10" !Sets the test set expected
                                                  !input level to 10 DBM.
```

RFANalyzer:EXPected:POWer:DCS

Function	Sets/queries the power level in DBM that the mobile station is expected to transmit at. The units DBM are optional. The test set will set up its input signal path to measure this power level. see “Receiver Control” on page 498
Setting	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see “Measurement Related Configuration” on page 540 Resolution: .01 DBM
Query	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see “Measurement Related Configuration” on page 540 Resolution: .01 DBM
*RST setting	Sets the receiver control to auto Band: PGSM Expected Power: +13DBM
Programming Example	

```
OUTPUT 714;"RFANALYZER:EXPECTED:POWER:DCS -10" !Sets expected power in DCS band
                                               !to -10 DBM.
```

RFANalyzer:EXPected:POWer:EGSM

Function	Sets/queries the power level in DBM that the mobile station is expected to transmit at. The units DBM are optional. The test set will set up its input signal path to measure this power level. see “Receiver Control” on page 498
Setting	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see “Measurement Related Configuration” on page 540 Resolution: .01 DBM
Query	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see “Measurement Related Configuration” on page 540 Resolution: .01 DBM
*RST setting	Sets the receiver control to auto Band: PGSM Expected Power: +13DBM
Programming Example	

```
OUTPUT 714;"RFANALYZER:EXPECTED:POWER:EGSM -10" !Sets expected power in EGSM
                                                !band to -10 DBM.
```

RFANalyzer:EXPected:POWer:PCS

Function	Sets/queries the power level in DBM that the mobile station is expected to transmit at. The units DBM are optional. The test set will set up its input signal path to measure this power level. see “Receiver Control” on page 498
Setting	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see “Measurement Related Configuration” on page 540 Resolution: .01 DBM
Query	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see “Measurement Related Configuration” on page 540 Resolution: .01 DBM
*RST setting	Sets the receiver control to auto Band: PGSM Expected Power: +13DBM

Programming Example

```
OUTPUT 714;”RFANALYZER:EXPECTED:POWER:PCS -10” !Sets expected power in PCS band
                                               !to -10 DBM.
```

RFANalyzer:EXPected:POWer:PGSM

Function	Sets/queries the power level in DBM that the mobile station is expected to transmit at. The units DBM are optional. The test set will set up its input signal path to measure this power level. see “Receiver Control” on page 498
Setting	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see “Measurement Related Configuration” on page 540 Resolution: .01 DBM
Query	Range: -60 to +53 dBm, after the Amplitude Offset (optional) has been factored in. see “Measurement Related Configuration” on page 540 Resolution: .01 DBM
*RST setting	Sets the receiver control to auto Band: PGSM Expected Power: +13DBM

Programming Example

```
OUTPUT 714;”RFANALYZER:EXPECTED:POWER:PGSM -10” !Sets expected power in PGSM
                                                !band to -10 DBM.
```

RFANalyzer:MANual:BAND

Function	Sets/queries the frequency band that the test set will expect the mobile station to operate on. This setting is used by the test set to map an expected channel (ARFCN) to an uplink frequency. see “Receiver Control” on page 498 The receiver control is set to manual when a manual band is selected. see “RFANalyzer:CONTrol:AUTO” on page 363 The manual band must be set before manual channel will update.
Setting	Range: DCS | EGSM | PCS | PGSM
Query	Range: DCS | EGSM | PCS | PGSM
*RST setting	PGSM

Programming Example

```
OUTPUT 714;"RFANALYZER:MANUAL:BAND DCS" !Sets the band in manual
                                        !receiver control.
```

RFANalyzer:MANual:CHANnel[:SELected]

Function	Sets/queries the ARFCN that the mobile station is expected to transmit o for the band selected. The test set will tune to the corresponding uplink frequency for the frequency band currently selected. see “Receiver Control” on page 498 The manual band must be set before manual channel will update.
Setting	Any ARFCN within the currently selected frequency band.
Query	Any ARFCN within the currently selected frequency band.
*RST setting	Sets the receiver control to auto Band: PGSM Traffic Channel: 30

Programming Example

```
OUTPUT 714;"RFANALYZER:MANUAL:SELECTED 512" !Configures the test set to
                                            !ARFCN 512.
```

RFANalyzer:MANual:CHANnel:DCS

Function	Sets/queries the ARFCN that the mobile station is expected to transmit on. The test set will tune to the corresponding uplink frequency for the DCS frequency band. see “Receiver Control” on page 498 The manual band must be set before manual channel will update. see“RFANalyzer:MANual:BAND” on page 366
Setting	Range: 512 to 885 Resolution: 1
Query	Range: 512 to 885 Resolution: 1
*RST setting	Sets the receiver control to auto Band: PGSM Traffic Channel: 30

Programming Example

```
OUTPUT 714;”RFANALYZER:MANUAL:CHANNEL:DCS 512” !Sets ARFCN for DSC in manual
                                               !receiver mode.
```

RFANalyzer:MANual:CHANnel:EGSM

Function	Sets /queries the ARFCN that the mobile station is expected to transmit on. The test set will tune to the corresponding uplink frequency for the EGSM frequency band. see “Receiver Control” on page 498 The manual band must be set before manual channel will update. see “RFANalyzer:MANual:BAND” on page 366
Setting	Range: 0 to 124 and 975 to 1023 Resolution: 1
Query	Range: 0 to 124 and 975 to 1023 Resolution: 1
*RST setting	Sets the receiver control to auto Band: PGSM Traffic Channel: 30

Programming Example

```
OUTPUT 714;”RFANALYZER:MANUAL:CHANNEL:EGSM 975” !Sets ARFCN for EGSM in manual
                                                !receiver mode.
```

RFANalyzer:MANual:CHANnel:PCS

Function	Sets/queries the ARFCN that the mobile station is expected to transmit on. The test set will tune to the corresponding uplink frequency for the PCS frequency band. see “Receiver Control” on page 498 The manual band must be set before manual channel will update. see “RFANalyzer:MANual:BAND” on page 366
Setting	Range: 512 to 810 Resolution: 1
Query	Range: 512 to 810 Resolution: 1
*RST setting	Sets the receiver control to auto Band: PGSM Traffic Channel: 30

Programming Example

```
OUTPUT 714;"RFANALYZER:MANUAL:CHANNEL:PCS 512" !Sets ARFCN for PCS in manual
                                               !receiver mode.
```

RFANalyzer:MANual:CHANnel:PGSM

Function	Sets/queries the ARFCN that the mobile station is expected to transmit on. The test set will tune to the corresponding uplink frequency for the PGSM frequency band. see “Receiver Control” on page 498 The manual band must be set before manual channel will update. see “RFANalyzer:MANual:BAND” on page 366
Setting	Range: 1 to 124 Resolution: 1
Query	Range: 1 to 124 Resolution: 1
*RST setting	Sets the receiver control to auto Band: PGSM Traffic Channel: 30

Programming Example

```
OUTPUT 714;"RFANALYZER:MANUAL:CHANNEL:PGSM 124" !Sets ARFCN for PGSM in manual
                                                !receiver mode.
```

RFANalyzer:MANual:FREQuency

Function	Sets/queries the frequency that the mobile station is expected to transmit on. See "Receiver Control" on page 498 . The units (HZ | KHZ | MHZ | GHZ) are optional, if no units are specified then units default to HZ. Setting the manual frequency changes the receiver control to manual. see "RFANalyzer:CONTrol:AUTO" on page 363
Range	Range: 292.5 MHZ to 2700 MHZ Resolution: .01 HZ
Query	Range: 292.5 MHZ to 2700 MHZ Resolution: .01 HZ
*RST setting	896 MHZ

Programming Example

```
OUTPUT 714;"RFANALYZER:MANUAL:FREQUENCY 942.6MHZ" !Sets the expected frequency
                                                  !to 942.6 MHZ in manual
                                                  !receiver mode.
```

RFANalyzer Subsystem

July 1, 1999

Description

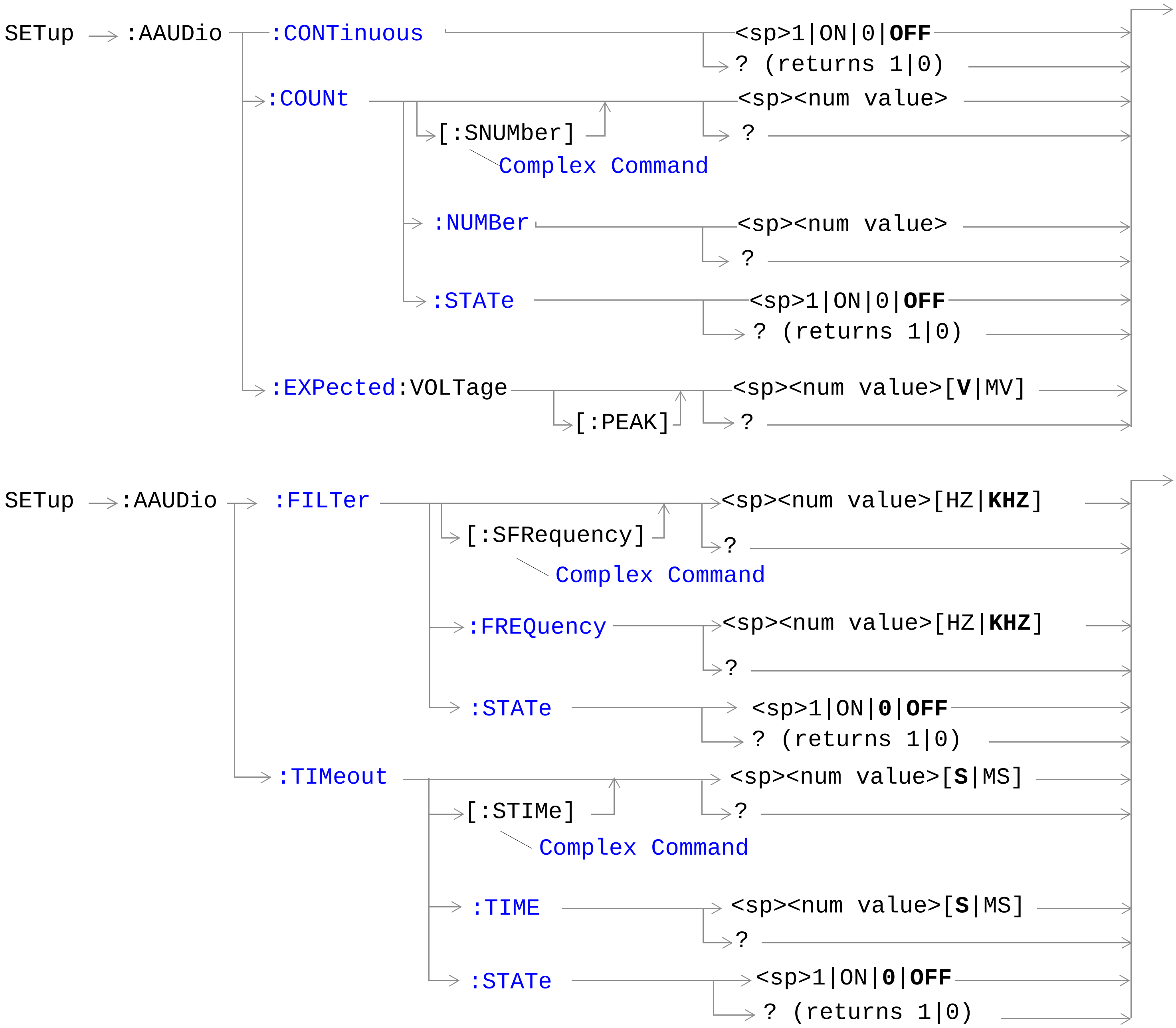
The RFANalyzer command subsystem performs “lower-level” functions that control the Test Set's measuring receiver. Most of these functions are normally controlled indirectly by commands in other subsystems. One exception would be when operating in Test Mode. For example, the command CALL:TCHannel:<channel number> would set the RFANalyzer:EXPected:FREQuency parameter to the frequency that maps to the uplink traffic channel specified.

Syntax Diagrams and Command Descriptions

“RFANalyzer” on page 362

SETup:AAUDio

July 1, 1999



"Diagram Conventions" on page 207

SETup:AAUDio:CONTinuous

Function	Selects/queries the trigger arm state for Analog Audio measurements.
Setting	Continuous trigger arm mode = 1|ON| Single trigger arm mode = 0|OFF
Query	0|1
*RST setting	Single
Programming Example	

```
10 OUTPUT 714;"AAUDIO:COUNTINUOUS OFF" !Selects single trigger mode.
```

SETup:AAUDio:COUNt[:SNUMber]

Function	Selects the number of Analog Audio multi-measurements the Test Set will make and sets the count state to ON.
Setting	range 1 to 999 / resolution 1
*RST setting	OFF
Programming Example	

```
OUTPUT 714;"AAUDIO:COUNT :SNUMBER 5" !Sets the value to 5 and the state to on.
```

SETup:AAUDio:COUNt:NUMBer

Function	Selects/queries the number of Analog Audio measurements the Test Set will make when the "SETup:AAUDio:COUNt:STATe" is on.
Setting	range 1 to 999 / resolution 1
Query	range 1 to 999 / resolution 1
*RST setting	10
Programming Example	

```
OUTPUT 714;"ABORT:ALL" !Aborts all active measurements in progress.
OUTPUT 714;"SETUP:AAUDIO:COUNT:NUMBER 10" !Sets the audio multi-measurement
                                          !count number.
```

SETup:AAUDio:COUNt:STATe

Function	Selects/queries the Analog Audio multi-measurement count state.
Setting	1|ON | 0|OFF
Query	1|0
*RST setting	0|OFF
Programming Example	

```
OUTPUT 714;"SETUP:AAUDIO:COUNT:STATE ON" !Turns the analog audio measurement
                                         !multi-measurement count state on.
```

SETup:AAUDio:EXPected:VOLTage[:PEAK]

Function	Sets/queries the maximum expected peak voltage (clipping level) of the Analog Audio signal to be measured. The units (V|MV|UV) are optional, if no units are specified then units default to V. see "SETup:AAUDio" on page 371
Setting	range 10 mV to 20 V peak / resolution 0.1 mV
Query	range 10 mV to 20 V peak / resolution 0.1 mV
*RST setting	20V

Programming Example

```
OUTPUT 714;"SETUP:AAUDIO: EXPECTED:VOLTAGE 5 V" !Sets the clipping level of
                                                !Analog Audio measurements
                                                !to +5 volts.
```

SETup:AAUDio:FILTer[:SFRequency]

Function	Sets/queries the state to on and the center frequency for the 100 Hz bandpass filter applied to Analog Audio measurements. Units (KHZ|HZ) are optional, if no units are specified then units default to Hz. see"Analog Audio Measurement Description" on page 46
Setting	range 200 Hz to 8.0 kHz / resolution 1 Hz
Query	range 200 Hz to 8.0 kHz / resolution 1 Hz
*RST setting	1000 Hz

Programming Example

```
OUTPUT 714;"SETUP:AAUDIO:FILTER :SFREQUENCY 1000" !This is a complex command that
                                                  !sets the aaudio filter state
                                                  !to on and sets the bandpass
                                                  !filter frequency to 1 kHz.
```

SETup:AAUDio:FILTer:FREQuency

Function	Sets/queries the center frequency for the 100 Hz bandpass filter applied to Analog Audio measurements. Units (KHZ|HZ) are optional, if no units are specified then units default to Hz. see "SETup:AAUDio" on page 371
Setting	range 200 Hz to 8.0 kHz / resolution 1 Hz
Query	range 200 Hz to 8.0 kHz / resolution 1 Hz
*RST setting	1 kHZ

Programming Example

```
OUTPUT 714;"SETUP:AAUDIO:FREQUENCY 217HZ" !Set aaudio bandpass filter to 217 hz.
```

SETup:AAUDio:FILTer:STATe

Function	Selects/queries the state of the Analog Audio bandpass filter. see “SETup:AAUDio” on page 371
Setting	1|ON |0 |OFF
Query	1 | 0
*RST setting	0|OFF

Programming Example

```
OUTPUT 714;”SETUP:AAUDIO:FILTER:STATE ON” !Sets filter state on.
```

SETup:AAUDio:TIMEout[:STIME]

Function	Selects/queries the timeout value in seconds that will be used for Analog Audio measurements and sets the timeout state to ON. Units (S|MS) are optional, if no units are specified then units default to S.
Setting	range 1 to 999 / resolution 1
Query	range 1 to 999 / resolution 1
*RST setting	10

Programming Example

```
OUTPUT 714;”SETUP:AAUDIO:TIMEOUT:STIME 3” !A complex command that sets timeout
                                         !state to on and sets the
                                         !timeout value.
```

SETup:AAUDio:TIMEout:STATe

Function	Selects/queries the Analog Audio measurement timeout state.
Setting	1|ON|0|OFF
Query	1 | 0
*RST setting	0|OFF

Programming Example

```
OUTPUT 714;”SETUP:AAUDIO:TIMEOUT:STATE ON” !Sets timeout state to on.
```

SETup:AAUDio:TIMEout:TIME

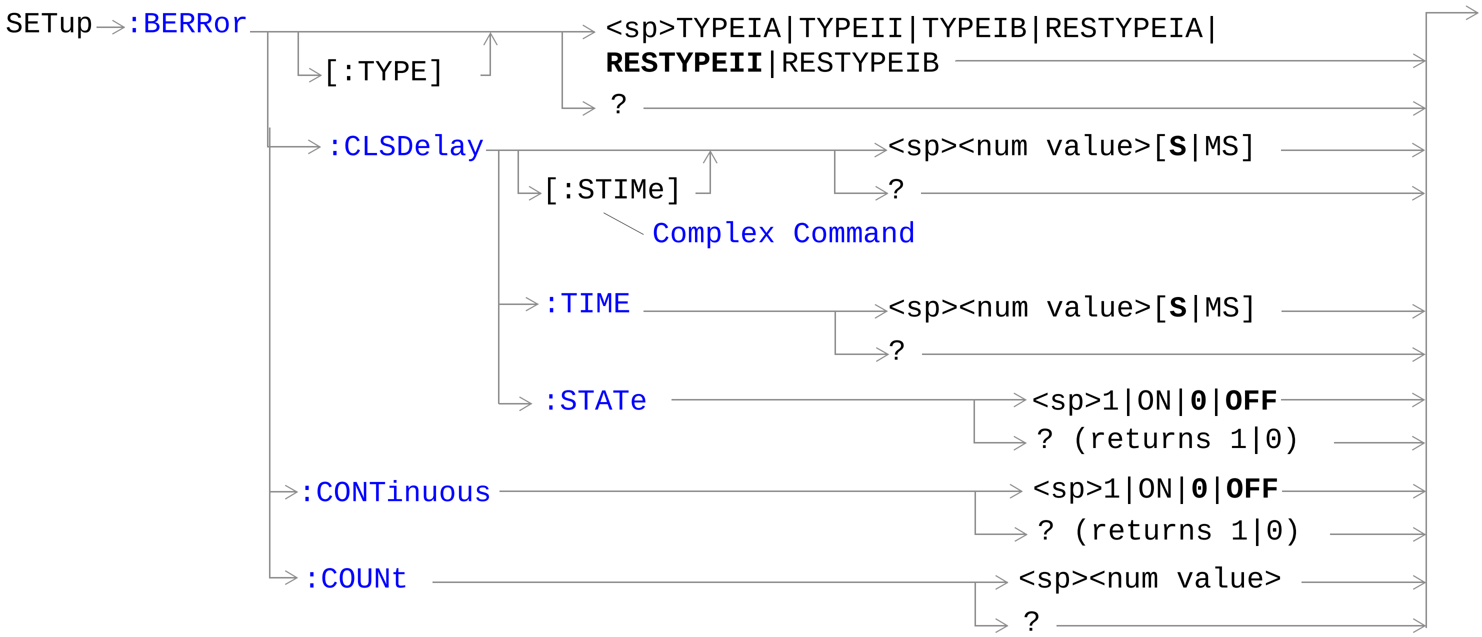
Function	Selects/queries the timeout value in seconds that will be used for Analog Audio measurements when the timeout state is ON. Unit (S|MS) are optional, if no units are specified then units default to S.
Setting	range 1 to 999 / resolution 1
Query	range 1 to 999 / resolution 1
*RST setting	10

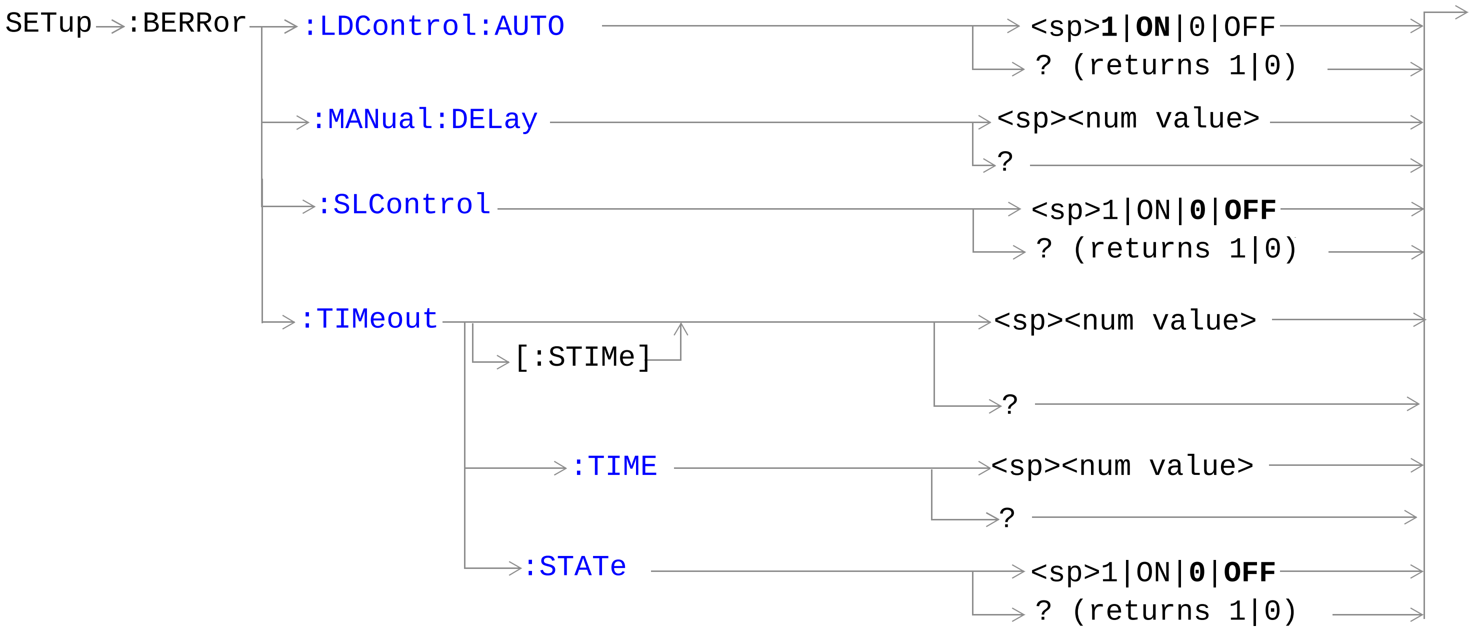
Programming Example

```
OUTPUT 714;”SETUP:AAUDIO:TIMEOUT:TIME 5” !Sets timeout value to 5 seconds.
```

SETup:BERRor

December 1, 1999





"Diagram Conventions" on page 207

SETup:BERRor:CLSDelay[:STIMe]

Function	Selects/queries the closed loop signalling delay time in seconds for Bit Error measurements and sets the delay state to ON. The units (S|MS) are optional, if no units are specified than units default to S. The delay time defines how long the test set should wait before starting a BERR measurement. The downlink signalling operation must be completed and the test set must send a close loop command to the MS before the measurement can begin. The delay time allows time for the loop to close. When a close loop message is set to the MS the closed loop signalling delay time will hold off the BERR measurement from starting for the specified time period.
Setting	Range: 0 to 5 seconds Resolution: 100 ms
Query	Range: 0 to 5 seconds Resolution: 100 ms
*RST	500 ms

Programming Example

```
OUTPUT 714;”SETUP:BERROR:CLSDELAY:STIME 400 MS” ! Set state to on
                                                ! and delay time
```

SETup:BERRor:CLSDelay:TIME

Function	Selects/queries the closed loop signalling delay time in seconds for Bit Error measurements. The units (S|MS) are optional, if no units are specified than units default to S. The delay time defines how long the test set should wait before starting a BERR measurement. The downlink signalling operation must be completed and the test set must send a close loop command to the MS before the measurement can begin. The delay time allows time for the loop to close. When a close loop message is set to the MS the closed loop signalling delay time will hold off the BERR measurement from starting for the specified time period.
Setting	Range: 0 to 5 seconds Resolution: 100 ms
Query	Range: 0 to 5 seconds Resolution: 100 ms
*RST	500 ms

Programming Example

```
OUTPUT 714;”SETUP:BERROR:CLSDELAY:TIME 600MS” ! Set delay time
```

SETup:BERRor:CLSDelay:STATe

Function	Selects/queries the closed loop signalling delay state for Bit Error measurements. If the state is off the test set will not wait to start a BERR measurement after a downlink signalling operation has completed. The delay time defines how long the test set should wait before starting and BERR measurement after a downlink signalling operation has completed and after the test set has sent a close loop command to the MS. When a close loop message is set to the MS the closed loop signalling delay time will hold off the BERR measurement from starting for the specified time period.
Setting	Range: 1 | ON | 0 | OFF
Query	Range: 1 | 0
*RST	1 | ON
Programming Example OUTPUT 714;"SETUP:BERROR:CLSDELAY:STATE ON"	

SETup:BERRor[:TYPE]

Function	Sets the measurement type for BER measurements including Type A (residual) and Type B (non-residual).
Setting	Range: TYPEIA | TYPEII |TYPEIB | RESTYPEIA | RESTYPEII | RESTYPEIB
Query	Range: TYPEIA | TYPEII |TYPEIB | RESTYPEIA | RESTYPEII | RESTYPEIB
*RST Setting	RESTYPEII
Programming Example OUTPUT 714;"SETUP:BERROR:TYPE TYPEIA" !Sets type of BER measurement.	

SETup:BERRor:CONTinuous

Function	Sets/queries the trigger state to single trigger mode or continuous trigger mode for BER measurement.
Setting	Range: 0|OFF | 1|ON
Query	0|1
*RST Setting	0|off
Programming Example OUTPUT 714;"BERROR:CONTINUOUS OFF" !Sets BER measurement to single trigger mode.	

SETup:BERRor:COUNt

Function	Sets/queries the number of BER measurements the test set will make when the count state is on
Setting	Range: 1 to 999,000 Resolution: 1
Query	Range: 1 to 999,000 Resolution: 1
*RST Setting	10,000

Programming Example

```
OUTPUT 714;"SETUP:BERROR:COUNT 880" !Set BER multi-measurement count
                                          !to 880.
```

SETup:BERRor:LDControl:AUTO

Function	Sets/queries speech frames delay control mode. If speech frames delay control mode is automatic (Auto), the test set will determine the frame delay value that will allow correlation between uplink information bits with downlink information bits. If speech frames delay control mode is manual (not Auto), the test set will use the frame delay value entered in the Speech Frames Delay field. Refer to. see“SETup:BERRor:MANual:DELay” on page 381 Refer also to the “Bit Error Measurement Description” on page 50 for a description of frame delay and its use in the BER measurement.
Setting	Range: 0 | OFF | 1 | ON
Query	0 | 1
*RST Setting	1 | auto
Related Topics	“SETup:BERRor:MANual:DELay” on page 381

Programming Example

```
OUTPUT 714;"SETUP:BERROR:LDCONTROL:AUTO OFF" !sets BER delay to manual the user
                                             !must select the manual frame
                                             !delay number.
```

SETup:BERRor:MANual:DELay

Function	Sets/queries the number of frames the test set will use to correlate uplink information bits with downlink information bits when loop delay control mode is manual (AUTO OFF). To set the delay mode to manual, refer to “SETup:BERRor:LDControl:AUTO” on page 380. This value is displayed in the Speech Frames Delay field when Auto is not displayed. (If you want to display this value and Auto is currently displayed, press the front-panel key labeled OFF). Refer to “Bit Error Measurement Description” on page 50 for a description of frame delay and how it is used in this measurement.
Setting	Range: 1 to 15 Resolution : 1
Query	Range: 1 to 15 Resolution : 1
*RST Setting	5
Programming Example	

```
OUTPUT 714;"SETUP:BERROR:MANUAL:DELAY 4" !Set delay of 4 speech frames.
```

SETup:BERRor:SLControl

Function	Selects/queries the Signalling loopback control state for an BER measurement. When signalling loopback control is set to on, the test set will automatically send the loopback for Type A (residual) or Type B (non-residual) loopback to the MS, based on the measurement type selected, and then set loopback to off when the measurement is complete. The loopback type is controlled manually from the Mobile Loopback F12 key, see “CALL:TCHannel:LOOPback” on page 285 for a program example and details about the command.
Setting	Range: 1 | ON | 0 | OFF
Query	Range: 1 | 0
*RST	1 | ON
Programming Example	

```
OUTPUT 714;”SETUP:BERROR:SLCONTROL ON” ! Test set will send
                                        ! loopback type automatically
```

SETup:BERRor:TIMeout[:STIMe]

Function	Sets/queries the timeout value in seconds for the trigger state during BER measurements and turns the timeout state on. The units (S|MS) are optional, if no units are specified than units default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:BERR:TIMEOUT:STIME 8" !Sets BER measurement timeout to
                                        !8 seconds and the state to on.
```

SETup:BERRor:TIMeout:TIME

Function	Sets/queries the timeout value in seconds for the trigger state during BER measurements. The units (S|MS) are optional, if no units are specified than units default to S (seconds).
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:BERR:TIMEOUT:TIME 8" !Sets BER measurement timeout to
                                       !8 seconds.
```

SETup:BERRor:TIMeout:STATe

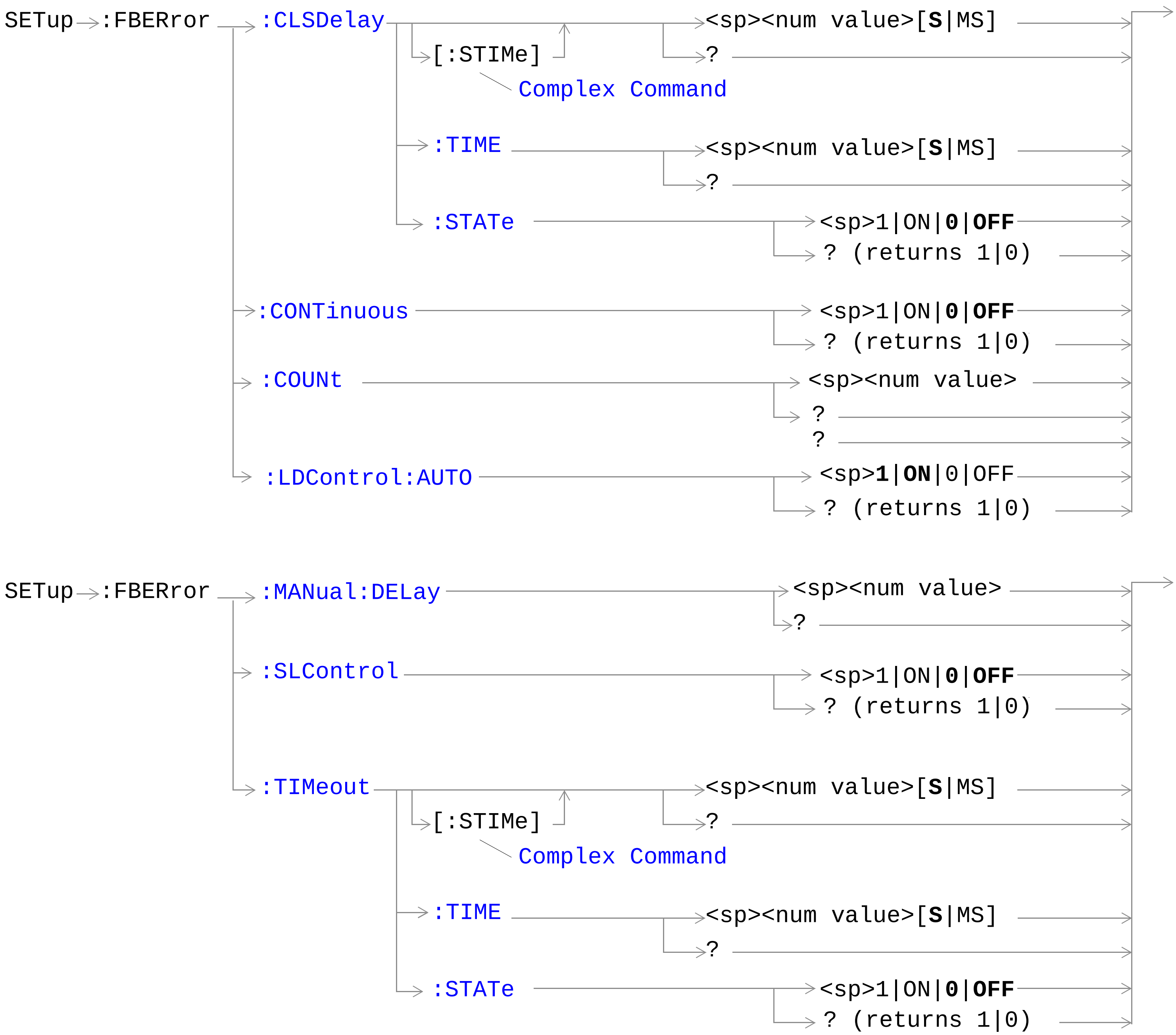
Function	Sets/queries the timeout state for BER measurements.
Setting	Range: 0 | OFF | 1 | ON
Query	0 | 1
*RST Setting	0 | off

Programming Example

```
OUTPUT 714;"SETUP:BERR0R:TIMEOUT:STATE ON" !Sets the timeout state to on.
```

SETup:FBERror

July 8, 1999



[“Diagram Conventions” on page 207](#)

SETup:FBERror:CLSDelay[:STIMe]

Function	Selects/queries the closed loop signalling delay time in seconds for Fast Bit Error measurements and sets the delay state to ON. The units (S | MS) are optional, if no units are specified than units default to S. The delay time defines how long the test set should wait before starting a FBER measurement. The downlink signalling operation must be completed and the test set must send a close loop command to the MS before the measurement can begin. The delay time allows time for the loop to close. When a close loop message is set to the MS the closed loop signalling delay time will hold off the FBER measurement from starting for the specified time period.
Setting	Range: 0 to 5 seconds Resolution: 100 ms
Query	Range: 0 to 5 seconds Resolution: 100 ms
*RST	500 ms

Programming Example

```
OUTPUT 714;"SETUP:FBERROR:CLSDELAY:STIME 500 MS" ! Sets the Close Loop Delay
                                                  ! to 500 ms.
```

SETup:FBERror:CLSDelay:TIME

Function	Selects/queries the closed loop signalling delay time in seconds for Fast Bit Error measurements. The units (S | MS) are optional, if no units are specified than units default to S. The delay time defines how long the test set should wait before starting a FBER measurement. The downlink signalling operation must be completed and the test set must send a close loop command to the MS before the measurement can begin. The delay time allows time for the loop to close. When a close loop message is set to the MS the closed loop signalling delay time will hold off the FBER measurement from starting for the specified time period.
Setting	Range: 0 to 5 seconds Resolution: 100 ms
Query	Range: 0 to 5 seconds Resolution: 100ms
*RST	500 ms

Programming Example

```
OUTPUT 714;"SETUP:FBERROR:CLSDELAY:TIME 500 MS" ! Sets the Close Loop Delay
                                                 ! to 500 ms.
```

SETup:FBERror:CLSDelay:STATe

Function	Selects/queries the closed loop signalling delay state for Fast Bit Error measurements. If the state is off the test set will not wait to start a FBER measurement after a downlink signalling operation has completed. The delay time defines how long the test set should wait before starting and FBER measurement after a downlink signalling operation has completed and after the test set has sent a close loop command to the MS. When a close loop message is set to the MS the closed loop signalling delay time will hold off the FBER measurement from starting for the specified time period.
Setting	Range: 1 | ON | 0 | OFF
Query	Range: 1 | 0
*RST	1 | ON

Programming Example

```
OUTPUT 714;"SETUP:FBERROR:CLSDELAY:STATE ON" ! Sets the Close Loop Delay
                                            ! state to on.
```

SETup:FBERror:CONTinous

Function	Selects/queries the trigger state for Fast Bit Error Rate tests.
Setting	Range: 1 | ON = Continuous trigger mode 0 | OFF = Single trigger mode
Query	Range: 1 | 0
*RST	0 | single

Programming Example

```
OUTPUT 714;"SETUP:FBERROR:CONTINUOUS 0" !Specifies single trigger mode for Fast
                                        !BER measurements.
```

SETup:FBERror:COUNt

Function	Sets/queries the number of bits to test during each Fast Bit Error Rate test.
Setting	Range: 1 to 999,000 Resolution: 1
Query	Range: 1 to 999,000 Resolution: 1
*RST	10,000
Comments	The actual number of bits that are tested will be determined by the number of frames tested, and will be at least as great as this count

Programming Example

```
OUTPUT 714;''SETUP:FBERROR:COUNT 10000" !Specifies the number of Fast BER bits
                                        !to test at 10,000 bits.
```

SETup:FBERror:LDControl:AUTO

Function	Sets/queries loopback delay control mode. If loopback control mode is automatic (auto on), the test set will determine the frame delay value that will allow correlation between uplink information bits with downlink information bits. . If loopback delay control mode is manual (auto off) , the test set will use the frame delay value entered in the TDMA Frames Delay field. Refer to "SETup:FBERror:MANual:DELay" on page 387 . Refer also to the "Fast Bit Error Measurement Description" on page 71 for a description of frame delay and its use in the fast bit error rate measurement.
Setting	Range: 1 | ON | 0 | OFF
Query	Range: 1 | 0
*RST	1 | AUTO
Related Topics	see "SETup:FBERror:MANual:DELay" on page 387

Programming Example

```
OUTPUT 714;"SETUP:FBERROR:LDCONTROL OFF"  !Set delay control to manual the user
                                          !must select the manual frame
                                          !delay number.
```

SETup:FBERror:MANual:DELay

Function	Sets/queries the number of frames the test set will use to correlate uplink information bits with downlink information bits when loopback delay control mode is manual (auto off). To set the loopback delay mode to manual, refer to “SETup:FBERror:LDControl:AUTO” on page 386. This value is displayed in the TDMA Frames Delay field when Auto is not displayed. (If you want to display this value and Auto is currently displayed, press the front panel key labeled MANUAL). Refer to “Fast Bit Error Measurement Description” on page 71 for a description of frame delay and how it is used in this measurement.
Setting	Range: 0 to 26 Resolution: 1
Query	Range: 0 to 26 Resolution: 1
*RST	5 (loopback delay control is reset to automatic (auto on).
Related Topics	see “SETup:FBERror:LDControl:AUTO” on page 386
Programming Example	

```
OUTPUT 714;”SETUP:FBERROR:MANUAL:DELAY 6” !Set frame delay to 6 frames.
```

SETup:FBERror:SLControl

Function	Selects/queries the Signalling loopback control state for an FBER measurement. When the state is set to on, the test set will automatically send the command for Type C (burst-by-burst) loopback to the MS when a FBER measurement is activated, and then set loopback to off when the measurement is complete. The loopback type is controlled manually from the Mobile Loopback F12 key, see “CALL:TCHannel:LOOPback” on page 285 for a program example and details about the command.
Setting	Range: 1 | ON | 0 | OFF
Query	Range: 1 | 0
*RST	1 | ON
Programming Example	

```
OUTPUT 714;”SETUP:FBERROR:SLCONTROL ON” ! Sets the Signal Loop Control state to on.
```

SETup:FBERror:TIMeout[:STIMe]

Function	Selects/queries the timeout value in seconds for the trigger state during Fast Bit Error measurements and sets the timeout state to ON. The units (S|MS) are optional, if no units are specified than units default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:FBERROR:TIMEOUT:STIME 20" !Sets the time out value to
                                            !20 seconds and the state to on.
```

SETup:FBERror:TIMeout:TIME

Function	Selects/queries the timeout value in seconds for the trigger state during Fast Bit Error measurements. The units (S|MS) are optional, if no units are specified than units default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:FBERROR:TIMEOUT:TIME 20" !Sets the time out value to
                                           !20 seconds.
```

SETup:FBERror:TIMeout:STATe

Function	Sets/queries the timeout state for Fast BER measurements.
Setting	Range: 0|OFF | 1|ON
Query	Rang: 0|1
*RST	0|OFF

Programming Example

```
OUTPUT 714;"SETUP:FBERROR:TIMEOUT:STATE ON" !Sets the timeout state to on.
```

SETup:CONTinuous

December 1, 1999

```
SETup ──┬──────────────┬──> :CONTinuous ──────> :OFF|:ON ──────>
        └──>[:ALL] ────┘
```

"Diagram Conventions" on page 207

SETup[:ALL]:CONTinuous

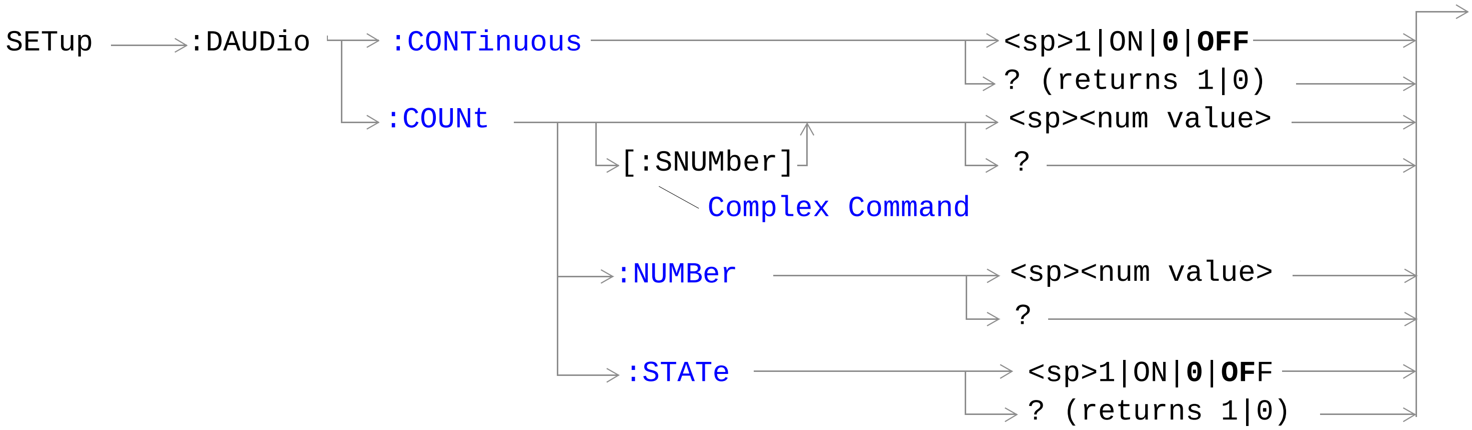
Function	Sets trigger arm to OFF (single trigger) or ON (continuous trigger) for all measurements. See "Trigger Arm (Single or Continuous) Description" on page 147. At power on and a (manual user) full preset the trigger arm is set to continuous. Partial preset has no effect on the trigger arm state. Remote full preset sets the trigger arm to single, this is the recommended trigger arm for any remote measurements. Trigger arm may be set and queried for each individual measurement.
Setting	Range • Continuous trigger = ON • Single trigger = OFF
*RST Setting	Single

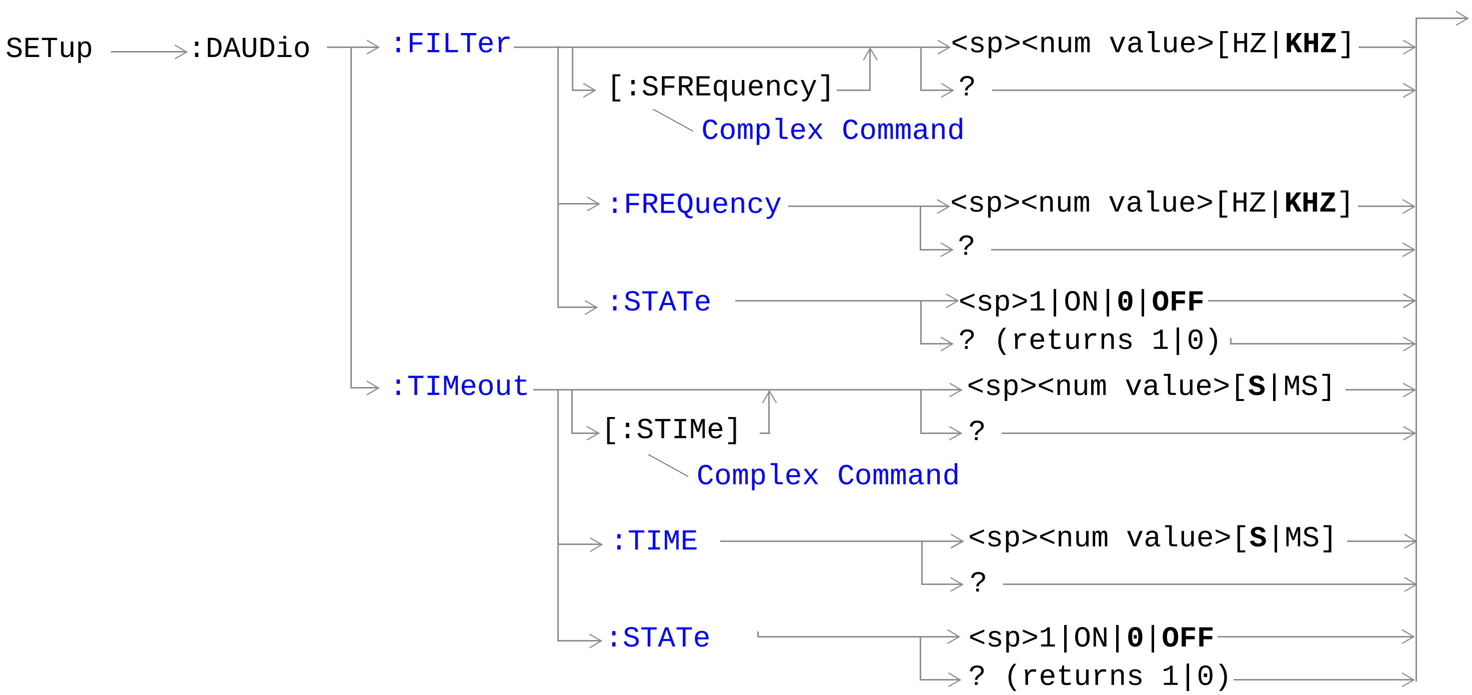
Programming Example

```
OUTPUT 714;"SETUP:ALL:CONTINUOUS:OFF" !Sets trigger arm for all measurements
                                      !to single.

OUTPUT 714;"SETUP:PVTIME:CONTINUOUS:OFF" !Sets trigger arm for power versus
                                         !time measurements to single each
                                         !measurment can be set individually.

OUTPUT 714;"SETUP:TXPOWER:CONTINUOUS?" !Queries trigger arm for TX power
                                       !measurements. Trigger arm may be queried
                                       !only one measurement at a time.
```

SETup:DAUDio

July 7, 1999





"Diagram Conventions" on page 207

SETup:DAUDio:CONTinuous

Function	Selects/queries the trigger state for Decoded Audio measurements.
Setting	Continuous 1 | ON | Single 0 | OFF
Query	1 | 0
*RST setting	0 | single

Programming Example

```
OUTPUT 714;"SETUP:DAUDIO:CONTINUOUS OFF" !Set DAUDIO measurement to single
                                         !trigger mode.
```

SETup:DAUDio:COUNt[:SNUMber]

Function	Selects/queries the number of Decoded Audio multi-measurements the Test Set will make. This command sets the count state to ON.
Setting	range 1 to 999 / resolution 1
Query	range 1 to 999 / resolution 1
*RST setting	10

Programming Example

```
OUTPUT 714;"SETUP:DAUDIO:COUNT:SNUMBER 10" !Sets the value to 10 and the state
                                           !to on.
```

SETup:DAUDio:COUNt:NUMBer

Function	Selects/queries the number of Decoded Audio measurements the test set will make when the multi-measurement count state is on.
Setting	range 1 to 999 / resolution 1
Query	range 1 to 999 / resolution 1
*RST setting	10

Programming Example

```
OUTPUT 714;"SETUP:DAUDIO:COUNT:NUMBER 25" !Sets the number of DAUDIO
                                          !measurements that will be made.
```

SETup:DAUDio:COUNt:STATe

Function	Selects/queries the Decoded Audio multi-measurement count state.
Setting	1|ON | 0|OFF
Query	1|0
*RST setting	0 |OFF

Programming Example

```
OUTPUT 714;"SETUP:DAUDIO:COUNT:STATE OFF" !Sets trigger state for
                                          !DAUDIO measurement.
```

SETup:DAUDio:FILTer [:SFREquency]

Function	Sets/queries the center frequency for the 100 Hz bandpass filter applied to Decoded Audio measurements. This command sets the count state to ON. The units (HZ|KHZ) are optional, if no units are specified then units default to KHZ. see "Decoded Audio Measurement Description" on page 57
Setting	range 200 Hz to 3.6 kHz / resolution 1 HZ
Query	range 200 Hz to 3.6 kHz / resolution 1 HZ
*RST setting	1000 HZ

Programming Example

```
OUTPUT 714;"SETUP:DAUDIO:FILTER:SFREQUENCY 2.2KHZ" !This is a complex command
                                                   !that sets the value and the
                                                   !state to on.
```

SETup:DAUDio:FILTer:FREQuency

Function	Sets/queries the center frequency for the 100 Hz bandpass filter applied to Decoded Audio measurements. The units (HZ|KHZ) are optional, if no units are specified then units default to KHZ. see "Decoded Audio Measurement Description" on page 57
Setting	range 200 Hz to 3.6 kHz / resolution 1 HZ
Query	range 200 Hz to 3.6 kHz / resolution 1 HZ
*RST setting	1000 HZ

Programming Example

```
OUTPUT 714;"DAUDIO:FILTER:FREQUENCY 217HZ" !Sets bandpass filter frequency.
```

SETup:DAUDio:FILTer:STATe

Function	Selects/queries the Decoded Audio bandpass filter state. see "Decoded Audio Measurement Description" on page 57
Setting	1|ON |0|OFF
Query	1|0
Programming Example `OUTPUT 714;"ABORT:ALL" !Aborts all active measurements in progress.`	
Programming Example `OUTPUT 714;"SETUP:DAUDIO:FILTER:STATE OFF" !Sets bandpass filter state to off.`	

SETup:DAUDio:TIMeout[:STIMe]

Function	Selects/queries the timeout value in seconds that will be used for Decoded Audio measurements. This command sets the timeout state to ON. The units (S|MS) are optional, if no units are specified then units default to S.
Setting	range 1 to 999 / resolution 1
Query	range 1 to 999 / resolution 1
*RST setting	10 seconds
Programming Example `OUTPUT 714;"SETUP:DAUDIO:TIMEOUT:STIME 6" !Sets the value to 6 seconds and the !state to on.`	

SETup:DAUDio:TIMeout:TIME

Function	Selects/queries the timeout value used for Decoded Audio measurements when the timeout state is ON. The units (S|MS) are optional, if no units are specified then units default to S.
Setting	range 1 to 999 / resolution 1
Query	range 1 to 999 / resolution 1
*RST setting	10 seconds
Programming Example `OUTPUT 714;"SETUP:DAUDIO:TIMEOUT:TIME 15" !Sets timeout value to 15 seconds.`	

SETup:DAUDio:TIMeout:STATe

Function	Selects/queries the Decoded Audio measurement timeout state.
Setting	1|ON | 0|Off
Query	1|0
*RST setting	0|OFF
Programming Example	

```
OUTPUT 714;"SETUP:DAUDIO:TIMEOUT:STATE ON" !Sets timeout state to on.
```

SETup Subsystem

Description

The SETup subsystem is used to configure the test set for each measurement. Typical settings include:

- Specifying whether a measurement will run continuously or need to be INITiated.
- How a measurement is triggered
- How many measurements will be made each time a measurement is INITiated

NOTE Trigger arming for each measurement is controlled in the SETup subsystem. The choices are single or continuous. In most cases, it is a best practice (during remote operation) to use “single” measurement mode. This simplifies the tasks of starting concurrent measurements, using the INIT subsystem commands to determine which measurements are ready to be fetched, then using the FETCh subsystem to obtain results. The command “SETup:CONTinuous:OFF sets all measurements to “single” trigger mode.

Syntax Diagrams and Command Descriptions

“SETup:CONTinuous” on page 389

“SETup:AAUDio” on page 371

“SETup:BERRor” on page 376

“SETup:DAUDio” on page 390

“SETup:DPOWer” on page 396

“SETup:FBERror” on page 383

“SETup:IQTuning” on page 400

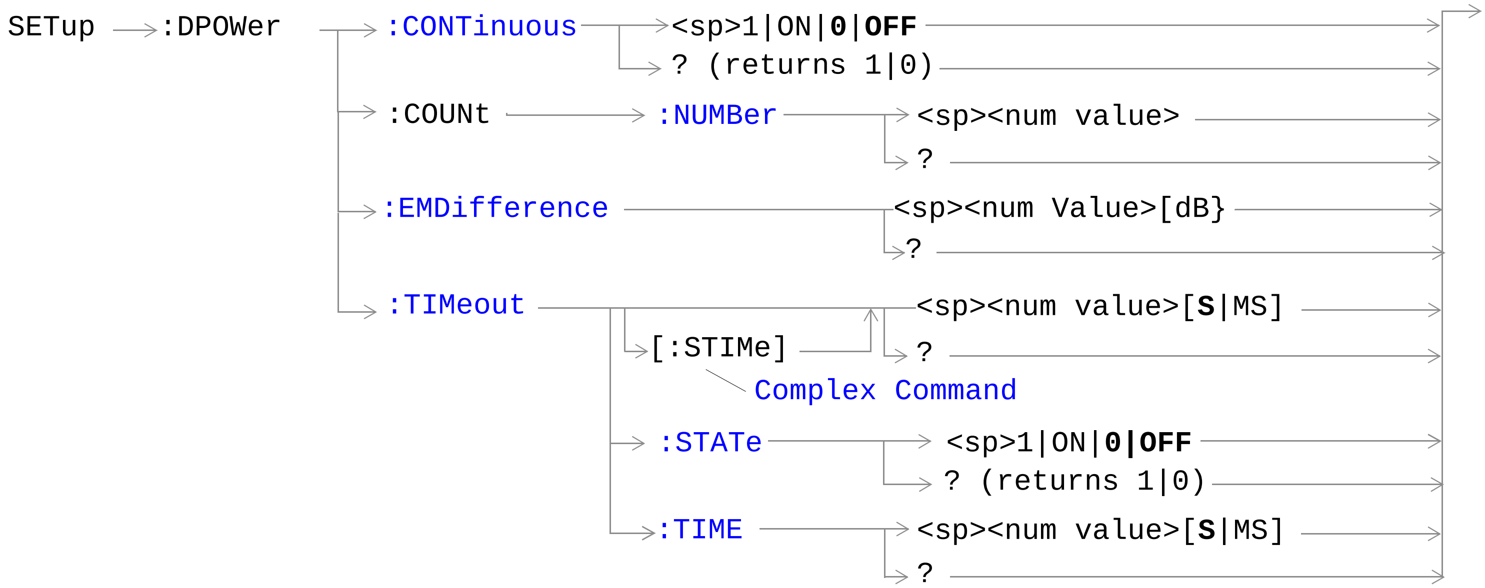
“SETup:ORFSpectrum” on page 406

“SETup:PFERror” on page 415

“SETup:PVTime” on page 420

“SETup:TXPower” on page 426

SETup:DPOWer



“Diagram Conventions” on page 207

SETup:DPOWer:CONTinuous

Function	Selects/queries the trigger state for Dynamic Power measurements.
Setting	Continuous trigger mode: 1|ON Single trigger mode: 0|OFF
Query	1|0
*RST	0|OFF
Programming Example	

```
OUTPUT 714;"SETUP:DPOWER:CONTINUOUS ON" !Sets trigger mode to continuous
for a Dynamic Power measurement.
```

SETup:DPOWer:COUNt:NUMBer

Function	Sets/queries the number of bursts for the Dynamic Power measurement.
Setting	Range: 1 to 100 Resolution: 1
Query	Range: 1 to 100 Resolution: 1
*RST	10
Programming Example	

```
OUTPUT 714;"SETUP:DPOWER:COUNT:NUMBER 30" !Sets the number of bursts for
the Dynamic Power measurement to 30.
```

SETup:DPOWer:EMDifference

Function	Sets/queries the Expected Maximum Difference from Previous Measurement parameter for the Dynamic Power measurement. The units dB are optional. The Expected Maximum Difference from Previous Measurement parameter is used with the measured transmit power from the previous burst to set the maximum RF power that the base station emulator is expecting the mobile to transmit in the next burst. The setting of this parameter does not affect the receiver Expected Power parameter. See "RFANalyzer:EXPected:POWer[:SELected]" on page 363.
Setting	Range: -30 dB to +30 dB Resolution: 0.01 dB
Query	Range: -30 dB to +30 dB Resolution: 0.01 dB

Programming Example

```
OUTPUT 714;"SETUP:DPOWER:EMDIFFERENCE -3" !Sets the Expected Maximum
                       ! Difference from previous measurement parameter
                       ! to -3 dB. (Example: If the previous burst
                       ! measures 0 dB and you expect the maximum
                       ! amplitude of the next burst to be 3 dB, set the
                       ! Expected Maximum Difference parameter to 3).
```

SETup:DPOWer:TIMeout[:STIMe]

Function	Sets/queries the Dynamic Power measurement time out value in seconds and sets the time-out state to on. The units (S | MS) are optional, if no units are specified then the default is S.
Setting	Range 1 to 999 Resolution 1
Query	Range 1 to 999 Resolution 1
*RST	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:DPOWER:TIMEOUT:STIME 5" !Sets the timeout state to on
and the timeout value to 5 seconds for the Dynamic Power measurement.
```

SETup:DPOWer:TIMeout:STATe

Function	Sets/queries the time-out state for the Dynamic Power measurement.
Setting	0|OFF|1|ON
Query	0|1
*RST	0|OFF

Programming Example

```
OUTPUT 714;"SETUP:DPOWER:IQTUNING:TIMEOUT:STATE ON" !Sets the timeout
state to on for a Dynamic Power measurement.
```

SETup:DPOWer:TIMeout:TIMe

Function	Sets/queries the time-out value in seconds that is used for the Dynamic Power measurements when the time-out state is ON. The units (S|MS) are optional, if no units are specified then the default is S.
Setting	Range 1 to 999 Resolution 1
Query	Range 1 to 999 Resolution 1
*RST	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:DPOWER:TIMEOUT:TIME 6" !Sets the timeout value to
6 seconds for a dynamic power measurement.
```

SETup:IQTuning

```
SETup  :IQTuning  :CONTinuous  <sp>1|ON|0|OFF
                               ? (returns 1|0)
                  :COUNt       [:SNUMber]  <sp><num value>
                                           ?
                               Complex Command
                               :NUMBer     <sp><num value>
                                           ?
                               :STATe      <sp>1|ON|0|OFF
                                           ? (returns 1|0)
                  :REFerence   [:FREQuency] <sp>NEG67KHZ|ZEROKHZ|POS67KHZ|AUTO
                                            ?
                  :SPUR        [:SFRequency] <sp><num value>[HZ|KHZ|MHZ]
                                             ?
                               Complex Command
                               :FREQuency  <sp><num value>[HZ|KHZ|MHZ]
                                           ?
                               :STATe      <sp>1|ON|0|OFF
                                           ? (returns 1|0)

SETup  :IQTuning  :TIMeout     [:STIMe]    <sp><num value>[S|MS]
                                           ?
                               Complex Command
                               :TIME       <sp><num value>[S|MS]
                                           ?
                               :STATe      <sp>1|ON|0|OFF
                                           ? (returns 1|0)
                  :TRIGger     :DELay      <sp><num value>[S|MS|US|NS]
                                           ?
                               :SOURce     <sp>IMMediate|RISE
                                           ?
```

“Diagram Conventions” on page 207

SETup:IQTuning:CONTinuous

Function	Selects/queries the trigger state for I/Q Tuning measurements.
Setting	Continuous trigger mode: 1 | ON Single trigger mode: 0 | OFF
Query	1 | 0
*RST	1 | ON
Programming Example	

```
OUTPUT 714;"SETUP:IQTUNING:CONTINUOUS OFF" !Sets trigger mode to single for
an I/Q Tuning measurement.
```

SETup:IQTuning:COUNt:STATe

Function	Sets/queries the I/Q Tuning multi-measurement count state.
Setting	Range: 0 | OFF | 1 | ON
Query	0 | 1
*RST	0 | OFF
Programming Example	

```
OUTPUT 714;"SETUP:IQTUNING:COUNT:STATE ON" !Turns on the multi-measurement
mode for I/Q Tuning measurements.
```

SETup:IQTuning:COUNt:NUMBer

Function	Sets/queries the number of I/Q Tuning multi-measurements the test set makes when the multi-measurement count state is on. See “I/Q Tuning Measurement Description” on page 65.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST	10
Programming Example	

```
OUTPUT 714;"SETUP:IQTUNING:COUNT:NUMBER 80" !Sets the multi-measurement
count number for I/Q Tuning measurements to 80.
```

SETup:IQTuning:COUNt[:SNUMBer]

Function	Sets/queries the number of I/Q Tuning multi-measurements the test set makes. This command sets the count state to ON.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST	10
Programming Example	

```
OUTPUT 714;"SETUP:IQTUNING:COUNT:SNUMBER 25" !Sets the state to ON and the
multi-measurement count value to 25.
```

SETup:IQTuning:REFerence[:FREQuency]

Function	Sets/queries the reference offset frequency to be used for the measurement. This means that if your mobile is transmitting all 1s you should set this command to NEG67KHZ, and if your mobile is transmitting all 0s it should be set to POS67KHZ. Alternatively you could select AUTO which allows the test set to select the most appropriate offset.
Setting	NEG67KHZ|ZEROKHZ|POS67KHZ|AUTO
Query	NEG67KHZ|ZEROKHZ|POS67KHZ|AUTO
*RST	AUTO
Programming Example	

```
OUTPUT 714;"SETUP:IQTUNING:REFERENCE:FREQUENCY NEG67KHZ" !Sets the I/Q
Tuning measurements reference frequency to -67 kHz.
```

SETup:IQTuning:SPUR:FREQuency

Function	Sets/queries the spur frequency for the I/Q Tuning measurement. The units (HZ|KHZ|MHZ) are optional, if no units are specified then the default is HZ.
Setting	Range: -13.0 MHz to -1.0 MHz and +1.0 MHz to +13 MHz Resolution: 100 Hz
Query	Range: -19 MHz to +19 MHz Resolution: 100 Hz
*RST	0 MHz

Programming Example

```
OUTPUT 714;"SETUP:IQTUNING:SPUR:FREQUENCY 10MHZ" !Sets the I/Q Tuning
spur measurement to 10 MHz.
```

SETup:IQTuning:SPUR:STATe

Function	Sets/queries the spur state for the I/Q Tuning measurement.
Setting	0|OFF|1|ON
Query	0|1
*RST	0|OFF

Programming Example

```
OUTPUT 714;"SETUP:IQTUNING:SPUR:STATE ON" !Sets the spur state to on.
```

SETup:IQTuning:SPUR[:SFRequency]

Function	Sets/queries the spur frequency for the I/Q Tuning measurement. The units (HZ|KHZ|MHZ) are optional, if no units are specified then the default is HZ. This command sets the spur state to ON.
Setting	Range: -13.0 MHz to -1.0 MHz and +1.0 MHz to +13 MHz Resolution: 100 Hz
Query	Range: -13.0 MHz to -1.0 MHz and +1.0 MHz to +13 MHz Resolution: 100 Hz
*RST	0|OFF

Programming Example

```
OUTPUT 714;"SETUP:IQTUNING:SFRequency 10MHZ" !Sets the spur state on
with a frequency of 10 MHz.
```

SETup:IQTuning:TIMeout:STATe

Function	Sets/queries the time-out state for the I/Q Tuning measurement.
Setting	0 | OFF | 1 | ON
Query	0 | 1
*RST	0 | OFF

Programming Example

```
OUTPUT 714;"SETUP:IQTUNING:TIMeout:STATE ON" !Sets the timeout state to
on for an I/Q Tuning measurement.
```

SETup:IQTuning:TIMeout[:STIMe]

Function	Sets/queries the I/Q Tuning measurement time-out value in seconds and sets the time-out state to on. The units (S | MS) are optional, if no units are specified then the default is S.
Setting	Range 1 to 999 Resolution 1
Query	Range 1 to 999 Resolution 1
*RST	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:IQTUNING:TIMEOUT:STIME 3" !Sets the timeout state to on
and the timeout value to 3 seconds.
```

SETup:IQTuning:TIMeout:TIMe

Function	Sets/queries the time-out value in seconds that is used for the I/Q Tuning measurements when the time-out state is ON. The units (S | MS) are optional, if no units are specified then the default is S.
Setting	Range 1 to 999 Resolution 1
Query	Range 1 to 999 Resolution 1
*RST	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:IQTUNING:TIMEOUT:TIME 4" !Sets the timeout value to
4 seconds.
```

SETup:IQTuning:TRIGger:DELay

Function	Sets/queries the trigger delay time in seconds for an I/Q Tuning measurement. The units (S | MS | US | NS) are optional, if no units are specified then the default is S.
Setting	Range -2.31 ms to +2.31 ms Resolution 5 significant digits or 100 ns, whichever is greater
Query	Range -2.31 ms to +2.31 ms Resolution 5 significant digits or 100 ns, whichever is greater
*RST	zero seconds

Programming Example

```
OUTPUT 714;"SETUP:IQTUNING:TRIGGER:DELAY 1.2MS" !Sets the trigger delay
time to 1.2 milli seconds.
```

SETup:IQTuning:TRIGger:SOURce

Function	Sets/queries the trigger source for an I/Q Tuning measurement.
Setting	RISE | IMMediate See “Triggering of Measurements” on page 145.
Query	RISE | IMM
*RST	RISE

Programming Example

```
OUTPUT 714;"SETUP:IQTUNING:TRIGGER:SOURCE IMM" !Sets the trigger source to
immediate.
```

SETup:ORFSpectrum

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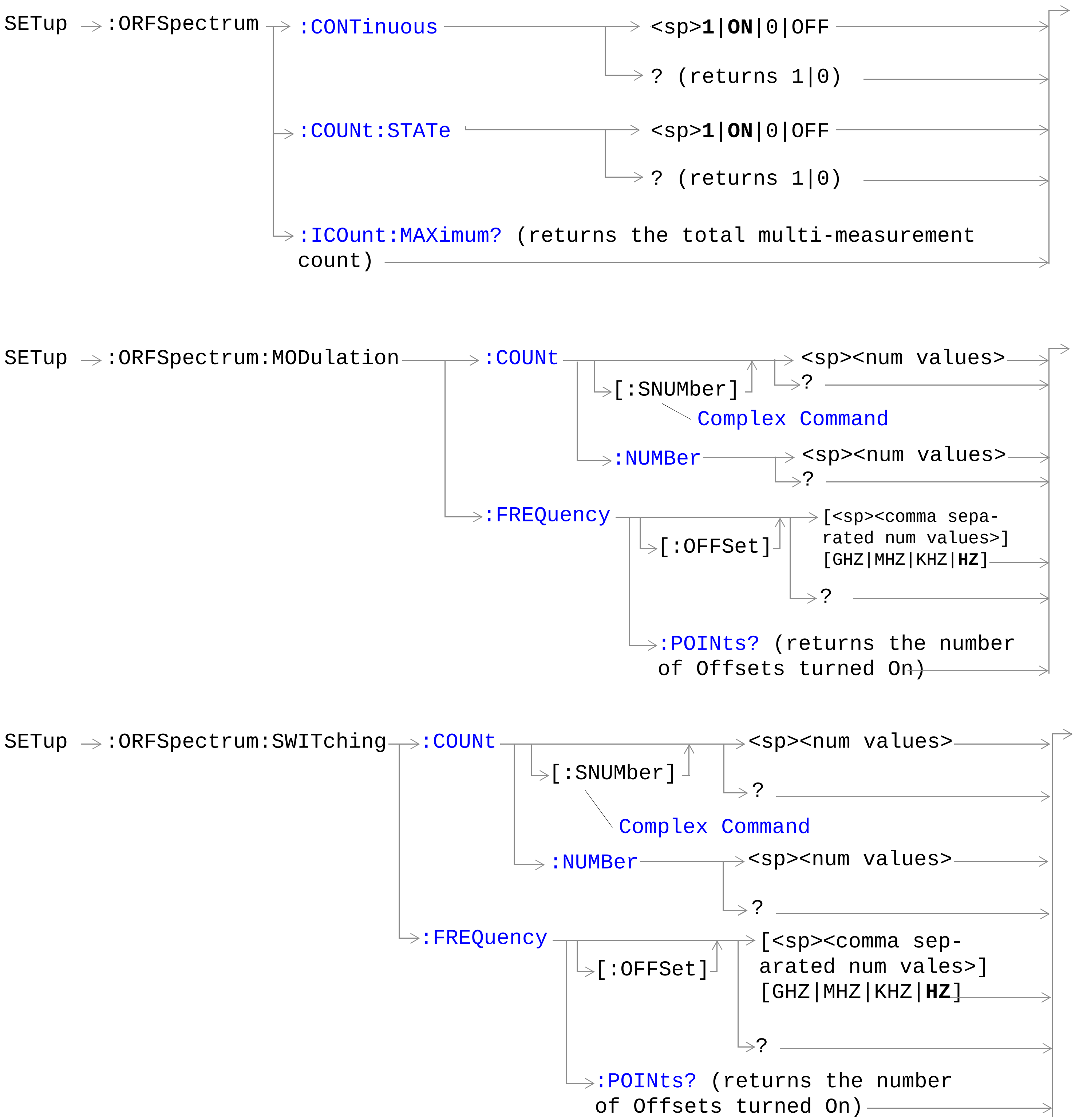

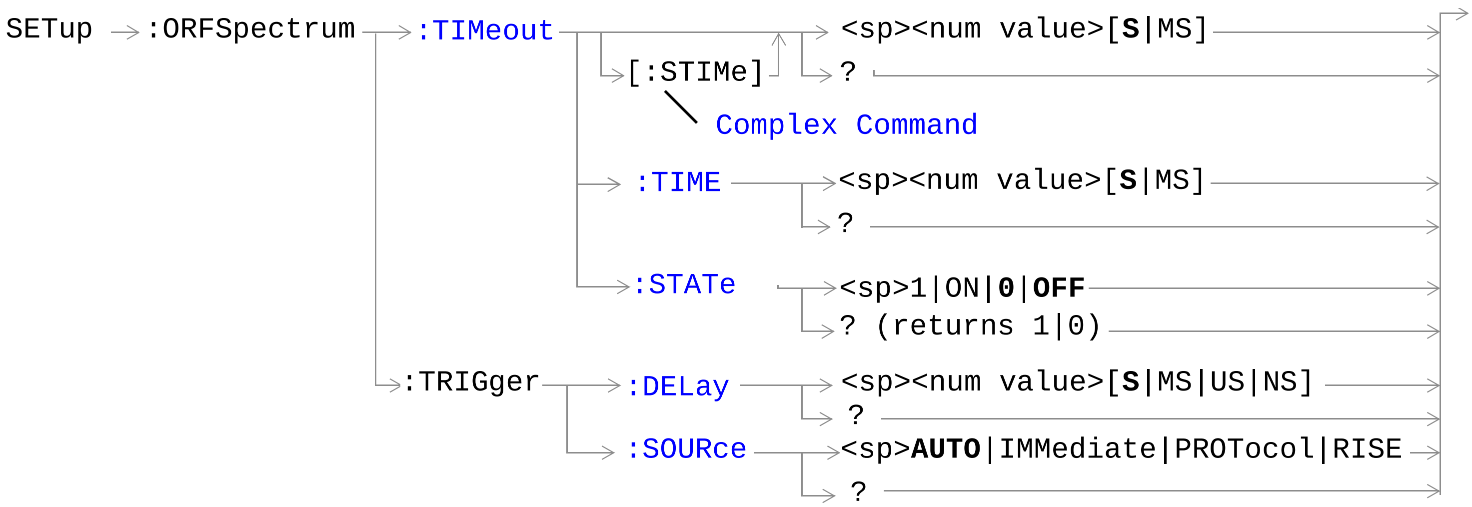

"Diagram Conventions" on page 207

SETup:ORFSpecturm:CONTinuous

Function	Selects/queries the trigger state for output RF spectrum measurements.
Range	Continuous trigger mode: 1|ON Single trigger mode: 0|OFF
Query Setting	1|0
*RST	1|on

Programming Example

```
OUTPUT 714;"ABORT:ALL" !Aborts all active measurements in progress.
OUTPUT 714;"SETUP:CONTINUOUS OFF" !Sets trigger mode to single for an
                                  !ORFS measurement.
```

SETup:ORFSpectrum:COUNt:STATe

Function	Selects/queries output RF spectrum due to switching and modulation multi-measurement count state.
Setting	0|OFF|1|ON
Query Setting	0|1
*RST	1|on

Programming Example

```
OUTPUT 714;"SETUP:ORFSPECTRUM:COUNT:STATE ON" !Sets count state for both ORFS
                                              !due to switching and
                                              !modulation measurements.
```

SETup:ORFSpectrum:ICOunt:MAXimum?

Function	Queries the total number measurements made each time an ORFS measurement is initiated. This number will vary depending on the number of offsets and number of multi-measurements the user chooses. The total number of measurements is calculated using the following formula: ICO MAX = 1 + M + S *Where:* M= (*the number of modulation offsets*) × (*the number of multi-measurements for ORFS due to modulation*). S= (*the number of switching offsets*) × (*the number of multi-measurements for ORFS due to switching*) . See “Output RF Spectrum Measurement Description” on page 77 for a description of modulation and switching offsets.
Query	Range: 1 to 29971 Resolution: 1

SETup:ORFSpectrum:MODulation:COUNt[:SNUMber]

Function	Sets/queries the number of output RF spectrum due to modulation multi-measurements the test set will make. This command sets the count state to ON.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	20

Programming Example

```
OUTPUT 714"SETUP:ORFSPECTRUM:MODULATION:COUNT:SNUMBER 99" !Sets the value to 99
                                                       !multi-measurements
                                                       !and the state to on.
```

SETup:ORFSpectrum:MODulation:COUNt:NUMBer

Function	Sets/queries the number of output RF spectrum due to modulation multi-measurements the test set will make when the multi-measurement count state is on. see "Output RF Spectrum Measurement Description" on page 77
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	20

Programming Example

```
OUTPUT 714;"SETUP:ORFSPECTRUM:MODULATION:COUNT:NUMBER 75"  !Sets the
                                                           !multi-measurement
                                                           !count number for ORFS
                                                           !due to modulation
                                                           !measurements to 75.
```

SETup:ORFSpectrum:MODulation:FREQuency[:OFFSet]

Function	Specifies/queries the list of output RF spectrum due to modulation frequency offsets. Each offset listed in the command is turned on by default. If no frequency offsets (null list) are sent, the output RF spectrum due to modulation measurement will not be made. The units (GHZ | MHZ | KHZ | HZ) are optional, if no units are specified than units default to HZ. see "Output RF Spectrum Measurement Description" on page 77
Setting	Range: 0 to 22 comma-separated values ranging from –1.8 MHz to –10 Hz, and +10 Hz to +1.8 MHz Resolution: 10 Hz
Query	Range: 0 to 22 comma-separated values ranging from –1.8 MHz to –10 Hz, and +10 Hz to +1.8 MHz Resolution: 10 Hz
*RST Setting	Offset 1: 400.0 kHz Offset 2: 600.0 kHz Offsets 3 to 22: off

Programming Example

```
OUTPUT 714;"SETUP:ORFSPECTRUM:MODULATION:FREQUENCY:OFFSET 400 KHZ, 700 KHZ"
!Turns on the first two ORFS due to modulation measurement offsets and sets
!them to 400 kHz and 700 kHz offsets. All other offsets are in the off state.

OUTPUT 714;"SETUP:ORFSPECTRUM:MODULATION:FREQUENCY:OFFSET 700 KHZ" !Turns on
                                                                   !the first
                                                                   !ORFS due to
                                                                   !modulation
                                                                   !measurement
                                                                   !offset and
                                                                   !sets it to
                                                                   !A 700 kHz
                                                                   !offset. All
                                                                   !other
                                                                   !offsets are
                                                                   !in the off
                                                                   !state.

OUTPUT 714;"SETUP:ORFSPECTRUM:MODULATION:FREQUENCY:OFFSET"  !Turns all offsets
                                                            !for ORFS due to
                                                            !modulation
                                                            !measurement to the
                                                            !off state.
```

SETup:ORFSpectrum:MODulation:FREQuency:POINts?

Function	Queries the number of frequency offsets currently on during an ORFS due to modulation measurement. See “Output RF Spectrum Measurement Description” on page 77
Query	Range: 0 to 22 Resolution: 1

SETup:ORFSpectrum:SWITching:COUNt[:SNUMber]

Function	Sets /queries the ORFS due to switching multi-measurement count value and turns the state on.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10

Programming Example

```
OUTPUT 714;"SETUP:ORFSPECTRUM:SWITCHING:COUNT:SNUMBER 55" !Sets the
                                                          !multi-measurment
                                                          !value to 10 and the
                                                          !state to on.
```

SETup:ORFSpectrum:SWITching:COUNt:NUMBer

Function	Sets/queries the ORFS due to switching multi-measurement count value. see “Output RF Spectrum Measurement Description” on page 77
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10

Programming Example

```
OUTPUT 714;"SETUP:ORFSPECTRUM:SWITCHING:COUNT:NUMBER 15" !Sets the
                                                         !multi-measurement
                                                         !count number for ORFS
                                                         !due to switching
                                                         !to 15.
```

SETup:ORFSpectrum:SWITching:FREQuency[:OFFSet]

Function	Sets/queries the list of output RF spectrum due to switching frequency offsets. Each offset listed in the command is turned on by default. If no frequency offsets (null list) are sent, the output RF spectrum due to switching measurement will not be made. The units (GHZ|MHZ|KHZ|HZ) are optional, if no units are specified than units default to HZ. See “Output RF Spectrum Measurement Description” on page 77
Setting	Range: 0 to 8 comma-separated values ranging from –1.8 MHz to –10 Hz, and +10 Hz to +1.8 MHz Resolution: 10 Hz
Query	Range: 0 to 8 comma-separated values ranging from –1.8 MHz to –10 Hz, and +10 Hz to +1.8 MHz Resolution: 10 Hz
*RST Setting	Offset 1 = 400.0 kHz Offset 2 = 600.0 kHz Offsets 3 to 8 off

Programming Example

```
OUTPUT 714;"SETUP:ORFSPECTRUM:SWITCHING:FREQUENCY:OFFSET 400 KHZ, 700 KHZ"
!Turns on the first two ORFS due to switching measurement offsets and sets them
!to 400 kHz and 700 kHz offsets. All other offsets are in the off state.

OUTPUT 714;"SETUP:ORFSPECTRUM:SWITCHING:FREQUENCY:OFFSET 700 KHZ" !Turns on the
                                                                 !first ORFS
                                                                 !due to
                                                                 !switching
                                                                 !measurement
                                                                 !offset and
                                                                 !sets it to
                                                                 !700 kHz
                                                                 !offsets. All
                                                                 !other offsets
                                                                 !are in the
                                                                 !off state.

OUTPUT 714;"SETUP:ORFSPECTRUM:SWITCHING:FREQUENCY:OFFSET" !Turns all of the ORFS
                                                         !due to switching
                                                         !measurements offsets
                                                         !to off.
```

SETup:ORFSpectrum:SWITching:FREQuency:POINts?

Function	Queries the number of frequency offsets currently on during an ORFS due to switching measurement. See “Output RF Spectrum Measurement Description” on page 77
Query	Range: 0 to 8 Resolution: 1

SETup:ORFSpectrum:TIMeout:TIME

Function	Selects/queries the timeout value in seconds that will be used for output RF spectrum measurements when the “SETup:ORFSpectrum:TIMeout:STATe” is ON. The units (S | MS) are optional, if no units are specified than units default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:ORFSPECTRUM:TIMEOUT:TIME 1" !Sets the timeout value to
                                              !15 seconds.
```

SETup:ORFSpectrum:TIMeout[:STIMe]

Function	Sets/queries the timeout value in seconds that will be used for output RF spectrum measurements and turns the timeout state on. The units (S | MS) are optional, if no units are specified than units default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:ORFSPECTRUM:TIMEOUT:STIME 12" !Sets the timeout value to
                                                !10 seconds and the state to on.
```

SETup:ORFSpectrum:TIMeout:STATe

Function	Selects/queries output RF spectrum measurement timeout state.
Setting	0|OFF | 1|ON
Query	0|1
*RST Setting	0|off
Programming Example	

```
OUTPUT 714;"SETUP:ORFSPECTRUM:TIMEOUT:STATE ON" !Sets timeout state to on.
```

SETup:ORFSpectrum:TRIGer:DELay

Function	Sets/queries the trigger delay for output RF spectrum measurements. The units (S|MS|US|NS) are optional, if no units are specified than units default to S.
Range	Range: –2.31 ms to +2.31 ms Resolution: 5 significant digits or 100 nanoseconds whichever is greater
Query	Range: –2.31 ms to +2.31 ms Resolution: 5 significant digits or 100 nanoseconds whichever is greater
*RST Setting	0 seconds
Programming Example	

```
OUTPUT 714;"SETUP:ORFSPECTRUM:TRIGGER:DELAY 1MS" !Sets the trigger delay value
                                                 !to 1 millisecond.
```

SETup:ORFSpectrum:TRIGger:SOURce

Function	Selects/queries the trigger source for output RF spectrum measurements. See “Output RF Spectrum Measurement Description” on page 77.
Setting	Range: AUTO | IMMediate | PROTocol | RISE See “Measurement Triggering” on page 145.
Query	Range: AUTO | IMM | PROT | RISE
*RST Setting	AUTO
Programming Example	

```
OUTPUT 714;"SETUP:ORFSPECTRUM:TRIGGER:SOURCE AUTO" !Sets trigger source.
```

SETup:PFERror

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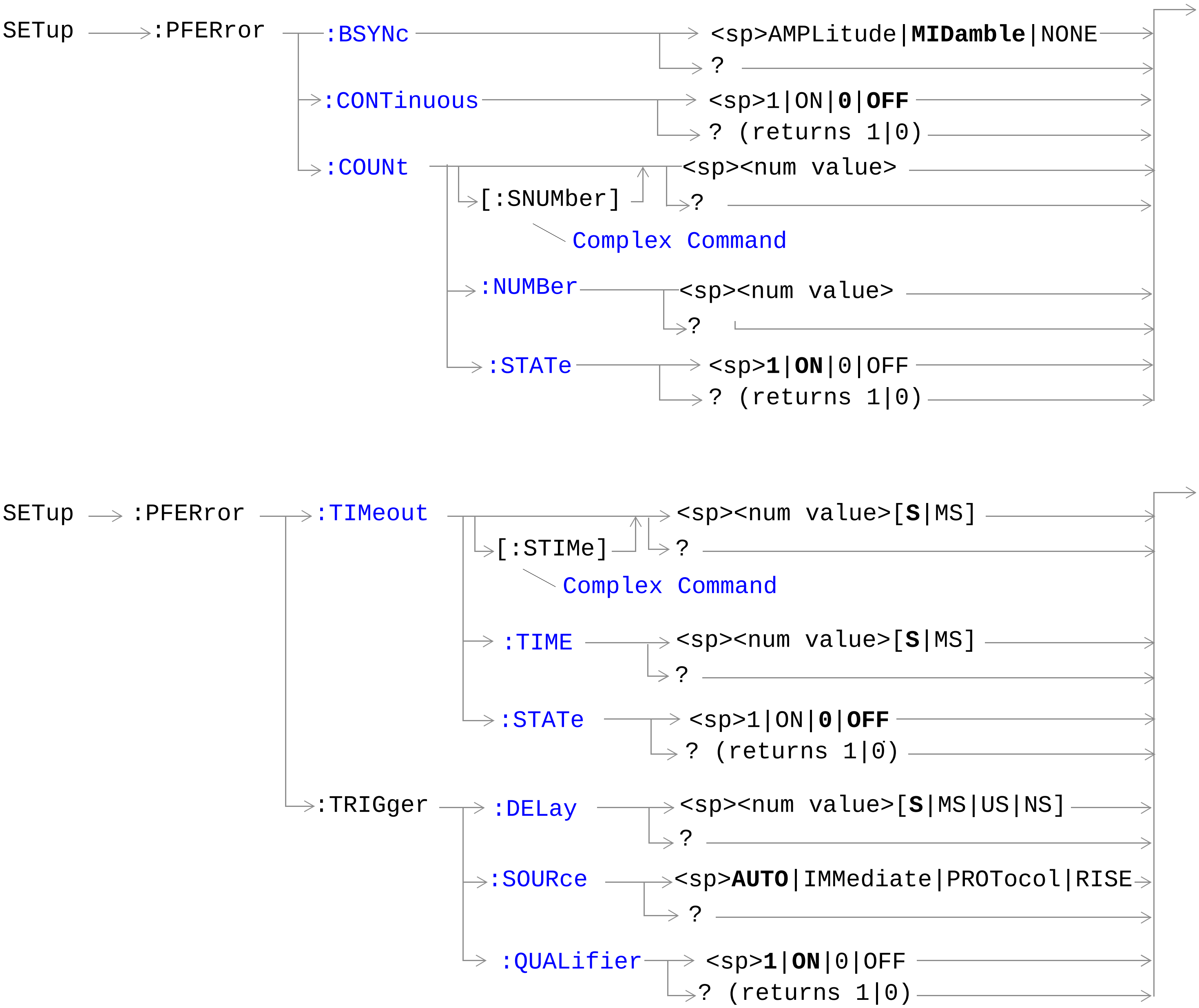

"Diagram Conventions" on page 207

SETup:PFERror:BSYNc

Function	Sets/queries the burst synchronization mode for phase/frequency measurements. See “Burst Synchronization of Measurements” on page 117.
Setting	Range: MIDamble|AMPLitude|NONE
Query	Range: MID | AMPL | NONE
*RST Setting	MIDamble
Programming Example	

```
OUTPUT 714;"SETUP:PFERROR:BSYNC MIDAMBLE" !Sets the burst synchronization.
```

SETup:PFERror:CONTinuous

Function	Sets/queries the trigger state for phase/frequency measurements.
Setting	Single trigger mode = 0|OFF Continuous trigger mode = 1|ON
Query	0|1
*RST Setting	0|off
Programming Example	

```
OUTPUT 714;"SETUP:PFERROR: CONTINUOUS OFF" !Specifies single trigger mode for
                                           !phase/frequency measurements.
```

SETup:PFERror:COUNt[:SNUMber]

Function	Sets/queries the number of phase/frequency measurements the test set will make and turns the multi-measurement count state on.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	0 | off
Programming Example	

```
OUTPUT 714;"SETUP:PFERROR:COUNT:SNUMBER 100" !Sets the value to 100 and the
                                             !state to on
```

SETup:PFERror:COUNt:NUMBer

Function	Sets/queries the number of phase/frequency measurements the Test Set will make when the multi-measurement count state is on.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10

Programming Example

```
OUTPUT 714;"SETUP:PFERROR:COUNT:NUMBER 55" !Sets the multi-measurement count
                                           !value to 55.
```

SETup:PFERror:COUNt:STATe

Function	Sets/queries the phase/frequency multi-measurement count state.
Setting	Range: 0|OFF | 1|ON
Query	0|1
*RST Setting	0|off

Programming Example

```
OUTPUT 714;"SETUP:PFERROR:COUNT:STATE ON" !Turns on multi-measurement mode for
                                          !the phase/frequency measurement.
```

SETup:PFERror:TIMeout[:STIMe]

Function	Sets/queries the phase/frequency measurement timeout value in seconds and sets the timeout state to on. The units (S|MS) are optional, if no units are specified then unit default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:PFERROR:TIMEOUT:STIME 3" !Sets the timeout state to on and the
                                           !timeout value to 3 seconds.
```

SETup:PFERror:TIMeout:TIME

Function	Sets/queries the timeout value in seconds that will be used for phase/frequency measurements when the timeout state is ON. The units (S | MS) are optional, if no units are specified then unit default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds
Programming Example	

```
OUTPUT 714;"SETUP:PFERROR:TIMEOUT:TIME 4" !Sets the timeout value to 4 seconds.
```

SETup:PFERror:TIMeout:STATe

Function	Selects/queries the timeout state for a phase/frequency measurement.
Setting	0 | OFF | 1 | ON
Query	0 | 1
*RST Setting	0 | off
Programming Example	

```
OUTPUT 714;"SETUP:PFERROR:TIMEOUT:STATE ON" !Sets the timeout state to on for a
                                            !Phase/Frequency measurement.
```

SETup:PFERror:TRIGger:DELay

Function	Sets/queries the trigger delay time in seconds for a phase/frequency measurement. The units (S | MS | US | NS) are optional, if no units are specified then units default to S. See “Phase and Frequency Error Measurement Description” on page 84
Setting	Range: –2.31 ms to +2.31 ms Resolution: 5 significant digits or 100 ns, whichever is greater
Query	Range: –2.31 ms to +2.31 ms Resolution: 5 significant digits or 100 ns, whichever is greater
*RST Setting	0 seconds
Programming Example	

```
OUTPUT 714;"SETUP:PFERROR:TRIGGER:DELAY 1.2MS" !Sets trigger delay time to
                                               !1.2 milli-seconds
```

SETup:PFERror:TRIGer:SOURce

Function	Sets/queries the trigger source for phase/frequency measurements. See “Phase and Frequency Error Measurement Description” on page 84.
Range	AUTO | PROTocol | RISE | IMMediate See “Triggering of Measurements” on page 145.
Query	AUTO | PROT | RISE | IMM
*RST Setting	AUTO

Programming Example

```
OUTPUT 714;"SETUP:PFERROR:TRIGGER:SOURCE AUTO" !Sets trigger source to AUTO.
```

SETup:PFERror:TRIGger:QUALifier

Function	Selects/queries the trigger qualifier for phase/frequency measurements. See “Trigger Qualifier Description” on page 148.
Setting	Range: 0 | OFF | 1 | ON
Query	0 | 1
*RST Setting	1 | on

Programming Example

```
OUTPUT 714;"SETUP:PFERROR:TRIGGER:QUALIFIER OFF" !Sets trigger qualifier state
                                                 !to off.
```

SETup:PVTime

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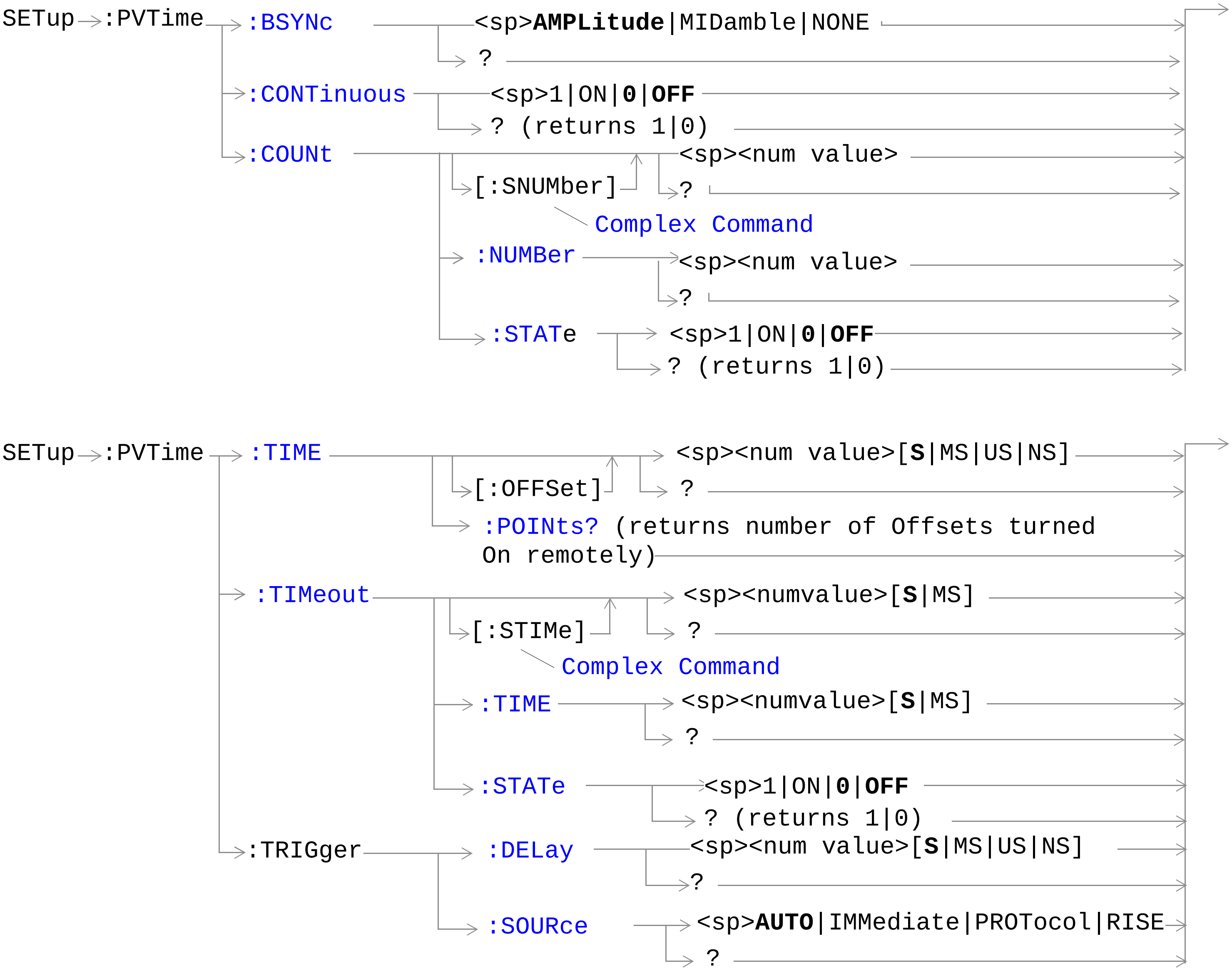


"Diagram Conventions" on page 207

SETup:PVTime:BSYNc

Function	Sets/queries the burst synchronization mode for power versus time measurements. See "Burst Synchronization of Measurements" on page 117.
Setting	MIDamble | AMPLitude | NONE
Query	MID | AMPL | NONE
*RST Setting	MID

Programming Example

```
OUTPUT 714;"SETUP:PVTIME:BSYNC MIDAMBLE" !Selects burst synchronization to on
                                         !midamble for power versus time
                                         !measurements.
```

SETup:PVTime:CONTinuous

Function	Sets/queries the trigger state for power versus time measurements. See "Measurement States" on page 147
Range	Single trigger mode = 0 | OFF Continuous trigger mode = 1 | ON
Query	0 | 1
*RST Setting	0 | OFF

Programming Example

```
OUTPUT 714;"SETUP:PVTIME: CONTINUOUS OFF" !Specifies single trigger mode for
                                          !power versus time measurements.
```

SETup:PVTime:COUNt[:SNUMber]

Function	Sets/queries the number of power versus time measurements the test set will make and turns the multi-measurement count state on.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10

Programming Example

```
OUTPUT 714;"SETUP:PVTIME:COUNT:SNUMBER 25" !Sets the state to on and the
                                           !multi-measurement count value to 25.
```

SETup:PVTime:COUNt:NUMBer

Function	Sets/queries the number of Power vs. Time measurements the test set will make when multi-measurement state is on.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10
Programming Example	

```
OUTPUT 714;"SETUP:PVTIME:COUNT:NUMBER 20" !Sets multi-measurement count value
                                          !to 20.
```

SETup:PVTime:COUNt:STATe

Function	Sets/queries power versus time multi-measurement count state.
Setting	0|OFF | 1| ON
Query	0|1
*RST Setting	0 |OFF
Programming Example	

```
OUTPUT 714;"SETUP:PVTIME:COUNT:STATE ON" !Sets multi-measurement count state
                                         !to on.
```

SETup:PVTime:TIME[:OFFSet]

Function	Sets/queries the time offsets in seconds for power vs time power measurement, (not the mask measurement). All 12 time offsets are set to on by default. If less than 12 values are sent with this command, the remaining offsets are turned off, see "Power versus Time Measurement Description" on page 90. These values are referenced to the occurrence of bit 0 in a normal burst. The units (S | MS | US | NS) are optional, if no units are specified then units default to S.
Setting	Range: 0 to 12 comma-separated values ranging from: –50 us to 593 µs Resolution: 1 ns
Query	Range: 0 to 12 comma-separated values ranging from: –50 us to 593 µs and 9.91E+37 if no offsets are specified Resolution: 1 ns
*RST Setting	Time offsets 1 through 12 are on and set to these values: time offset 1 = –28 µs time offset 2 = –18 µs time offset 3 = –10 µs time offset 4 = 0 µs time offset 5 = 321.2 µs time offset 6 = 331.2 µs time offset 7 = 339.2 µs time offset 8 = 349.2 µs time offset 9 = 542.8 µs time offset 10 = 552.8 µs time offset 11 = 560.8 µs time offset 12 =570.8 µs

Programming Example

```
OUTPUT 714;"SETUP:PVTIME:TIME:OFFSET -28.0 US, -18.0 US, -10.0 US, 0"

!Configures the first four time offset points and turns the remaining eight off.
!Using the query form of this command would return four time offset values

OUTPUT 714;"SETUP:PVTIME:TIME:OFFSET -28.0 US" !Configures the first time offset
                                               !point and turns the remaining
                                               !eleven off. Using the query form
                                               !of this command would return one
                                               !time offset value

OUTPUT 714;"SETUP:PVTIME:TIME:OFFSET" !Turns all 12 offset points off. Using the
                                      !query form of this command would return
                                      !9.91E+37 (NAN)
```

SETup:PVTime:TIME:POINts?

Function	Queries the number of Measurement Offset points that are turned on during a power versus time measurement.
Query	Range: 0 to 12 Resolution: 1
*RST Setting	12
Comments	This command is useful for determining how many time values will be returned in a comma-separated list when the "SETup:PVTime:TIME[:OFFSet]" query is sent, and how many power values will be returned when the "FETCh:PVTime:POWer[:ALL][:MAXimum]?" on page 334 command is sent.

SETup:PVTime:TIMeout[:STIMe]

Function	Sets/queries the timeout value in seconds that will be used for power versus time measurements. This command also sets the timeout state to on. The units (S | MS) are optional, if no units are specified then units default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:PVTIME:TIMEOUT:STIME 4" !Sets the state to on and the timeout
                                          !value to 4 seconds.
```

SETup:PVTime:TIMeout:TIME

Function	Sets/queries the timeout value in seconds that will be used for power versus time measurements. The units (S | MS) are optional, if no units are specified then units default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:PVTIME:TIMEOUT:TIME 6" !Sets the timeout value to 6 seconds.
```

SETup:PVTime:TIMeout:STATe

Function	Sets/queries power versus time timeout state.
Setting	0 |OFF | 1 | ON
Query	0 | 1
*RST Setting	0 | OFF
Programming Example	

```
OUTPUT 714;"SETUP:PVTIME:TIMEOUT:STATE ON" !Sets timeout state to on.
```

SETup:PVTime:TRIGger:DELay

Function	Selects/queries the trigger delay in seconds for power versus time measurements. The units (S | MS | US | NS) are optional, if no units are specified then units default to S.
Range	Range: –2.31 ms to +2.31 ms Resolution: 5 significant digits or 100 ns, whichever is greater
Query	Range: –2.31 ms to +2.31 ms Resolution: 5 significant digits or 100 ns, whichever is greater
*RST Setting	0 seconds
Programming Example	

```
OUTPUT 714;"SETUP:PVTIME:TRIGGER:DELAY 1.1MS" !Sets trigger delay value to 1.1
                                              !milli-seconds.
```

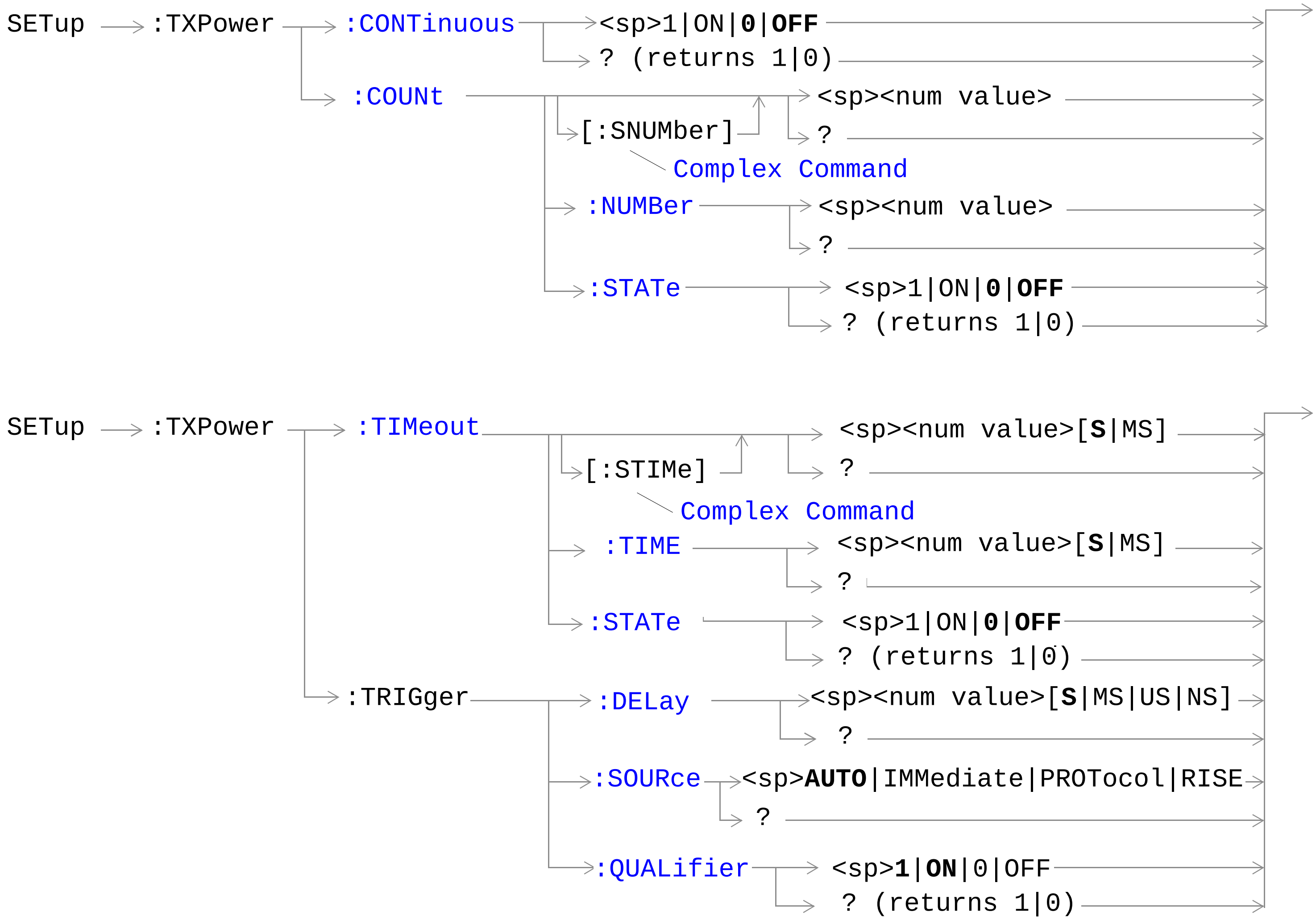
SETup:PVTime:TRIGger:SOURce

Function	Selects/queries the trigger source for power versus time measurements. See “Triggering of Measurements” on page 145
Setting	AUTO | PROTocol | RISE | IMMediate
Query	AUTO | PROT | RISE | IMM
*RST Setting	AUTO
Programming Example	

```
OUTPUT 714;"SETUP:PVTIME:TRIGGER:SOURCE AUTO" !Sets trigger source to AUT.
```

SETup:TXPower

July 7, 1999



"Diagram Conventions" on page 207

SETup:TXPower:CONTinuous

Function	Sets/queries the trigger state for TX carrier power measurements.
Setting	Single trigger mode = 0 | OFF Continuous trigger mode = 1 | ON
Query	0 | 1
*RST Setting	0 | off
Program Example	OUTPUT 714;"SETUP:TXPOWER: CONTINUOUS OFF" ! specifies single trigger mode for TX Carrier Power measurements.

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER: CONTINUOUS OFF" !Specifies single trigger mode for
                                           !TX Carrier Power measurements.
```

SETup:TXPower:COUNt[:SNUMber]

Function	Sets/queries the number of TX carrier power measurements the test set will make and turns the multi-measurement count state on.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER:COUNT:SNUMBER 99" !Sets the state to on and the
                                            !multi-measurement count value
                                            !to 99.
```

SETup:TXPower:COUNt:NUMBer

Function	Sets/queries the number of TX power measurements the test set will make when the multi-measurement state is on.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER:COUNT:NUMBER 5" !Sets the TX Power multi-measurement
                                          !count number to 5.
```

SETup:TXPower:COUNt:STATe

Function	Sets/queries the TX power multi-measurement count state.
Setting	0 | Off | 1 | On
Query	0 | 1
*RST Setting	0 | off

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER:COUNT:STATE ON" !Sets the multi-measurement count
                                          !state to on.
```

SETup:TXPower:TIMeout[:STIMe]

Function	Sets/queries TX carrier power measurement timeout value and also sets the state to on. The units (S | MS) are optional, if no units are specified then units default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER:TIMEOUT:STIME 20" !Sets the state to on and the
                                            !timeout value to 20 seconds.
```

SETup:TXPower:TIMeout:TIME

Function	Sets/queries the timeout value in seconds that will be used for TX power measurements. The units (S | MS) are optional, if no units are specified then units default to S.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST Setting	10 seconds

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER:TIMEOUT:TIME 20" !Sets the TX power measurement
                                           !timeout to 20 seconds.
```

SETup:TXPower:TIMeout:STATe

Function	Selects/queries TX carrier power measurement timeout state.
Setting	0|OFF | 1|ON
Query	0|1
*RST Setting	0|off

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER:COUNT:STATE 1" !Turns the TX carrier power timeout
                                         !state on.
```

SETup:TXPower:TRIGger:DELay

Function	Sets/queries the trigger delay in seconds for TX carrier power measurements. The units (S|MS|US|NS) are optional, if no units are specified then units default to S.
Setting	Range: –2.31 ms to +2.31 ms Resolution: 5 significant digits or 100 ns, whichever is greater
Query	Range: –2.31 ms to +2.31 ms Resolution: 5 significant digits or 100 ns, whichever is greater
*RST Setting	zero seconds

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER:TRIGGER:DELAY 1.5MS" !Set trigger delay time to
                                               !1.5 milliseconds
```

SETup:TXPower:TRIGger:SOURce

Function	Selects/queries the trigger source for TX carrier power measurements. See “Triggering of Measurements” on page 145
Setting	AUTO|PROTocol|RISE|IMMediate
Query	AUTO|PROT|RISE|IMM
*RST Setting	AUTO

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER:TRIGGER:SOURCE AUTO" !Sets trigger source to AUTO.
```

SETup:TXPower:TRIGger:QUALifier

Function	Sets/queries the trigger qualification for TX carrier power measurements. When ON, an automatic trigger re-arm occurs if a measurement is triggered when no valid signal (burst) is present. See "Trigger Qualifier Description" on page 148
Setting	0|OFF | 1|ON
Query	0|1
*RST Setting	1|on

Programming Example

```
OUTPUT 714;"SETUP:TXPOWER:TRIGGER:QUALIFIER ON" !Sets trigger qualifier state
                                                 !to on.
```

STATus Subsystem Description

Description

The STATus subsystem is used to communicate current test set status information to the controlling application program.

Status Reporting Structure (Register Fan-Out)

To see a diagram showing status register fan-out, which shows the binary weighting of each summary message bit, refer to "Overview of STATus Reporting Structure" on page 139

Syntax Diagrams and Command Descriptions

Status Register Bit Definitions

STATus:OPERation

December 1, 1999

```
STATus :OPERation ──┬──────────────────> ? (reads event register)
                    ├─> [:EVENt]
                    ├─> :CONDition? (reads condition register)
                    ├─> :ENABle ──┬─> <sp><num value> (writes to enable register)
                    │             └─> ? (reads enable register)
                    ├─> :NTRansition ──┬─> <sp><num value> (writes to negative
                    │                  │   transition register)
                    │                  └─> ? (reads negative transition register)
                    └─> :PTRansition ──┬─> <sp><num value> (writes to positive
                                       │   transition register)
                                       └─> ? (reads positive transition register)
```

```
STATus :OPERation:CALL ──┬──────────────────> ? (reads event register)
                         ├─> [:EVENt]
                         ├─> :CONDition? (reads condition register)
                         ├─> :ENABle ──┬─> <sp><num value> (writes to enable
                         │             │   register)
                         │             └─> ? (reads enable register)
                         ├─> :NTRansition ──┬─> <sp><num value> (writes to nega-
                         │                  │   tive
                         │                  │   transition register)
                         │                  └─> ? (reads negative transition
                         │                      register)
                         └─> :PTRansition ──┬─> <sp><num value> (writes to
                                            │   positive transition register)
                                            └─> ? (reads positive transition
                                                register)
```

STATus :OPERation:CALL:GSM

? (reads event register)

[:EVENt]

:CONDition? (reads condition register)

:ENABle

<sp><num value> (writes to enable register)

? (reads enable register)

:NTRansition

<sp><num value> (writes to nega-
tive
transition register)

? (reads negative transition register)

:PTRansition

<sp><num value> (writes to positive transition register)

? (reads positive transition register)

STATus :OPERation:NMRReady

? (reads event register)

[:EVENt]

:CONDition? (reads condition register)

:ENABle

<sp><num value> (writes to enable register)

? (reads enable register)

:NTRansition

<sp><num value> (writes to nega-
tive
transition register)

? (reads negative transition register)

:PTRansition

<sp><num value> (writes to positive transition register)

? (reads positive transition register)

```
STATus :OPERation:NMRReady:GSM
    [:EVENt] ? (reads event register)
    :CONDition? (reads condition register)
    :ENABle
        <sp><num value> (writes to enable register)
        ? (reads enable register)
    :NTRansition
        <sp><num value> (writes to negative transition register)
        ? (reads negative transition register)
    :PTRansition
        <sp><num value> (writes to positive transition register)
        ? (reads positive transition register)
```

“Diagram Conventions” on page 207

STATus:OPERation Condition Register Bit Assignment

The OPERation status register set contains bits which give an indication of conditions that are part of the test set's normal operation.

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Processing SYSTem:SYNChronized Command	This condition bit will be "pulsed" by the SYSTem:SYNChronized command. This will allow the status system to indicate that the input buffer is synchronized to the point where this command is parsed and that all prior sequential commands are completed and all prior overlapped commands have started.
11	2048	Reserved for future use	This bit will always be 0.
10	1024	CALL Summary	This bit is the summary bit for the OPERation:CALL register.
9	512	NMRReady (New Measurement Result Ready) Summary	This bit is the summary bit for the OPERation:NMRReady register.
8	256	Reserved for future use.	This bit will always be 0.
7	128	Reserved for future use.	This bit will always be 0.
6	64	Reserved for future use.	This bit will always be 0.
5	32	Reserved for future use.	This bit will always be 0.
4	16	Reserved for future use.	This bit will always be 0.
3	8	Reserved for future use.	This bit will always be 0.
2	4	Reserved for future use.	This bit will always be 0.
1	2	Reserved for future use.	This bit will always be 0.
0	1	Extension Bit	This bit will always be 0.

Program Examples - STATus:OPERation

```
OUTPUT 714;”STATUS:OPERATION:EVENT?” !Queries the
          !Operation Event Register.
OUTPUT 714;”STATUS:OPERATION:CONDITION?” !Queries the
          !Operation Condition Register.
OUTPUT 714;”STATUS:OPERATION:ENABLE 1024” !Sets bit
          !10 (2^10 equals 1024) of the Operation Enable Register.
OUTPUT 714;”STATUS:OPERATION:NTR 1024” !Sets bit
          !10 (2^10 equals 1024) of the Operation Negative Transition Register.
OUTPUT 714;”STATUS:OPERATION:PTR 512” !Sets bit
!         9 (2^9 equals 512) of the Operation Positive Transition Register.
```

STATus:OPERation:CALL Condition Register Bit Assignment

The STATus:OPERation:CALL register bits will be used to indicate status of processes that occur during normal call processing operations.

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be 0.
11	2048	Reserved for future use.	This bit will always be 0.
10	1024	Reserved for future use.	This bit will always be 0.
9	512	Reserved for future use.	This bit will always be 0.
8	256	Reserved for future use.	This bit will always be 0.
7	128	Reserved for future use.	This bit will always be 0.
6	64	Reserved for future use.	This bit will always be 0.
5	32	Reserved for future use.	This bit will always be 0.
4	16	Reserved for future use.	This bit will always be 0.
3	8	Reserved for future use.	This bit will always be 0.
2	4	GSM Summary bit	This bit is the summary bit for the OPERation:CALL:GSM register.
1	2	Reserved for future use.	This bit will always be 0.
0	1	Extension Bit	This bit will always be 0.

Program Examples - STATus:OPERation:CALL

```
OUTPUT 714;"STATUS:OPERATION:CALL:EVENT?" !Queries the Operation Call Event
                                          !Register.
OUTPUT 714;"STATUS:OPERATION:CALL:CONDITION?" !Queries the Operation Call
                                              !Condition Register.
OUTPUT 714;"STATUS:OPERATION:CALL:ENABLE 4" !Sets the Operation Call Enable
                                            !Register for bit 4.
OUTPUT 714;"STATUS:OPERATION:CALL:NTR 4" !Sets the Negative Transition
                                         !Register for bit 4.
OUTPUT 714;"STATUS:OPERATION:CALL:PTR 256" !Sets the Positive Transition
                                           !Register for bit 256.
```

STATus:OPERation:CALL:GSM Condition Register Bit Assignment

The STATus:OPERation:CALL:GSM register bits will be used to indicate status of processes that occur during normal GSM call processing operations.

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be 0.
11	2048	Reserved for future use.	This bit will always be 0.
10	1024	Reserved for future use.	This bit will always be 0.
9	512	Reserved for future use.	This bit will always be 0.
8	256	BS Disconnecting	This bit will be a 1 when: • Active Cell mode - the call processing state reaches (or is in) the idle state • Test mode - the test set has noted a base station termination.
7	128	BS Originating	This bit will be a 1 when: • Active Cell mode - the call processing state leaves the idle state • Test mode - the test set has noted a base station origination.
6	64	Call Control Status Changing	This bit is set to a 1 when the call control status change detector has been armed.

Bit Number	Binary Weighting	Condition	Description
5	32	TCH Assignment in Progress	This bit will be a 1 when: • The channel assignment is successfully completed (when a call is established). • The test set notes a change in the TCH ARFCN, cell band, TCH timeslot, or mobile station timing advance. • An error message is generated.
4	16	BCH Changing	This bit will be a 1 when: • The downlink signal is transmitting on the new broadcast channel. • The test set has noted a change in cell band.
3	8	Call Control Status Alerting	This bit will be a 1 when the test set is in the call alerting state (ringing).
2	4	Call Control Status Connected	This bit will be a 1 when the test set is in the call connected state.
1	2	Call Control Status Idle	This bit will be a 1 when the test set is in the call idle state.
0	1	Extension Bit	This bit will always be 0.

Program Examples - STATus:OPERation:CALL:GSM

```
OUTPUT 714;”STATUS:OPERATION:CALL:GSM:EVENT?” !Queries the GSM Operation Call
                                          !Event Register.
OUTPUT 714;”STATUS:OPERATION:CALL:GSM:CONDITION?” !Queries the GSM Operation Call
                                              !Condition Register.
OUTPUT 714;”STATUS:OPERATION:CALL:GSM:ENABLE 4” !Sets the GSM Operation Call
                                            !Enable Register for bit 4.
OUTPUT 714;”STATUS:OPERATION:CALL:GSM:NTR 4” !Sets the GSM Negative Transition
                                         !Register for bit 4.
OUTPUT 714;”STATUS:OPERATION:CALL:GSM:PTR 256” !Sets the GSM Positive Transition
                                           !Register for bit 256.
```

STATus:OPERation:NMRReady Condition Register Bit Assignment

The STATus:OPERation:NMRReady register bits indicate when a measurement has been completed and new measurement results are available.

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be 0.
11	2048	Reserved for future use.	This bit will always be 0.
10	1024	Reserved for future use.	This bit will always be 0.
9	512	Reserved for future use.	This bit will always be 0.
8	256	Reserved for future use.	This bit will always be 0.
7	128	Reserved for future use.	This bit will always be 0.
6	64	Reserved for future use.	This bit will always be 0.
5	32	Reserved for future use.	This bit will always be 0.
4	16	Reserved for future use.	This bit will always be 0.
3	8	Reserved for future use.	This bit will always be 0.
2	4	GSM Summary bit	This bit is the summary bit for the OPERation:NMRReady:GSM register.
1	2	Reserved for future use.	This bit will always be 0.
0	1	Extension Bit	This bit will always be 0.

Program Examples - STATus:OPERation:NMRReady

```
OUTPUT 714;”STATUS:OPERATION:NMRREADY:EVENT?” !Queries the New Measurement
                                              !Results Ready Event Register.
OUTPUT 714;”STATUS:OPERATION:NMRREADY:CONDITION?” !Queries the New Measurement
                                                  !Results Ready
                                                  !Condition Register.
OUTPUT 714;”STATUS:OPERATION:NMRREADY:ENABLE 16” !Sets New Measurement Results
                                                 !Ready Enable Regigter
                                                 !for bit 16.
OUTPUT 714;”STATUS:OPERATION:NMRREADY:NTR 2” !Sets the New Measurement Results
                                             !Ready Negative Transition
                                             !Register for bit 4.
OUTPUT 714;”STATUS:OPERATION:NMRREADY:PTR 4” !Sets the New Measurement
                                             !Results Ready Positive
                                             !Transition Register
                                             !for bit 4
```

STATus:OPERation:NMRReady:GSM Condition Register Bit Assignment

The STATus:OPERation:NMRReady:GSM register bits indicate when a GSM measurement has been completed and new measurement results are available.

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be 0.
11	2048	Reserved for future use.	This bit will always be 0.
10	1024	DPOWer New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.
9	512	I/Q Tuning New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.
8	256	BERRor New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.
7	128	FBERror New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.
6	64	DAUDio New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.
5	32	AAUDio New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.

Bit Number	Binary Weighting	Condition	Description
4	16	ORFSpectrum New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.
3	8	PFERror New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.
2	4	PVTime New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.
1	2	TXPower New Measurement Result Ready	This bit will be a 1 if the measurement has been initiated. This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See “Measurement States” on page 147.
0	1	Extension Bit	This bit will always be 0.

Program Examples - STATus:OPERation:NMRReady

```
OUTPUT 714;”STATUS:OPERATION:NMRREADY:GSM:EVENT?” !Queries the GSM New Measurement
                                              !Results Ready Event Register.
OUTPUT 714;”STATUS:OPERATION:NMRREADY:GSM:CONDITION?” !Queries the GSM New Measurement
                                                  !Results Ready
                                                  !Condition Register.
OUTPUT 714;”STATUS:OPERATION:NMRREADY:GSM:ENABLE 16” !Sets the GSM New Measurement Results
                                                 !Ready Enable Regigter
                                                 !for bit 16.
OUTPUT 714;”STATUS:OPERATION:NMRREADY:GSM:NTR 2” !Sets the GSM New Measurement Results
                                             !Ready Negative Transition
                                             !Register for bit 4.
OUTPUT 714;”STATUS:OPERATION:NMRREADY:GSM:PTR 4” !Sets the GSM New Measurement
                                             !Results Ready Positive
                                             !Transition Register
                                             !for bit 4
```

STATus:PRESet

July 12, 1999

`STATus → :PRESet →`

"Diagram Conventions" on page 207

STATus:PRESet

Function	Presets the Status Subsystem Sets all Enable Registers to 0 (not enabled). Sets all Positive Transition Registers (PTR) to 1 (positive transitions enabled). Sets all Negative Transition Registers (NTR) to 0 (negative transitions disabled).

STATus:QUEStionable

December 1, 1999

```
STATus :QUEStionable
    ? (reads event register)
    [:EVENt]
    :CONDition? (reads condition register)
    :ENABle
        <sp><num value> (writes to enable register)
        ? (reads enable register)
    :NTRansition
        <sp><num value> (writes to negative transition register)
        ? (reads negative transition register)
    :PTRansition
        <sp><num value> (writes to positive transition register)
        ? (reads positive transition register)
```

```
STATus :QUEStionable:CALL
    ? (reads event register)
    [:EVENt]
    :CONDition? (reads condition register)
    :ENABle
        <sp><num value> (writes to enable register)
        ? (reads enable register)
    :NTRansition
        <sp><num value> (writes to negative transition register)
        ? (reads negative transition register)
    :PTRansition
        <sp><num value> (writes to positive transition register)
        ? (reads positive transition register)
```

STATus → :QUEStionable:CALL:GSM → [:EVENt] ? (reads event register)

→ :CONDition? (reads condition register)

→ :ENABle → <sp><num value> (writes to enable register)

→ ? (reads enable register)

→ :NTRansition → <sp><num value> (writes to negative transition register)

→ ? (reads negative transition register)

→ :PTRansition → <sp><num value> (writes to positive transition register)

→ ? (reads positive transition register)

STATus → :QUEStionable:ERRors → [:EVENt] ? (reads event register)

→ :CONDition? (reads condition register)

→ :ENABle → <sp><num value> (writes to enable register)

→ ? (reads enable register)

→ :NTRansition → <sp><num value> (writes to negative transition register)

→ ? (reads negative transition register)

→ :PTRansition → <sp><num value> (writes to positive transition register)

→ ? (reads positive transition register)

```
STATus :QUEStionable:ERRors:GSM
    ? (reads event register)
    [:EVENt]
    :CONDition? (reads condition register)
    :ENABle
        <sp><num value> (writes to enable register)
        ? (reads enable register)
    :NTRansition
        <sp><num value> (writes to negative transition register)
        ? (reads negative transition register)
    :PTRansition
        <sp><num value> (writes to positive transition register)
        ? (reads positive transition register)
```

```
STATus :QUEStionable:HARDware
    ? (reads event register)
    [:EVENt]
    :CONDition? (reads condition register)
    :ENABle
        <sp><num value> (writes to enable register)
        ? (reads enable register)
    :NTRansition
        <sp><num value> (writes to negative transition register)
        ? (reads negative transition register)
    :PTRansition
        <sp><num value> (writes to positive transition register)
        ? (reads positive transition register)
```

"Diagram Conventions" on page 207

STATus:QUEStionable Condition Register Bit Assignment

The STATus:QUEStionable register contains bits which give an indication that the data currently being acquired or generated is of questionable quality due to some condition affecting the parameter associated with that bit.

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be set to 0.
11	2048	QUEStionable:HARDware summary	This bit is the summary bit for the QUEStionable:HARDware register.
10	1024	QUEStionable:CALL summary	This bit is the summary bit for the QUEStionable:CALL register.
9	512	Reserved for future use.	This bit will always be 0.
8	256	Reserved for future use.	This bit will always be 0.
7	128	Reserved for future use.	This bit will always be 0.
6	64	Reserved for future use.	This bit will always be 0.
5	32	Reserved for future use.	This bit will always be 0.
4	16	Reserved for future use.	This bit will always be 0.
3	8	Reserved for future use.	This bit will always be 0.
2	4	Reserved for future use.	This bit will always be 0.
1	2	QUEStionable:ERRors summary	This bit is the summary bit for the QUEStionable:ERRors register.
0	1	Reserved for future use.	This bit will always be 0.

Program Example - STATus:QUEStionable Condition Register Bit Assignment

```
OUTPUT 714;”STATUS:QUESTIONABLE:EVENT?” !Queries the Questionable Event
                                        !Register.
```

STATus:QUEStionable:CALL Condition Register Bit Assignment

The STATus:QUEStionable:CALL registers will contain information about which event(s) occurred during call processing that indicate why the call processing procedure failed.

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be 0.
11	2048	Reserved for future use.	This bit will always be 0.
10	1024	Reserved for future use.	This bit will always be 0.
9	512	Reserved for future use.	This bit will always be 0.
8	256	Reserved for future use.	This bit will always be 0.
7	128	Reserved for future use.	This bit will always be 0.
6	64	Reserved for future use.	This bit will always be 0.
5	32	Reserved for future use.	This bit will always be 0.
4	16	Reserved for future use.	This bit will always be 0.
3	8	Reserved for future use.	This bit will always be 0.
2	4	GSM Summary bit	This bit is the summary bit for the QUEStionable:CALL:GSM register.
1	2	Reserved for future use.	This bit will always be 0.
0	1	Extension Bit	This bit will always be 0.

Program Example - STATus:QUEStionable:CALL Condition Register Bit Assignment

```
OUTPUT 714;"STATUS:QUESTIONABLE:CALL:CONDITION?" !Queries the Questionable
                                             !Call Condition Register
```

STATus:QUEStionable:CALL:GSM Condition Register Bit Assignment

The STATus:QUEStionable:CALL:GSM registers will contain information about which event(s) occurred during GSM call processing that indicate why the call processing procedure failed.

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be 0.
11	2048	Reserved for future use.	This bit will always be 0.
10	1024	Reserved for future use.	This bit will always be 0.
9	512	Call disconnected: Channel Mode not supported	This bit is a 1 if the mobile station is not capable of supporting the selected channel mode.
8	256	Identification failure	This bit is a 1 if the identity request timer (T3270) has expired. The timer expires if the mobile does not respond to identity request message, within 5 seconds.
7	128	Channel Assignment exceeded specified number of frames	This bit is a 1 if the channel assignment exceeded the specified number of frames.
6	64	Call disconnected: No Response to Page	This bit is a 1 if the paging timer (T3113) has expired. The timer expires if the mobile does not respond to a paging request message, within 5 seconds.
5	32	Call disconnected: Handover Failure	This bit is a 1 if the physical information timer (T3105) has expired. The timer expires if the mobile does not respond to a physical information message, within 50 ms. If the timer has expired and correctly decoded data or a TCH frame has not been received, newly allocated channels are released.
4	16	Call disconnected: Channel Assignment Failure	This bit is a 1 if the channel assignment timer (T3107) has expired. The timer expires if the mobile does not respond to an assignment command message within 3 seconds.
3	8	Call disconnected: Immediate Assignment Failure	This bit is a 1 if the immediate assignment timer (T3101) has expired. The timer expires after 1 second if a signaling link is not established when an immediate assignment or immediate assignment extended message is sent. If the timer expires, newly allocated channels are released.

Bit Number	Binary Weighting	Condition	Description
2	4	Call disconnected: Radio Link Failure	This bit is a 1 if the radio link time out (T100) has expired. The timer expires if a radio link is not detected within four SACCH mulitframes (1.92 seconds if no SACCH is present).
1	2	Call disconnected: Data Link Failure	This bit is a 1 if the data link timer (T200) has expired. This timer is used for retransmission on the data link. The expiration period of the timer depends on the message type (for FACCH, 155 ms).
0	1	Extension Bit	This bit will always be 0.

Program Example - STATus:QUEStionable:CALL:GSM Condition Register Bit Assignment

```
OUTPUT 714;"STATUS:QUESTIONABLE:CALL:GSM:CONDITION?" !Queries the GSM Questionable
                                                 !Call Condition Register
```

STATus:QUEStionable:ERRors Condition Register Bit Assignment

The STATus:QUEStionable:ERRors register bits will be used to indicate information about test set device-specific errors (positive error numbers).

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be 0.
11	2048	Reserved for future use.	This bit will always be 0.
10	1024	Reserved for future use.	This bit will always be 0.
9	512	Reserved for future use.	This bit will always be 0.
8	256	Reserved for future use.	This bit will always be 0.
7	128	Reserved for future use.	This bit will always be 0.
6	64	Reserved for future use.	This bit will always be 0.
5	32	Reserved for future use.	This bit will always be 0.
4	16	Reserved for future use.	This bit will always be 0.
3	8	Reserved for future use.	This bit will always be 0.
2	4	GSM Summary bit	This bit is the summary bit for the QUEStionable:ERRors:GSM register.
1	2	Reserved for future use.	This bit will always be 0.
0	1	Extension Bit	This bit will always be 0.

Program Example - STATus:QUEStionable:ERRors Condition Register Bit Assignment

```
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:EVENT?" !Queries the Questionable Errors
                                               !Event Register
```

STATus:QUEStionable:ERRors:GSM Condition Register Bit Assignment

The STATus:QUEStionable:ERRors:GSM register bits will be used to indicate information about GSM test set device-specific errors (positive error numbers).

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be 0.
11	2048	Reserved for future use.	This bit will always be 0.
10	1024	Reserved for future use.	This bit will always be 0.
9	512	+900 Errors	The condition bit will be pulsed to a 1 and immediately back to 0 if an error in the +900 to +999 range occurs. Query the Event Register to find out if one of these errors occurred.
8	256	+800 Errors	The condition bit will be pulsed to a 1 and immediately back to 0 if an error in the +800 to +899 range occurs. Query the Event Register to find out if one of these errors occurred.
7	128	+700 Errors	The condition bit will be pulsed to a 1 and immediately back to 0 if an error in the +700 to +799 range occurs. Query the Event Register to find out if one of these errors occurred.
6	64	+600 Errors	The condition bit will be pulsed to a 1 and immediately back to 0 if an error in the +600 to +699 range occurs. Query the Event Register to find out if one of these errors occurred.
5	32	+500 Errors	The condition bit will be pulsed to a 1 and immediately back to 0 if an error in the +500 to +599 range occurs. Query the Event Register to find out if one of these errors occurred.
4	16	+400 Errors	The condition bit will be pulsed to a 1 and immediately back to 0 if an error in the +400 to +499 range occurs. Query the Event Register to find out if one of these errors occurred.
3	8	+300 Errors	The condition bit will be pulsed to a 1 and immediately back to 0 if an error in the +300 to +399 range occurs. Query the Event Register to find out if one of these errors occurred.

Bit Number	Binary Weighting	Condition	Description
2	4	+200 Errors	The condition bit will be pulsed to a 1 and immediately back to 0 if an error in the +200 to +299 range occurs. Query the Event Register to find out if one of these errors occurred.
1	2	+100 Errors	The condition bit will be pulsed to a 1 and immediately back to 0 if an error in the +100 to +199 range occurs. Query the Event Register to find out if one of these errors occurred.
0	1	Extension Bit	This bit will always be 0.

Program Example - STATus:QUEStionable:ERRors:GSM Condition Register Bit Assignment

```
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:GSM:EVENT?" !Queries the GSM Questionable
                                               !Errors Event Register
```

STATus:QUEStionable:HARDware Condition Register Bit Assignment

The STATus:QUEStionable:HARDware register bits give an indication that the data/signals currently being acquired or generated are of questionable quality.

Bit Number	Binary Weighting	Condition	Description
15	32768	Not Used. Defined by SCPI.	This bit will always be 0.
14	16384	Reserved for future use.	This bit will always be 0.
13	8192	Reserved for future use.	This bit will always be 0.
12	4096	Reserved for future use.	This bit will always be 0.
11	2048	Reserved for future use.	This bit will always be 0.
10	1024	Reserved for future use.	This bit will always be 0.
9	512	Reserved for future use.	This bit will always be 0.
8	256	Reserved for future use.	This bit will always be 0.
7	128	Reserved for future use.	This bit will always be 0.
6	64	Reserved for future use.	This bit will always be 0.
5	32	Reserved for future use.	This bit will always be 0.
4	16	Power-up Self Test(s) Failed	This bit will be a 1 if the power-up self tests failed.
3	8	Reserved for future use.	This bit will always be 0.
2	4	Reserved for future use.	This bit will always be 0.
1	2	Reserved for future use.	This bit will always be 0.
0	1	Extension Bit.	This bit will always be 0.

Program Example - STATus:QUEStionable:HARDware Condition Register Bit Assignment

```
OUTPUT 714;"STATUS:QUESTIONABLE:HARDWARE:CONDITION?" !Queries the Questionable
                                                     !Hardware Condition
                                                     !Register.
```

Status Byte Register

July 12, 1999

*STB?

*STB?

NOTE The Status Byte Register can also be read with a serial poll. For example, the command "Status_byte = SPOLL(714)" would perform a serial poll of the Status Byte Register, returning and releasing RQS (bit 6).

Status Byte Register Bit Assignments

Bit Number	Binary Weighting	Label	Description
7	128	STATus: OPERation	Summarizes the STATus: OPERation Status Register, which fans out to the NMRReady and CALL Status Registers.
6	64	RQS (SRQ TRUE?)/Master Summary Status	RQS is read by a serial poll (SPOLL) Master Summary Status is read by a *STB? query - defined by IEEE 488.2
5	32	Standard Event Status Register	Summarizes the Standard Event Status Register
4	16	Message Available	SCPI - Defined
3	8	STATus: QUEStionable Status Register	Summary Message comes from the STATus: QUEStionable Status Register, which fans out to the CALL and HARDware Status Registers
2	4	Error/ Event Queue	SCPI - Defined
1	2	Reserved	
0	1	Reserved	

Program Example - Status Byte Register Bit Assignments

```
OUTPUT 714;"*STB?" !Queries the Status Byte.
```

Standard Event Status Register

July 12, 1999

*ESR?

*ESR? → Reads and clears the Std Event Status Register.

*ESE?

*ESE? → Reads the Std Event Status Register Enable Register

*ESE

*ESE → Writes to the Std Event Status Register Enable Register

“Diagram Conventions” on page 207

Standard Event Status Register Bit Assignment

Bit Number	Binary Weighting	Condition	Description
15	32768	Reserved by IEEE.	This bit will always be 0.
14	16384	Reserved by IEEE.	This bit will always be 0.
13	8192	Reserved by IEEE.	This bit will always be 0.
12	4096	Reserved by IEEE.	This bit will always be 0.
11	2048	Reserved by IEEE.	This bit will always be 0.
10	1024	Reserved by IEEE.	This bit will always be 0.
9	512	Reserved by IEEE.	This bit will always be 0.
8	256	Reserved by IEEE.	This bit will always be 0.
7	128	Power On	This bit is set to 1 if the power supply has been turned off and on since the last time this register was read or otherwise cleared. Defined in "IEEE Std. 488.2-1992",11.5.1.1.2
6	64	Reserved for future use.	This bit will always be 0.
5	32	Command Error	This bit is set to 1 if the test set detects an error while trying to process a command. The following events cause a command error: • An IEEE 488.2 syntax error. The test set received a message that did not follow the syntax defined by the standard. • A semantic error. For example the test set received an incorrectly spelled command. • The test set received a group execution trigger (GET) inside a program message
4	16	Execution Error	This bit is set to 1 if the test set detects an error while trying to execute a command. The following events cause a execution error: • A <PROGRAM DATA> element received in a command is outside the legal range for the test set, or it is inconsistent with the operation of the test set. • The test set could not execute a valid command due to some test set hardware/firmware condition.
3	8	Device Dependent Error	This bit is set to 1 if a test set operation does not execute properly due to an internal condition (such as, overrange). This bit indicates that the error was not a command, query, or execution error.

Bit Number	Binary Weighting	Condition	Description
2	4	Query Error	This bit is set to 1 if an error has occurred while trying to read the test set's output queue. The following events cause a query error: • An attempt is made to read data from the output queue when no data is present or is pending. • Data in the output queue has been lost. An example of this would be an output queue overflow.
1	2	Reserved for future use.	This bit will always be 0.
0	1	Operation Complete	This bit is set to 1 when the test set has completed all pending operations and is ready to accept new commands. This bit is only generated in response to the *OPC IEEE 488.2 common command.

Program Example - Standard Event Status Register

```
OUTPUT 714;"*ESR?" !Queries (reads) the Standard Event Status Register.
```

SYSTem:BEEPer

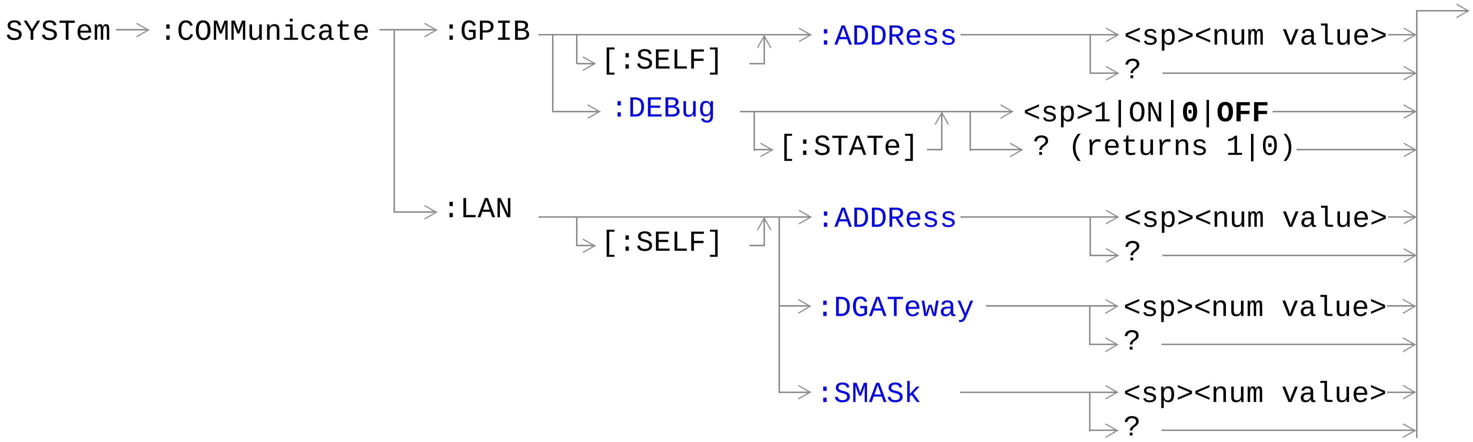
```
SYSTem ──:BEEPer ──> :STATe ──┬──> <sp>1|ON|0|OFF ──┬──>
                              └──> ? (returns 1|0) ─┘
```

“Diagram Conventions” on page 207

SYSTem:BEEPer:STATe

Function	Sets/queries the beeper state of the test set.
Setting	0|OFF | 1|ON
Query	0|1
*RST Setting	1|on
Programming Example OUTPUT 714;"SYSTEM:BEEPER:STATE OFF" !Sets beeper state to off.	

SYSTem:COMMunicate



"Diagram Conventions" on page 207

SYSTem:COMMunicate:GPIB:[:SELF]:ADDRess

Function	Sets/queries the test set's GPIB address.
Setting	Range: 0 to 30 Resolution: 1
Query	Range: 0 to 30 Resolution: 1
Factory setting	14 (this parameter is not affected by any reset operation and can only be changed by direct user access)
Related Topics	"Configuring the Test Set's GPIB Address" on page HIDDEN

Programming Example

```
OUTPUT 714;"SYSTEM:COMMUNICATE:GPIB:SELF:ADDRESS 14" !Sets the GPIB address
                                                     !to 14.
```

SYSTem:COMMunicate:GPIB:DEBug[:STATe]

Function	Sets/queries the test set's SCPI debugger state. When the state is on; enhanced error messages (generated from GPIB commands with syntax errors) are shown the test set display. The error message is printed along with the syntax. <ERR> is displayed at the end of the incorrect node. Non-printable characters will be replaced with the $ symbol. See "Error Messages" on page 549 for a list of the errors. The debugger state should be set to on only during GPIB code development. Test times will increase if the debugger state is left on.
Setting	Range: 0|OFF | 1|ON
Query	0|1
*RST setting	0|off
Programming Example	

```
OUTPUT 714;"SYSTEM:COMMUNICATE:GPIB:DEBUG:STATE ON" !Sets debugger to on.
```

SYSTem:COMMunicate:LAN[:SELF]:ADDRess

Function	Sets/queries the test set's LAN IP address. The value of A is used to determine the subnet mask, see "SYSTem:COMMunicate:LAN[:SELF]:SMASk" on page 461. If the LAN address is changed the subnet mask should be checked to insure that it is set to the proper class for that LAN address.
Setting	Range: 15 characters formatted as follows: A.B.C.D where A= 0 to 223 B,C,D = 0 to 255 (no embedded spaces)
Query	Range: 15 characters formatted as follows: A.B.C.D where A= 0 to 223 B,C,D = 0 to 255 (no embedded spaces)
Factory setting	0.0.0.0 (this parameter is not affected by any reset operation and can only be changed by direct user access)
Related Topics	"LAN IP Address" on page 537
Programming Example	

```
OUTPUT 714;"SYSTEM:COMMUNICATE:LAN:SELF:ADDRESS '200.015.156.255'" !Sets the
                                                                  !LAN IP
                                                                  !address.
```

SYSTem:COMMunicate:LAN[:SELF]:DGATeway

Function	Sets/queries the LAN IP router/gateway address for the test set.
Setting	Range: 15 characters formatted as follows: A.B.C.D where A= 0 to 223 B,C,D = 0 to 255 (no embedded spaces), blank field
Query	Range: 15 characters formatted as follows: A.B.C.D where A,B,C,D = 0 to 255 (no embedded spaces). blank field
Factory setting	blank field, (this parameter is not affected by any reset operation)
Programming Example `OUTPUT 714;”SYSTEM:COMMUNICATE:LAN:SELF:DGATEWAY ‘15.2.6.200’”`	

SYSTem:COMMunicate:LAN[:SELF]:SMASk

Function	Sets/queries the subnet mask of the test set based on the LAN IP address selected. The subnet mask changes according to the value of A used for the LAN IP address. If A is less than or equal to 127, the subnet mask is 255.0.0.0. If A is greater than 127 and less or equal to 191, the subnet mask is 222.255.0.0. If A is grater than 191, the subnet mask is 255.255.255.0. If the LAN address is changed the subnet mask should be checked to insure that it is set to the proper class for that LAN address.
Setting	Range: 15 characters formatted as follows: A.B.C.D where A,B,C,D are between = 0 to 255 (no embedded spaces)
Query	Range: 15 characters formatted as follows: A.B.C.D where A,B,C,D are between = 0 to 255 (no embedded spaces)
Factory setting	0.0.0.0 (this parameter is not affected by any reset operation and can only be changed by direct user access)
Programming Example `OUTPUT 714;”SYSTEM:COMMUNICATE:LAN:SELF:SMASK ‘15.2.6.200’”`	

SYSTem:CONFigure:INFormation:HARDware:VERBose?

SYSTem —— :CONFigure → :INFormation → :HARDware → :VERBose →

"Diagram Conventions" on page 1

SYSTem:CONFigure:INFormation:HARDware:VERBose?

Function	Query the manufacturer, model number, model number of the test application running, serial number, revision, board ID, and cal file information. The information provided by the query represents the configuration that existed when the test set was powered up.
*RST Setting	Resets have no effect on this information. The information is gathered during the power up cycle.

Related Topics

****

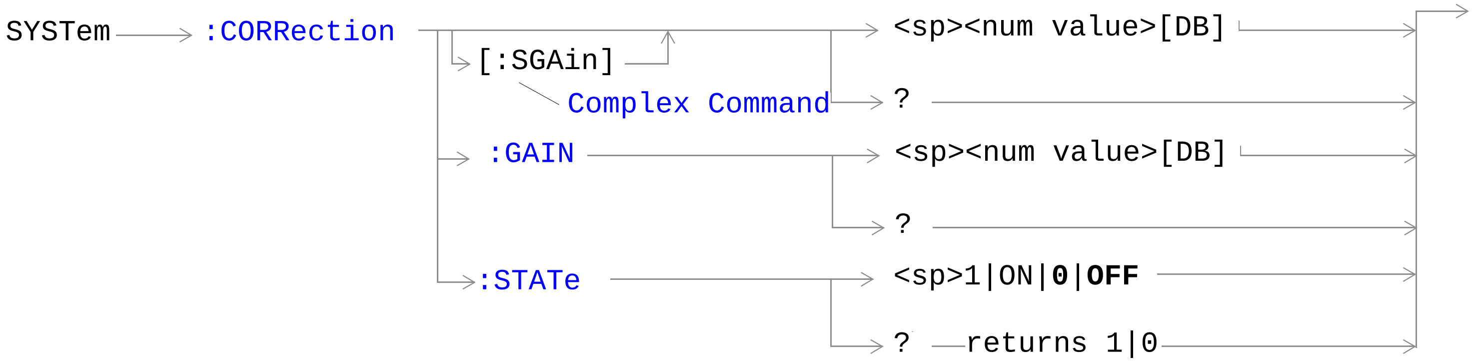
x-refs to related files

system:current:ta, conf obtaining, conf ident

****

SYSTem:CORRection

July 7, 1999



"Diagram Conventions" on page 207

SYSTem:CORRection[:SGAin]

Function	Sets/queries the amplitude offset value in dB, used to correct for RF path loss and also turns the STATe ON. See "Measurement Related Configuration" on page 540. The units, dB, are optional, if no units are specified then units default to dB.
Setting	Range: –100 to +100 Resolution: .1
Query	Range: –100 to +100 Resolution: 0.1
*RST Setting	0 dB
Programming Example `OUTPUT 714;"SYSTEM:CORRECTION:SGAIN 6" !Sets an amplitude offset of 6 dB.`	

SYSTem:CORRection:GAIN

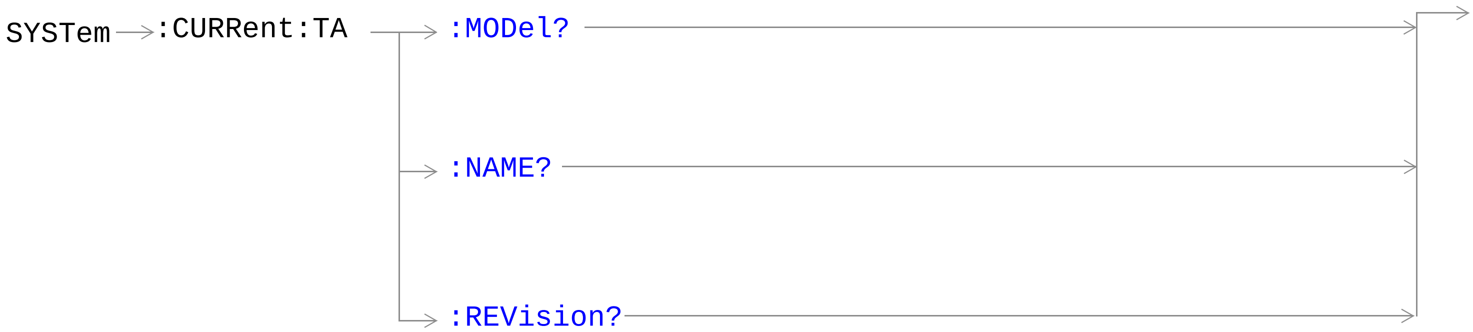
Function	Sets/queries the amplitude offset value in DB, used to correct for RF path loss when the correction state is on. See "Measurement Related Configuration" on page 540 The units DB are optional, if no units are specified then units default to DB.
Setting	Range: –100 to +100 Resolution: .1
Query	Range: –100 to +100 Resolution: .1
*RST Setting	0 dB
Programming Example	
`OUTPUT 714;"SYSTEM:CORRECTION:GAIN 6" !Sets an amplitude offset of 6 dB.`	

SYSTem:CORRection:STATe

Function	Sets/queries the amplitude offset state. See "Measurement Related Configuration" on page 540
Setting	0|OFF | 1|ON
Query	0|1
*RST Setting	0|off
Programming Example	
`OUTPUT 714;"SYSTEM:CORRECTION:STATE ON" !Sets amplitude offset state on.`	

SYSTem:CURRent:TA

July 7, 1999



"Diagram Conventions" on page 207

SYSTem:CURRent:TA:MODel?

Function	Query the model number of the test application running. Printable ASCII characters up to a 15 character string. See "Obtaining Test Application Information" on page 544.
Query	Range: ASCII codes 32 - 126 decimal excluding comma and semicolon
*RST Setting	non volatile, read from the test set's hard disk

SYSTem:CURRent:TA:NAME?

Function	Query the name of the test application running. Printable ASCII characters up to a 25 character string. See "Obtaining Test Application Information" on page 544.
Query	Range: ASCII codes 32 - 126 decimal excluding comma and semicolon
*RST Setting	non volatile, read from the test set's hard disk

SYSTem:CURRent:TA:REVision?

Function	Query the coordinated codeware revision for the test application running. Printable ASCII characters up to a 20 character string. See "Obtaining Test Application Information" on page 544.
Query	Range: ASCII codes 32 - 126 decimal excluding comma and semicolon
*RST Setting	non volatile, read from the test set's hard disk.

SYSTem Subsystem

Description

The SYSTem subsystem performs system configuration and non-measurement related functions such as:

- Setting the HP-IB and LAN addresses
- Setting Date and Time
- Correcting for RF path loss
- Presetting the test set

Syntax Diagrams and Command Descriptions

"SYSTem:BEEPer" on page 458

"SYSTem:COMMunicate" on page 459

"SYSTem:CORRection" on page 463

"SYSTem:CURRent:TA" on page 465

"SYSTem:ERRor?" on page 467

"SYSTem:FTRigger" on page 468

"SYSTem:MEASurement" on page 470

"SYSTem:PRESet" on page 471

"SYSTem:ROSCillator" on page 473

"SYSTem:SYNChronized" on page 474

SYSTem:ERRor?

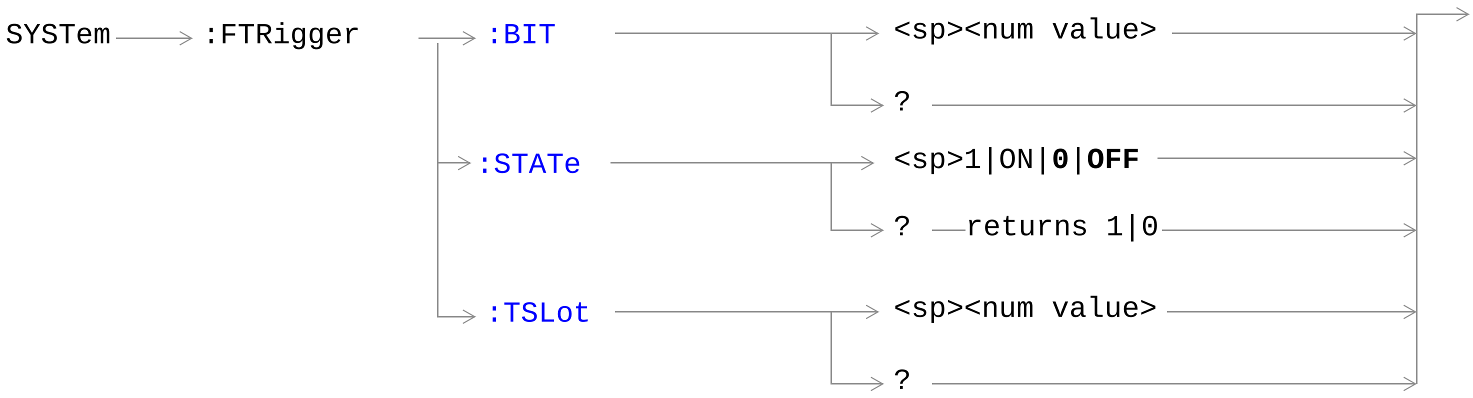
SYSTem → :ERRor?

"Diagram Conventions" on page 207

SYSTem:ERRor?

Function	Queries the contents of the Error/Event Queue. The Error/Event Queue may contain one or more messages with an error or event description. Manual users may view the Message Log from the SYSTEM CONFIG screen. The contents of the Error/Event Queue and the Message log may not match. Example, manual user errors are not displayed with SYSTem:ERRor? they are viewed from the Message Log. See "Error Messages" on page 549.
Query	Error/Event Queue • Range: 0 to 100 messages up to 255 characters in length

SYSTem:FTRigger



"Diagram Conventions" on page 207

SYSTem:FTRigger:BIT

Function	Selects/queries which bit, after zero, will be used for frame trigger pulse positioning. See "Setting Frame Trigger Parameters" on page 495
Setting	Range: 0 to 1250 Resolution: 1
Query	Range: 0 to 1250 Resolution: 1
*RST Setting	zero

Programming Example

```
OUTPUT 714;"SYSTEM:FRTIGGER:BIT 14" !Would cause external frame trigger pulses
                                    !to occur 14 bits after bit 0 of the
                                    !selected timeslot.
```

SYSTem:FTRigger:STATe

Function	Sets/queries the frame trigger state. See "Setting Frame Trigger Parameters" on page 495
Setting	0|OFF | 1|ON
Query	0|1
*RST Setting	0|off

Programming Example

```
OUTPUT 714;"SYSTEM:FRTIGGER:STATE ON" !Set frame trigger state to on.
```

SYSTem:FTRigger:TSLot

Function	Selects/queries the timeslot for frame trigger pulse positioning. See "Setting Frame Trigger Parameters" on page 495
Setting	Range: 0 to 7 Resolution: 1
Query	Range: 0 to 7 Resolution: 1
*RST Setting	zero
Programming Example `OUTPUT 714;"SYSTEM:FRTIGGER:TSLOT 5" !Dets the frame trigger timeslot to 5.`	

SYSTem:MEASurement

June 2, 1999

```
SYSTem ——> :MEASurement:RESet ——————————————————————————————>
```

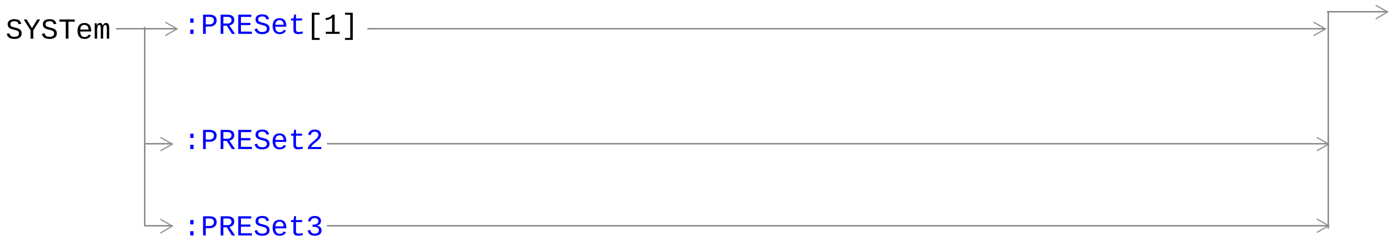
“Diagram Conventions” on page 207

SYSTem:MEASurement:RESet

Function	Sets all measurements to abort, if the trigger arm is set to continuous the measurements will begin a new measurement cycle. See “Trigger Arm (Single or Continuous) Description” on page 147 Any measurement results are cleared and the Integrity Indicator is set to 1 (No_Result_Available). See “Integrity Indicator” on page 126
Setting	These results are set to their default values: • RACH Count • Page Count • Missing Burst Count • Corrupted Burst Count • Channel Decoder Error Count • MS TX Level Reported • TCH Timing Advance Reported • RX Level • RX Qual
Programming Example	

```
OUTPUT 714;”SYSTEM:MEASUREMENT:RESET” !Resets current measurements.
```

SYSTem:PRESet



"Diagram Conventions" on page 207

SYSTem:PRESet[1] (not recommended for use)

Function	Not recommended for use at this time, use the SYSTEM:PRESET3 command for partial preset. Performs a partial preset. This is the recommended command when a user wants to change from remote operation to manual operation and a partial preset is needed. Any call in process is disconnected and all measurements are aborted and inactivated. Measurement parameters are not changed. A partial preset will not modify any measurement settings including trigger arm. See "Trigger Arm (Single or Continuous) Description" on page 147.
Related Topics	See "Partial Preset" on page 513 for more details
Programming Example `OUTPUT 714;"SYSTEM:PRESET" !Partial preset when changing from remote to manual operation.`	

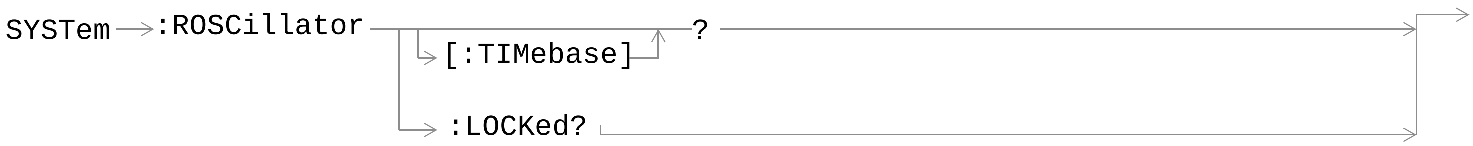
SYSTem:PRESet2

Function	Performs a full preset the same as using the *RST command. Either command may be used when a full preset is needed during remote operation of the test set. All parameters are set to their default values. All measurements are aborted the trigger arm is set to single. See "Trigger Arm (Single or Continuous) Description" on page 147.
Related Topics	See "Full Preset" on page 513 for more details.
Programming Example `OUTPUT 714;"SYSTEM:PRESET2" !Full preset.`	

SYSTem:PRESet3

Function	Performs a partial preset. This is the recommended command for users when a partial preset is needed during remote operation of the test set. Any call in process is disconnected and all measurements are aborted and inactivated. Measurement parameters are not changed. A partial preset will not modify any measurement settings including trigger arm. See “Trigger Arm (Single or Continuous) Description” on page 147.
Related Topics	See “Partial Preset” on page 513 for more details.
Programming Example `OUTPUT 714;”SYSTEM:PRESET3” !Partial preset when in remote operation.`	

SYSTem:ROSCillator



"Diagram Conventions" on page 207

SYSTem:ROSCillator[:TIMebase]?

Function	Query to indicate if the test set's internal source or a suitable external source has been chosen to drive the test set's time base. A suitable external source must have: • an output level of 0 to +13DBM • frequency of 10 MHZ
Query	INT | EXT

SYSTem:ROSCillator:LOCKed?

Function	Query the status of the reference oscillator and indicate if it is locked or unlocked.
Query	0 = Unlocked | 1 = Locked

SYSTem:SYNChronized

July 7, 1999

“Diagram Conventions” on page 207

SYSTem:SYNChronized

Function	Sets/queries the test set that all prior sequential commands have completed and all prior overlapped commands have started indicating that the input buffer is synchronized. (See “Call Processing Event Synchronization” on page 28.)
Setting	Bit 12 of the status operation condition register is pulsed. See “STATus:OPERation Condition Register Bit Assignment” on page 435.
Query	1
Related Topics	See “Status Subsystem Overview” on page 138. See “Call Processing Event Synchronization” on page 28.

Programming Example

```
OUTPUT 714;"SYSTEM:SYNCHRONIZED" !Pulses bit 12 of the status operation
                                 !condition register.
OUTPUT 714;"SYSTEM:SYNCHRONIZED?" !Returns a 1 indicating all prior sequential
                                  !commands have completed and all overlapped
                                  !commands have started.
```

IEEE 488.2 Common Commands

*CLS

The *CLS, clear status command, is defined in "IEEE Std 488.2-1992", 10.3. This command will also clear and close the error message screen on the test set's display.

*ESE

The *ESE, standard event status enable command, is defined in "IEEE Std 488.2-1992", 10.10.

*ESE?

The *ESE?, standard event status enable query, is defined in "IEEE Std 488.2-1992", 10.11.

*ESR?

The *ESR?, standard event status register query, is defined in "IEEE Std 488.2-1992 ",10.12.

*IDN?

The *IDN?, identification query, is defined in "IEEE Std 488.2-1992", 10.14.*IDN? is used to retrieve information about the test set in ASCII format. See "Obtaining Identification Information *IDN?" on page 535.

*IDN?, returns ASCII codes 32 through 126 excluding comma and semicolon in four comma separated fields. Field 1 returns the manufacturer, field 2 returns the instrument model number, field 3 returns the serial number, field 4 returns 0.

For revision information on the currently installed test application, see "SYSTem:CURRent:TA" on page 465.

*OPC

The *OPC, operation complete command, is defined in "IEEE 488.2-1992", 10.18. *OPC causes the test set to continuously sense the No Operation Pending flag. When the No Operation Pending flag becomes TRUE, the OPC event bit in the standard event status register (ESR) is set to indicate that the state of all pending operations is completed. The *OPC common command is not recommended, see "Call Processing Event Synchronization" on page 28 for the recommended overlapped commands.

*OPC?

The *OPC?, operation complete query, is defined in "IEEE Std 488.2-1992", 10.19. The *OPC? query allows synchronization between the controller and the test set using either the message available (MAV) bit in the status byte, or a read of the output OPC?. The *OPC? query does not effect the OPC event bit in the Standard Event Status Register (ESR). The *OPC? common command is not recommended, see "Call Processing Event Synchronization" on page 28 for the recommended overlapped commands.

*OPT?

The *OPT?, option identification query, is defined in "IEEE Std 488.2-1992", 10.20. Each option will have a unique name, that name will be retuned with the query.

*RST

The *RST command is defined in “IEEE Std 488.2-1992”, 10.32. The *RST command is a full preset, which restores a majority of settings to their default values.

Affects of Sending the *RST Command

- All pending operations are aborted.
- Measurement triggering is set to single.
- Any previously received operation complete command (*OPC) is cleared.
- Any previously received operation complete query (*OPC?) is cleared.
- The power-up self-test diagnostics are not performed.
- The contents of the save/recall registers are not affected.
- Calibration data is not affected.
- The GPIB interface is not reset (any pending service request is not cleared).
- All enable registers are unaffected: service request, standard event, communicate, hardware #1, hardware #2, operation, calibration, and questionable data/signal.
- All negative transition filter registers are unaffected: communicate, hardware #1, hardware #2, operation, calibration, and questionable data/signal.
- All positive transition filter registers are unaffected: communicate, hardware #1, hardware #2, operation, calibration, and questionable data/signal.
- The contents of the RAM memory are unaffected.
- The contents of the output queue are unaffected.
- The contents of the error queue are unaffected.

*SRE

The *SRE, service request enable command, is defined in “IEEE Std 488.2-1992”, 10.34. The parameter range for this command is 0 through 255.

*SRE?

The *SRE?, service request enable query, is defined in “IEEE Std 488.2-1992”, 10.35. Values returned by this query range from 0 through 255.

*STB?

The *STB?, read status byte query, is defined in “IEEE Std 488.2-1992”, 10.36. Values returned by this query range from 0 through 255.

*WAI

The *WAI, wait-to-continue command, is defined in “IEEE Std 488.2-1992”, 10.39. The *WAI command prevents the test set from executing any further commands or queries until all pending operation flags are false. The *WAI common command is not recommended, see “Call Processing Event Synchronization” on page 28 for the recommended overlapped commands.

6 General Usage

Frequency Banded Parameters

The majority of the test set's parameters are active regardless of the frequency band selected. There are, however, six parameters that have a band specifier; PGSM, EGSM, DCS, or PCS. These exceptions are referred to as frequency banded parameters.

Frequency banded parameters are activated upon selection of a band. Parameters that select frequency bands are the cell band, traffic band, and manual band fields.

The user can set values for parameters that are activated by a band that is not currently selected, and the test set will store the setting for future use. For example, during a call on the PGSM band, the MS TX level can be set to 10 for the DCS frequency band. When a handover (see "Programming a Dualband Handover" on page 121) to the DCS band is made, the MS TX level of 10 for DCS will already be set.

If the user does not specify a frequency band when setting frequency banded parameters, settings to the parameter will be made in the currently selected band.

List of Frequency Banded Parameters

You can control the frequency banded parameters with these six parameters:

For control of the broadcast channel, channel number, and BA table:

- Broadcast channel see "CALL:BCHannel" on page 229
- BA table (broadcast allocation table and broadcast allocation table points) see "CALL:BA" on page 221

For control of the traffic band, channel number, and level:

- Traffic channel and traffic band see "CALL:TCHannel[:ARFCn][:SELected]" on page 281.
- MS TX level (mobile station transmit level) see MS TX LEVEL NEW

For manual control of the test set's receiver:

- Manual channel see "RFANalyzer:MANual:CHANnel[:SELected]" on page 366.
- Expected power see "RFANalyzer:EXPected:POWer[:SELected]" on page 363.

Examples

```
OUTPUT 714;"CALL:CELL:BCHANNEL:ARFCN:DCS 512" !Sets broadcast channel to 512
                                              !for DCS.
OUTPUT 714;"CALL:CELL:BA:TABLE:EGSM 20,37,124,975,986,1008,1019" !Sets BA table to
                                                                 !to 7 of 16
                                                                 !possible channels.
OUTPUT 714;"CALL:TCHANNEL:ARFCN:PGSM 124" !Sets traffic channel to 124 for PGSM band.
OUTPUT 714;"CALL:MS:TXLEVEL:PGSM 7" !Sets the mobile station uplink power control
                                    !level to 7 for PGSM band.
OUTPUT 714;"RFANALYZER:MANUAL:CHANNEL:EGSM 24" !Manually sets the RF analyzer to
                                               !EGSM channel 24.
OUTPUT 714;"RFANALYZER:EXPECTED:POWER:PGSM -15DBM" !Sets the RF analyzer's input
                                                      !power to -15 dbm for PGSM band.
```

Cell Band Parameter

- When the operating mode is active cell and the call connected state is idle, changes to the cell band parameter will be reflected in the traffic band and manual band parameters as well.
- When the operating mode is active cell and the call connected state is connected, changes to the cell band parameter will disconnect any call in progress.
- When the operating mode is test mode and the test function is set to BCH, the cell band parameter should be used. See "CALL:FUNCtion:DOWNlink" on page 243.
- When the operating mode is test mode and the test function is set to CW, the cell band parameter should be used.

Example

```
OUTPUT 714;"CALL:CELL:BAND EGSM" !Sets the broadcast band and traffic band to EGSM.
```

Traffic Band Parameter

- When the operating mode is active cell and the call connected state is connected, changes to the traffic band parameter cause an inter-band channel assignment. See "Programming a Dualband Handover" on page 121.
- When the operating mode is active cell and the call connected state is connected, changes to the traffic band parameter are not reflected in the cell band or the manual band parameters.
- When the operating mode is test mode and the test function is set to BCH + TCH, the traffic band parameter should be used. See "CALL:FUNCtion:DOWNlink" on page 243.

Example

```
OUTPUT 714;"CALL:TCHANNEL:BAND DCS" !Sets the traffic band to DCS.
```

Manual Band Parameter

- When the receiver control parameter is set to manual, changes to the manual band parameter are not reflected in the traffic band or cell band parameters.
- Setting the manual band parameter changes the receiver control parameter to manual.
- When the receiver control parameter is set to manual, changes to the cell band parameter set the receiver control parameter to auto; however, the manual band parameter changes to match the cell band setting. Users will need to set receiver control back to manual.

Example

```
OUTPUT 714;"RFANALYZER:MANUAL:BAND DCS" !Sets the manual band to DCS.
```

Related Topics

****

"Programming a Dualband Handover" on page 121

"Configuring the Broadcast Channel (BCH)" on page 491

"Configuring the Traffic Channel (TCH)" on page 501

"Receiver Control" on page 498

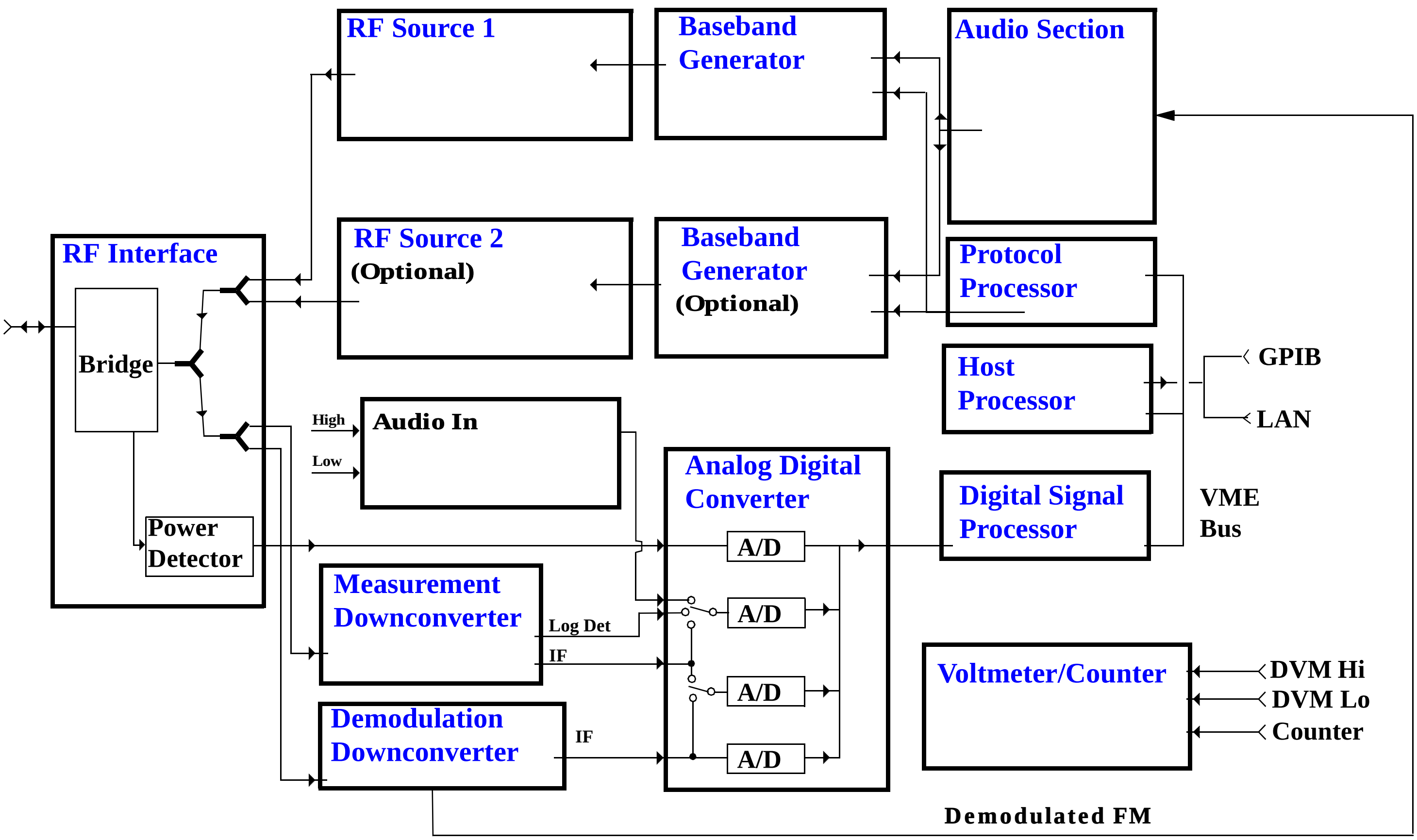
"CALL:CONNected[:STATe]?" on page 233

****

Block Diagram

The hardware architecture of the test set provides a number of parallel signal paths through the instrument. This parallel architecture allows the measurement hardware to run some measurements concurrently. See "Concurrent Measurements" on page 124.

Description



RF Interface Module

Input and output signals are routed through the RF Interface module. The RF Interface module consists of a directional bridge for sampling incoming power and hybrid power splitters which create 4 bidirectional ports, (two receiver ports and two source ports), RF amplifiers, video gain circuits, and fast and slow power detectors.

The sampled input power from the directional bridge is routed to a fast power detector or a slow detector. The fast power detector has a response time of several microseconds and can measure power during the bursts of TDMA systems.

The RF Interface module provides two identical RF Source path connections to the In/Out port of the instrument. There is about 25 dB of isolation between the two source paths. There is about 35 dB of isolation between the source paths and either receiver path. The RFIO module has nominally 23 dB of insertion loss in the source path. A temperature sensing circuit facilitates compensation for path loss variation with temperature.

The sampled input power from the directional bridge can be amplified by as many as two 18 dB range amplifiers and then can be directed to the fast detector, or the slow detector. The input power to the fast detector is detected by a diode detector that is part of a feedback loop. The input to the slow detector is measured in a bridge using a pair of RMS thermal detectors in a feedback loop. Signals from the fast and slow power detectors are calibrated with Gain DAC's. Video gain can be applied in 6 dB and 1.5 dB steps.

Signal Downconversion

The test set's downconversion receiver section has two downconversion modules; a high performance Measurement Downconversion Module for making measurements, and a Demodulation Downconversion Module for maintaining the radio link.

Measurement Downconverter Module The Measurement Downconverter module is a part of the receiver, it provides high quality (wide dynamic range, spurious free) signals to the Analog To Digital Converter module's measurement sampler input. These signals are:

- 10 KHz - 6 MHz Intermediate Frequency signal
- detected envelope of the Intermediate Frequency signal

The Measurement Downconverter module is designed for very high performance operation to ensure accurate and repeatable measurement results. The Measurement Downconverter module contains two downconversion stages, two local oscillators, and a logarithmic IF envelope detector . Both first and second LO synthesizers are tunable. The first LO is used when tuning to the RF input frequency, and the second LO is used when setting second IF frequency, which is fed to the measurement sampler on the Analog To Digital Converter module.

Demodulation Downconverter Module The Demodulation Downconverter module is used as part of the demodulation receiver to maintain the radio link of a given TA. The IF signal from the Demodulation Downconverter is sent to the Analog to Digital Converter, the digital data then goes to the protocol subsystem. That data allows the Protocol Processor module to set up a call with the DUT so that testing can be performed on the radio.

The Demodulation Downconverter module is also used as part of the BER testing path. For bit error ratio measurements the bits tested by the Protocol Processor module are taken from this path. The demodulated bits provided to the Protocol Processor contain the data that will be checked for errors.

Analog To Digital Converter Module

Following the Measurement Downconverter and Demodulation Downconverter modules is the Analog to Digital Converter module. The purpose of the Analog to Digital Converter module is to convert the downconverted analog signals into digital data streams which can be processed by the Digital Signal Processing module.

In order to maintain the radio link of a given TA, the downconversion path through the Demodulation Downconverter module has a dedicated A/D conversion path.

In order to optimize measurement throughput, the fast RF power detector also has a single dedicated A/D path. This allows power measurements, in many cases, to be made concurrently with other measurements. The two outputs from the Measurement Downconverter module, and the Audio In signal share a single multiplexed A/D path.

The outputs of the various analog to digital converters on the Analog to Digital Converter module share a common data bus to the Digital Signal Processing module.

Digital Signal Processing Module

The Digital Signal Processing (DSP) module is responsible for a variety of tasks within the overall test set architecture. These tasks are:

- demodulating data from the radio under test (data received from the Demodulation Downconverter module) and sending the demodulated data bits to the Protocol Processor module
- for some systems, perform audio measurements using audio information sent to the DSP module from the Protocol Processor module
- execute a variety of signal processing algorithms to perform measurements on the radio system of the currently loaded TA (data received from the power detector ADC, the measurement ADC and, in some cases, data received from the Demodulation Downconverter ADC)

The DSP processor communicates with the Host Processor and the Protocol Processor, as well as controlling the configuration and synchronization of the Analog To Digital Converter module.

Protocol Processor Module

The Protocol Processor module is responsible for maintaining the radio link between the test set and the mobile station under test. The primary tasks of the Protocol Processor module are:

- generating the protocol messaging necessary for the forward channel and sending that protocol stream to the test set’s RF source for transmission to the mobile station
- decoding the protocol messaging received from the mobile station under test on the reverse channel
- computing measurement results which are associated with data bits contained within the mobile stations messaging, such as bit error ratio

Host Processor Module

The Host Processor module is responsible for a variety of tasks within the overall test set architecture. These tasks include:

- control of the manual user interface (MUI)
- executing commands and processing data received from the LAN interface
- executing commands and processing data received from the GPIB interface
- controlling disk access
- control of all RF and audio hardware modules
- routing measurement results received form the Digital Signal Processing and Protocol Processor modules to the appropriate output device (display, HPIB, LAN, serial, etc.)

Voltmeter/Counter

Voltmeter The voltmeter is primarily used to measure external DC & AC voltages. A secondary purpose is to measure internal voltages for instrument self-diagnostics.

The external voltmeter is capable of measuring DC voltages up to + 50 VDC and AC voltages up to 50 Vpk. A true RMS detector is used for measuring AC voltages. For internal measurements, a switch routes the diagnostic MUX output to the Voltmeter 1 path.

Frequency Counter The Frequency Counter is used to measure external frequencies from the front panel Audio IN, High or Low BNC connectors, and to measure internal signals for diagnostics. The external input can receive a signal between 20 Hz and 50 MHz, with a level from 25 mV to 8 V rms.

The counter circuit is based on the METRON IC. This IC contains a reciprocal counter. A reciprocal counter functions by counting the input signal and a reference signal simultaneously during a selected gate period. At the end of this period, the counting is stopped and the values of the signal and reference counters are read. The ratio of these values is used to calculate the input signal frequency.

Audio Section

Audio Analysis Path Externally applied audio signals can be analyzed through the test set's DSP module for such characteristics as AC level, SINAD, or distortion.

The audio signal to be analyzed is input to the test set using the front panel Audio IN High and Low connectors. The signal is then routed to the Analog To Digital Converter module's measurement sampler for analysis by the DSP module.

The Audio In connector accepts signals from 20 Hz to 15 KHz, at input levels from 10 mV to 20 Vpk.

Audio 1 Path The Audio 1 path provides analog baseband signals used for frequency modulation of the test set's RF sources. Up to four separate audio sources may be summed together in any combination to provide the composite Audio 1 output. These include the external FM input, internal direct digital synthesis (DDS,) regenerated SAT, and audio echo input.

The external FM input accepts an externally supplied audio signal with a peak voltage between 0.25 and 2 Vpk.

The internal DDS generates low distortion audio signals from DC to 20 KHz with 0.1 Hz resolution. One to four signals may be generated and internally summed, with independent level control of each waveform.

The SAT regeneration circuit outputs a signal which is phase-locked to a received SAT signal. This is useful for testing situations where the test set needs to emulate a mobile station.

The audio echo input is used for retransmitting the received audio after a selectable time delay, to check both radio transmit and receive paths simultaneously.

For most applications, only one or two of these Audio 1 path sources are enabled at any given time.

Audio 2 Path The Audio 2 path provides a secondary means for sending analog baseband signals to the FM modulator. Audio 2 contains only one source, a DDS similar to that used for Audio 1.

Typically, the Audio 2 path DDS is used for cases where multiple signals must be summed together with the lowest possible distortion. Another potential use of Audio 2 would be to obtain higher output levels than Audio 1 is capable of (up to twice as much), assuming the two outputs are set to the same frequency and phase, and then summed together at the Baseband Generator module.

Audio 2 is rarely used in practice because the DDS used for Audio 2 is the same DDS that is used for the front panel audio output.

Audio Out Path Any one of four inputs may be coupled to the front panel audio output connector. These include a 4 channel DDS (shared with Audio 2), receiver discriminator audio from the Demodulation Downconverter module, audio echo from the Analog To Digital Converter module, and audio vocoder.

The front panel output is capable of providing signal levels up to 9 Vpk into > 600 ohm loads, and up to 0.8 Vpk into an 8 ohm load (e.g. speaker). The output level is calibrated for all modes except discriminator audio, The discriminator audio has an uncalibrated volume control provided due to the high tolerances involved.

Typically the DDS mode is used to feed the MIC input of a radio, or it may simply be used as a general purpose low distortion function generator. Possible waveforms include sine wave, square wave, triangle wave, ramp, uniform noise, gaussian noise, and DC. The DDS frequency range is DC to 20 KHz in 0.1 Hz increments, while the output level range is 0 to 1 Vpk with 0.5 mV resolution or 1 to 9 Vpk with 5.0 mV resolution.

Demodulated audio can be selected from either of two Demodulation Downconverters. 300 - 3000 Hz BPF, 750 usec de-emphasis, and expandor circuits can be individually applied to the receiver audio, or bypassed.

Audio echo can be selected to route the received audio to the front panel audio output connector.

RF Sources

The test set can contain two identical RF sources. The RF sources are used to provide analog or digitally modulated RF carriers for use in parametric testing of mobile stations encompassing a variety of cellular radio formats. In general, the sources have a frequency range of 45 MHz to 2.7 GHz and an amplitude range of -13 dBm to -135 dBm.

The RF sources consist of a Synthesized Signal Generator module followed by a Vector Output module and an RF Attenuator module. Baseband modulation information is supplied to the RF sources from a Baseband Generator module preceded by an Audio Section module. The various components which make up the test set source system are described in the following sections.

Baseband Generators

The purpose of the Baseband Generator module is to provide, for the modulation type currently in effect, properly formatted baseband signals to the modulation circuits on the RF Source modules.

The Baseband Generator performs several functions related to the generation and processing of these base-band modulation signals. These are:

- Transform data and clock signals from the Protocol Processor module into base-band analog I-Q modulation signals for the I-Q modulator in the Vector Output module
- Transform data from the Protocol Processor module into baseband FSK modulation for the FM modulator in the Signal Generator module
- Provide baseband FM path source selection, gain adjustment and summing node for analog FM signals from the Audio module and internally generated baseband FSK signals which are output to the FM modulator in the Signal Generator module
- Transform burst and adjacent timeslot signals from the Protocol Processor module into baseband burst modulation signals for the burst modulator in the Vector Output module

Active Cell Operating Mode

April 20, 1999

The test set can operate in two different operating modes (active cell mode or test mode). The operating modes changes the way in which the test set interacts with the mobile station. Active cell mode is the default operating mode and is used when emulating a normal GSM cell. Test mode is used when it is not possible, or not desired, to communicate via over the-the-air signaling with the mobile station (MS), but downlink stimulus and uplink measurements are still needed. see "Test Mode Operating Mode" on page 504

Associated with the active cell operating mode is the cell activated state parameter. This parameter turns on and off the test set's control of the uplink and downlink.

Trying to set any of the network configuration parameters while the cell is in the active state will generate the following error:

```
GSM operation rejected; Attempting to set <MCC|MNC|LAC|NCC|BCC> while generating a BCH
```

Active Cell Features

The basic features provided by active cell operating mode are:

- Generation of a broadcast channel (BCH) without traffic channel (TCH).
- Support for location updating.
- Call setup, both mobile station and base station emulator (BSE) originated.
- Changing TCH parameters during a call using over-the-air signaling.
- BSE initiated and mobile station initiated call disconnection.
- All measurements supported in the test application are available.
- The BSE automatically controls the test set's demodulation receiver.

Setting the Test Set's Operating Mode to Active Cell Mode

The test set's operating mode is set using the CALL:OPERating:MODE, which is a sequential command.

Example Command Syntax:

```
CALL:OPERating:MODE <CELL|TEST>
```

Example Programming Example:

```
!**********************************************************************
! Step 1: Set Test Set Operating Mode To Active Cell
!**********************************************************************
!
OUTPUT 714;"CALL:OPER:MODE CELL
```

Setting the Active Cell Mode State

The control of all signalling operations, uplink demodulation and downlink (BCH & TCH) generation on or off. See "CALL[:CELL]:ACTivated[:STATe]" on page 220.

When cell activated state is on and the test set is in Operating Mode active cell, burst type is determined by protocol. When the cell activated state is off, (Operating Mode active cell or test) the burst type is determined by the "CALL:BURSt:TYPE" on page 232 command.

Example Command Syntax:

```
CALL[:CELL[1]]:ACTivated[:STATe]<ON|1|OFF|0>
```

Example Programming Example:

```
OUTPUT 714;"CALL:ACT ON"
```

Related Topics

****

"Configuring the Broadcast Channel (BCH)" on page 491

"CALL:OPERating" on page 260

"Configuring the Traffic Channel (TCH)" on page 501

****

Configuring the Broadcast Channel (BCH)

The broadcast channel parameters are configured using the following call processing subsystem commands. For complete command syntax, refer to "CALL:BCHannel" on page 229 for GPIB commands.

BCH Parameters

- Cell Band
- Cell Power
- Cell Power State
- Broadcast Chan (ARFCN)
- Mobile Country Code (MCC)
- Mobile Network Code (MNC)
- Location Area Code (LAC)
- Network Color Code (NCC)
- Base Station Color Code (BCC)
- Paging IMSI
- Repeat Paging
- Paging Mode
- Paging Multiframes
- Get IMEI at Call Setup
- TX Level FACCH Signaling
- BA Table
- 3 Digit MNC for PCS

Examples:

Cell Band

```
OUTPUT 714;"CALL:BAND PGSM"
```

would set the cell to the PGSM band. See "CALL[:CELL]:BAND" on page 227.

Cell Power

```
OUTPUT 714;"CALL:POW -85 DBM"
```

would set the cell's RF transmitter power to –85 dBm. See "CALL[:CELL]:POWer:AMPLitude[:SAMPlitude]" on page 267.

Cell Power State

```
OUTPUT 714;"CALL:POW:STAT ON"
```

would turn on the cell’s RF transmitter on. See “CALL[:CELL]:POWer:STATe” on page 268.

Broadcast Chan

```
OUTPUT 714;"CALL:BCH 50"
```

would set the broadcast channel to 50 for the selected (active) cell band. See “CALL[:CELL]:BCHannel[:ARFCn][:SELected]” on page 229.

```
OUTPUT 714;"CALL:BCH:DCS 556"
```

would set the broadcast channel to 556 for the DCS cell band. See “CALL[:CELL]:BCHannel[:ARFCn]:DCS” on page 230.

Mobile Country Code

```
OUTPUT 714;"CALL:MCC 5"
```

would set the cell’s mobile country code to 5. See “CALL:MCCode” on page 246.

NOTE Can only be set when Cell Activated State = OFF.

Mobile Network Code

```
OUTPUT 714;"CALL:MNC 3"
```

would set the cell’s mobile network code to 5. See “CALL:MNCode” on page 247.

NOTE Can only be set when Cell Activated State = OFF.

Location Area Code

```
OUTPUT 714;"CALL:LAC 4"
```

would set the cell’s location area code to 4. See “CALL:LACode” on page 245.

NOTE Can only be set when Cell Activated State = OFF.

Network Color Code

```
OUTPUT 714;"CALL:NCC 1"
```

would set the cell’s network color code to 1. See “CALL:NCCode” on page 259.

NOTE Can only be set when Cell Activated State = OFF.

Base Station Color Code

```
OUTPUT 714;"CALL:BCC 5"
```

would set the cell's base station color code to 5. See "CALL:BCCode" on page 228.

NOTE Can only be set when Cell Activated State = OFF.

Paging IMSI

```
OUTPUT 714;"CALL:PAG:IMSI '001012345678901'"
```

would set the paging IMSI to 001012345678901. See "CALL:PAGing:IMSI" on page 262.

Repeat Paging

```
OUTPUT 714;"CALL:PAG:REP OFF"
```

would turn repeat paging off. See "CALL:PAGing:REPeat[:STATe]" on page 263.

Paging Mode

```
OUTPUT 714;"CALL:PAG:MODE REORG"
```

would set the paging mode so that the MS will sent a page on the next available paging subchannel without waiting for the mobile station's pre-selected paging subchannel. See "CALL:PAGing:MODE" on page 263.

Paging Multiframes

```
OUTPUT 714;"CALL:PAG:MFR 5"
```

would set the number of multiframes between paging subchannels. See "CALL:PAGing:MFRames" on page 264.

Get IMEI at Call Setup

```
OUTPUT 714;"CALL:IMEI:AUTO ON"
```

would cause the test set to automatically request the mobile station's IMEI at call setup. See "CALL:IMEI" on page 244.

TX Level FACCH Signaling

```
OUTPUT 714;"CALL:SIGN:MS:TXL:FACCH ON"
```

would set the base station emulator to use both See "CALL:SIGNaling" on page 276.

BA Table (broadcast allocation table)

```
OUTPUT 714;"CALL:BA:TABLE:DCS 512,612,787"
```

would set the first three DCS base allocation table entries to 512, 612, 787. The remaining 13 would be turned off. See "CALL[:CELL]:BA:TABLe:DCS" on page 223.

3 Digit MNC for PCS

```
OUTPUT 714;"CALL:PMNCODE:STATE ON"
```

configures the PCS BCCH to use the PCS, 3-digit MNC when the current cell band is PCS. See "CALL[:CELL]:PMNCode:STATe" on page 266.

NOTE	Can only be set when Cell Activated State = OFF.

Operating Considerations

There are a number of parameters for the broadcast channel and the traffic channel (see "Configuring the Traffic Channel (TCH)" on page 501) that can be configured, however the test set's default parameters should allow a properly functioning mobile station to successfully camp on the cell and make a call under most circumstances.

Parameters can be queried from the test set regardless of the state of the test set.

If the test set is in active cell operating mode, parameters MCC, MNC, LAC, NCC, and BCC can not be set unless the Cell Activated State is OFF. See "CALL:ACTivated" on page 220.

If the test set is in test mode (see "Test Mode Operating Mode" on page 504) operating mode, any BCH parameter can be set at any time.

The 3 Digit MNC for PCS parameter defines if the PCS BCCH should be configured using the standard 2-digit MNC (J-STD-007 coding), or the PCS 3-digit MNC (J-STD-007A coding, section 2.10.5.1.3). The PCS 3-digit MNC is used on the PCS BCCH instead of the 2-digit MNC only when the current cell band is PCS and the 3 Digit MNC for PCS parameter is set to on.

When TX Level FACCH Signaling is set to on, measurements are aborted and restarted as a result of mobile TX power level changes. However, when TX Level FACCH Signaling is set to off, measurements are not aborted and restarted. This may cause the integrity result for some measurements to indicate an under range or over range condition until the mobile's TX power level is within the specified measurement range. For more information about measurement integrity, see "Integrity Indicator" on page 126.

Related Topics

****

"Frequency Banded Parameters" on page 481

****

Setting Frame Trigger Parameters

Frame Trigger Parameters

The frame trigger is a positive-going TTL compatible pulse that is one GSM bit wide, it is aligned to the downlink TDMA frame timing. The test set provides a frame trigger for synchronizing other test equipment to a measurement it is available at the rear-panel TRIG OUT connector.

The frame trigger has 3 parameters that the user must set. See “SYSTem:FTRigger” on page 468.

- External Trigger State (on or off)
- External Trigger Timeslot (0 to 7)
- External Trigger Bit (0 to 1250)

Examples

External Trigger State

```
OUTPUT 714;"SYSTEM:FTRIGGER:STATE ON"
```

would set the external frame trigger ON.

External Trigger Timeslot

```
OUTPUT 714;"SYSTEM:FTRIGGER:TSLOT 3"
```

would cause external frame trigger pulses to align with timeslot three.

External Trigger Bit

```
OUTPUT 714;"SYSTEM:FTRIGGER:BIT 100"
```

would cause external frame trigger pulses to occur 100 bits after bit 0 of the selected timeslot.

Operating Considerations

Each frame is made up of 8 time slots. Time slots are defined in “ETSI GSM 05.10 Ver. 4.9.0 Section 5. Time slots 0 and 4 are 157 bit periods long, time slots 1, 2, 3, 5, 6, 7 are 156 bit periods long, the average time slot is 156.25 bits in duration. The external trigger timeslot can be set to any time slot 0 through 7, the external trigger bit position can be set from 0 through 1250. If the trigger bit position is set to 1250, that is one full frame beyond the setting of the external trigger timeslot, (156.25 * 8 = 1250).

When the cell activated state is OFF, the frame trigger output is disabled (set to 0 volts) since there is no reference downlink TDMA frame structure available. However, the frame trigger state is not affected when there are changes to cell activated state.

The frame trigger can be set manually from the system configuration screen by pressing the External Trigger Setup soft key.

Related Topics

****

"SYSTem:FTRigger" on page 468

****

Configuring Mobile Station Operating Parameters

The mobile station operating parameters are configured using the following call processing subsystem commands.

For a complete list of command syntax, refer to GPIB commands CALL subsystem.

Mobile Station Operating Parameters

- MS TX Level (mobile station transmit level) “Frequency Banded Parameters” on page 481
- Timing Advance
- Mobile DTX State (mobile station discontinuous transmit state)

Examples:

MS TX Level

`OUTPUT 714;"CALL:MS:TXL 15"`

would set the active cell mobile station transmit power level to 15. See “CALL:MS:TXLevel[:SELected]” on page 256.

`OUTPUT 714;"CALL:MS:TXL:DCS 13"`

would set the DCS cell mobile station transmit power level to 13. See “CALL:MS:TXLevel:DCS” on page 257.

Timing Advance

`OUTPUT 714;"CALL:MS:TADV 5"`

would set the timing advance of the mobile station to 5. See “CALL:MS:TADVance” on page 256.

Mobile DTX State

`OUTPUT 714;"CALL:MS:DTX ON"`

would set the discontinuous transmission state in the mobile station to on. See “CALL:MS:DTX[:STATe]” on page 250.

Operating Considerations

There are a number of parameters for the broadcast channel (see “Configuring the Broadcast Channel (BCH)” on page 491) and the traffic channel (see “Configuring the Traffic Channel (TCH)” on page 501) that can be configured, however the test set’s default parameters should allow a properly functioning mobile station to successfully camp on the cell and make a call under most circumstances.

When Operating Mode = Active Cell, if a call is connected, changes to these parameters, **including a change to the value of the parameter’s current setting**, causes signaling on the downlink to automatically initiate the change. No separate command is necessary to initiate the change. If a call is not connected, changes to the parameter are stored for when the next call **is** established

The MS TX Level parameter, besides informing the mobile station what uplink power to transmit to the test set, also updates the Expected Power parameter. See “RFANalyzer:EXPected:POWer[:SELected]” on page 363.

Receiver Control

The user may want to control the internal receiver parameters rather than allow the test set to control them. manual receiver control is accomplished through the use of receiver control parameters.

Selecting Manual or Automatic Receiver Control

Receiver control defines whether the test set (auto) or the user (manual) is in control of receiver's band, channel, frequency and power .

- Setting a manual band, manual frequency, or manual channel causes receiver control to be set to manual control mode.
- Setting the broadcast band, or any reset operation causes the receiver control to be set to auto control mode.
- Setting the RFANALYZER:CONTROL:AUTO to ON or OFF.

Example

```
OUTPUT 714;"RFANALYZER:CONTROL:AUTO OFF" !Allows manual control of
                                         !receiver parameters.
```

Operating Mode and Receiver Control

The test set's receiver control parameter is set using, "RFANalyzer:CONTrol:AUTO" on page 363.

Manual Receiver Control Parameters

When receiver control is set to auto, the test set's protocol controls the parameters. When receiver control is set to manual, the following three parameters are under user control.

- Manual Band
- Manual Freq
- Manual Channel

Manual Band The frequency bands available for the test set are PGSM, EGSM, DCS and PCS. Only one band can be active at a time. The frequency band must be selected in order to define the frequencies where measurements are to be made. See "Frequency Banded Parameters" on page 481 for details on these parameters.

```
OUTPUT 714;"RFANALYZER:MANUAL:BAND PCS"!Sets the frequency band to PCS.
```

Manual Freq Manual frequency is used to tune the test set's measuring receiver. None of the "Manual Channel" on page 498 parameters are affected by changes to manual frequency.

```
OUTPUT 714;"RFANALYZER:MANUAL:FREQUENCY 942.6MHZ" !Sets the input frequency to 942.6 MHz.
```

Manual Channel Manual channel is used to tune the test set's measuring receiver. "Manual Freq" on page 498 is affected by changes to manual channel.

```
OUTPUT 714;"RFANALYZER:MANUAL:CHANNEL:EGSM 24" !Sets the EGSM channel to 24.
```

Manual Receiver Control

If the receiver control parameter is set to manual, the test set's receiver frequency is set using the parameters in the following table. See "RFANalyzer:MANual:BAND" on page 366 for manual band or manual frequency details.

Table 10. Test Set Receiver Frequencies (Manual)

Operating Mode	Cell Activated State	Measurement Band	Measurement Frequency	Measurement Channel
Active Cell	ON or OFF	Manual Band	Manual Frequency	Manual Channel
Test Mode	ON or OFF	Manual Band	Manual Frequency	Manual Channel

Auto Receiver Control

If the receiver control parameter is set to auto, the test set's receiver frequency is set using the parameters in the following table. See "CALL:TCHannel[:ARFCn][:SELected]" on page 281 traffic channel details and "CALL:TCHannel:BAND" on page 283 for traffic band details. See "CALL[:CELL]:BAND" on page 227 for cell band details. See "CALL:BCHannel" on page 229 for broadcast channel details.

Table 11. Test Set Receiver Frequencies (Auto)

Operating Mode	Cell Activated State	Measurement Band	Measurement Frequency
Active Cell	ON	Traffic Band	Traffic Channel
Active Cell	OFF	Cell Band	Broadcast Channel

Table 12. Test Set Receiver Frequencies (Auto)

Operating Mode	Test Function	Measurement Band	Measurement Frequency
Test Mode	BCH (1)	Cell Band	Broadcast Channel
Test Mode	BCH +TCH (2)	Traffic Band	Traffic Channel
Test Mode	CW	Cell Band	Broadcast Channel

Table Footnotes

1 Actual frequency depends on current broadcast band (PGSM, EGSM, PCS, or DCS) and is defined in GSM as the uplink frequency.

2 Actual frequency depends on current traffic channel band (PGSM, EGSM, PCS, or DCS) and is defined in GSM as the uplink frequency.

Expected Power

The expected power parameter is available to the user regardless of the receiver control setting. The MS TX level parameter sets the MS uplink power control level ranges while expected power sets the MS uplink power in dBm.

Expected power defines the expected input power at the RF IN /OUT connector on the front panel of the test set. The range of expected power is beyond the capability of the test set's hardware. This is because expected power is intended to reflect the potential range of RF power at the DUT. This range of RF power is meant to accommodate the use of a gain or loss network between the DUT and the test set. See "Measurement Related Configuration" on page 540 for details about amplitude offset.

The upper and lower limits of expected power provide boundaries for the combination of amplitude offset and expected power. If the user sets expected power to +52 dBm and the amplitude offset to –3 dB, the calculated receiver power will be 49 dBm, but the test set shall be set to +43 dBm, the upper limit of the hardware. If the calculated value of receiver power goes below –25 dB, the lower limit of the hardware, the test set shall be set to –25 dB.

Expected power is always overwritten by settings made to the MS TX Level parameter.

Setting the expected power will not set receiver control to manual.

```
OUTPUT 714;"RFANALYZER:EXPECTED:POWER:PGSM -15DBM" !Set input power to –15 dbm.
```

See "RFANalyzer:EXPected:POWer:PGSM" on page 365 or "CALL:MS:TXLevel[:SELected]" on page 256.

Related Topics

****

"Active Cell Operating Mode" on page 489

"Test Mode Operating Mode" on page 504

"Frequency Banded Parameters" on page 481

****

Configuring the Traffic Channel (TCH)

The traffic channel parameters are configured using the following call processing subsystem commands.

For complete command syntax, see "CALL:TCHannel" on page 280.

TCH Parameters

- Traffic Channel Band
- Traffic Channel (ARFCN)
- Timeslot
- Mobile Loopback
- Speech
- Max Frames Allowed for Assignment
- Channel Mode

Examples:

Traffic Chan Band

```
OUTPUT 714;"CALL:TCH:BAND DCS"
```

would set the cell's traffic channel band to the DCS band. See "CALL:TCHannel:BAND" on page 283.

Traffic Channel

```
OUTPUT 714;"CALL:TCH 45"
```

would set the active cell's traffic channel number to 45. See "CALL:TCHannel[:ARFCn][:SELected]" on page 281.

```
OUTPUT 714;"CALL:TCH:DCS 65"
```

would set DCS cell's traffic channel number to 65. See "CALL:TCHannel[:ARFCn]:DCS" on page 281.

Timeslot

```
OUTPUT 714;"CALL:TCH:TSL 4"
```

would set the traffic channel timeslot to 4. See "CALL:TCHannel:TSLot" on page 285.

Mobile Loopback

```
OUTPUT 714;"CALL:TCH:LOOP OFF"
```

would turn off loopback of the traffic channel data. See "CALL:TCHannel:LOOPback" on page 285.

Speech

```
OUTPUT 714;"CALL:TCH:DOWN:SPE SIN1000"
```

would set the traffic channel downlink speech source to 1 kHz. See "CALL:TCHannel:DOWNlink:SPEech" on page 284.

Max Frames Allowed for Assignment

```
OUTPUT 714;"CALL:COUNT:TDMA:FRAMES 20"
```

would set the maximum number of frames allowed during channel assignments to 20 frames. See "CALL:COUNt:TDMA:FRAMes" on page 238.

Channel Mode

```
OUTPUT 714;"CALL:TCH:CMOD EFRS"
```

would set the channel mode of the mobile station to enhanced full rate speech. See "CALL:TCHannel:CMODe" on page 284.

Operating Considerations

When configuring the base station emulator (BSE) you must configure the broadcast channel (see "CALL:BCHannel" on page 229) and the traffic channel (TCH). There are a number of parameters for the BCH and the TCH that can be configured; however, the test set's default parameters should allow a properly functioning mobile station to successfully camp on the cell and make a call under most circumstances.

When Operating Mode = Active Cell, if a call is connected, changes to the traffic channel number (ARFCN) or traffic channel timeslot, **including a change to the value of the parameter's current setting**, causes signaling on the downlink FACCH to initiate a channel reassignment, see "Programming a Dualband Handover" on page 121. This configures the TCH to use the new parameter. If a call is not connected, changes to the parameter are stored for when the next call **is** established

When Operating Mode = "Test Mode", if Test Mode Downlink Function (see "CALL:FUNCtion:DOWNlink" on page 243) = "BCH+TCH", changes to the traffic channel number (ARFCN) or traffic channel timeslot will reconfigure the downlink TCH accordingly, but there will be no signaling initiated. The change will be immediate. If a TCH is not being generated, changes to the parameter are stored for when the next call is established

Downlink speech controls what kind of speech data is transmitted on the downlink TCH. A TCH with speech data is generated when call control status is connected (see "Call Processing State Synchronization" on page 34), or when in test mode with downlink function set to BCH+TCH.

When an FBER measurement is activated PRBS15 is transmitted on the downlink TCH, over riding the user setting of downlink speech source. Any changes to downlink speech source will be accepted and saved but not applied until FBER become inactive.

There are 5 different settings for the downlink speech source. See "CALL:TCHannel:DOWNlink:SPEech" on page 284.

- Echo retransmits the uplink speech frames back to the downlink with a non-selectable delay of about 1 second.
- PRBS15 the 260 speech frame bits (prior to channel coding) are generated using a pseudo random bit sequence.
- SIN300 the sequence of 260 speech bit frames represent a sine wave at 300 Hz.
- SIN1000 the sequence of 260 speech bit frames represent a sine wave at 1000 Hz.

Traffic channel loopback type cannot be set to type C if the traffic channel band is PGSM.

The Max Frames Allowed for Assignment parameter, is used to specify the maximum number of TDMA frames the mobile station is allowed to take for a channel assignment. This is only applicable to changes in TCH band, traffic channel, or TCH timeslot. Changes to any other TCH parameter will not cause an error to be generated if, the number of frames taken to perform the change exceeds the setting of the maximum frames allowed for assignment. If the mobile station does not complete the channel assignment within the specified number of frames, the test set will generate an error message, but this will not cause a call to drop. If the mobile DTX state (discontinuous transmission) parameter is on (see "CALL:MS:DTX[:STATe]" on page 250), the error is not generated, because when a mobile station is in discontinuous transmission mode, it is not required to transmit on the new channel, at least not until a SACCH, FACCH, or SID frame is ready. In this case, the mobile station may actually have changed channels in the correct time, but had nothing to transmit.

Related Topics

****

"Configuring the Broadcast Channel (BCH)" on page 491

"Configuring Mobile Station Operating Parameters" on page 497

"Receiver Control" on page 498

"Traffic Band Parameter" on page 482

"CALL:TCHannel" on page 280

"Fast Bit Error Measurement Description" on page 71

****

Test Mode Operating Mode

The test set can operate in two different operating modes (active cell mode or a test mode). Active cell mode is the default operating mode and is used when emulating a normal GSM cell. Test mode (see "CALL:OPERating" on page 260 for GPIB syntax) is used when it is not possible, or not desired, to communicate via over-the-air signalling with the mobile station, but downlink stimulus and uplink measurements are still needed. When test mode is selected, the choices of downlink stimulus (Test Function) are:

- BCH (broadcast channel) (see "BCH Test Function Behavior" on page 506)
- BCH + TCH (broadcast channel + traffic channel) (see "BCH + TCH Test Function Behavior" on page 508)
- CW (continuous wave) (see "CW Test Function Behavior" on page 510)

See "CALL:FUNCtion" on page 243 for test function GPIB syntax.

Test Mode Operation

When the test set's operating mode is test mode:

- No over the air signaling is available.
- No capability to demodulate and decode uplink RACH bursts is available.
- Test mode features are determined by the test function: BCH, BCH + TCH, or CW.
- When the operating mode is set to test mode, auto triggering sets the trigger source to RF Rise. See "RF Rise Trigger Source:" on page 145.

The test set's receiver remains on the uplink frequency determined by the broadcast channel see "CALL[:CELL]:BCHannel[:ARFCn][:SELected]" on page 229 as long as receiver control is set to auto. If the user needs manual control of the receiver parameters, receiver control should be set to manual. This gives access to the receiver parameters of manual band, manual channel and manual frequency. See "Receiver Control" on page 498.

NOTE "Setting the Active Cell Mode State" on page 490 has no effect while the test set is in test mode.

Receiver Control - Auto

If the receiver control field is set to auto (see “RFANalyzer:CONTrol:AUTO” on page 363), the test set’s receiver frequency is set according to the fields or GPIB commands in the following table.

Table 1. Test Set Receiver Frequencies (Receiver Control = Auto)

Test Function	Receiver Frequency Fields	GPIB Command
BCH	Broadcast Chan (1)	“CALL[:CELL]:BCHannel[:ARFCn][:SELected]” on page 229
BCH + TCH	Traffic Channel (2)	“CALL:TCHannel[:ARFCn][:SELected]” on page 281
CW	RF Gen Channel	“CALL[:CELL]:BCHannel[:ARFCn][:SELected]” on page 229

Table Footnotes

1 Actual frequency depends on current broadcast band (PGSM, EGSM, PCS, or DCS), and is defined in GSM as the uplink frequency.

2 Actual frequency depends on current traffic channel band (PGSM, EGSM, PCS, or DCS), and is defined in GSM as the uplink frequency.

Receiver Control - Manual

If the Receiver Control field is set to Manual (see “RFANalyzer:CONTrol:AUTO” on page 363), the test set’s receiver frequency is set according to the fields or GPIB commands in the following table.

Table 2. Test Set Receiver Frequencies (Receiver Control = Manual)

Test Function	Receiver Frequency Fields	GPIB Command
Don’t Care	Manual Channel (1)	“RFANalyzer:MANual:CHANnel[:SELected]” on page 366
	Manual Frequency	“RFANalyzer:MANual:FREQuency” on page 369

Table Footnotes

1 Actual frequency is defined in GSM as the uplink frequency.

Expected Burst

This parameter is only used when Operating Mode = Test Mode or Cell Activated State = OFF, manual users will find this field in the Call Parms window, screen 3 of 3, F12. It defines which burst type (Midamble + Burst Length) to look for in the signal from the mobile station. When Operating Mode = Active Cell and Cell Activated State = ON, the test set chooses the correct burst type. See "CALL:BURSt" on page 232 for details about the GPIB command.

When the test set's operating mode is "test mode" or when the cell activated state is "off", the burst type may need to be specified before the test set can synchronize to the input signal's midamble.

```
OUTPUT 714;"CALL:BURST:TYPE TSC5" !Defines burst type for test mode and cell
                                  !activated state OFF.
```

BCH Test Function Behavior

- The test set generates a BCH without a TCH. BCH configuration and timeslot configuration are the same as when the operating mode is set to active cell.
- Cell power is set using the "CALL:POWer" on page 267 command.
- By default, the test set expects the mobile station to transmit on the uplink BCH. The test set's receiver frequency can be set manually, which de-couples the automatic setting.
- Changes to the MS TX level will couple to the expected power, and the MS TX Level parameter will be transmitted on the downlink BCCH.
- All measurements are available to the user, the same as if the operating mode was set to active mode.

Example BCH Test Function Using Auto Receiver Control

The following example shows how to set up a test mode measurement using the BCH test function. In this example the test set is configured to transmit a BCH on PGSM channel 21, and receive the mobile station on PGSM channel 21 at a power level of 12.

1. Select test mode.

   ```
   OUTPUT 714;"CALL:OPERATING:MODE TEST"
   ```

2. Select PGSM as the broadcast band.

   ```
   OUTPUT 714;"CALL:CELL:BAND PGSM"
   ```

3. Select BCH as the test function.

   ```
   OUTPUT 714;"CALL:FUNCTION:DOWNLINK BCH"
   ```

4. Configure the receiver control to auto.

   ```
   OUTPUT 714;"RFANALYZER:CONTROL:AUTO ON"
   ```

5. Set the BCH to channel 21.

   ```
   OUTPUT 714;"CALL:BCH:PGSM 21"
   ```

6. Set the MS TX level to 12.

   ```
   OUTPUT 714;"CALL:MS:TXLEVEL 12"
   ```

7. To make the measurement, set up the mobile station to transmit on PGSM channel 21 at a power level of 12.

Example BCH Test Function Using Manual Receiver Control

The following example shows how to set up a test mode measurement using the BCH test function. In this example the test set is configured to transmit a BCH on PGSM channel 21. Manual receiver control is used to configure the test set to measure a signal from the mobile station at 895 MHz and 14 dBm. Note that the frequency can also be tuned by channel number.

1. Select test mode.

   ```
   OUTPUT 714;"CALL:OPERATING:MODE TEST"
   ```

2. Select PGSM as the broadcast band.

   ```
   OUTPUT 714;"CALL:CELL:BAND PGSM"
   ```

3. Select BCH as the test function.

   ```
   OUTPUT 714;"CALL:FUNCTION:DOWNLINK BCH"
   ```

4. Set the BCH to channel 21.

   ```
   OUTPUT 714;"CALL:BCH:PGSM 21"
   ```

5. Configure the receiver control to manual.

   ```
   OUTPUT 714;"RFANALYZER:CONTROL:AUTO OFF"
   ```

6. Configure the test set's receiver frequency to 895 MHz.

   ```
   OUTPUT 714;"RFANALYZER:MANUAL:FREQUENCY 895 MHZ"
   ```

   If tuning by channel number, see "RFANalyzer:MANual:CHANnel[:SELected]" on page 366

7. Set the receiver's expected power level to 14 dBm.

   ```
   OUTPUT 714;"RFANALYZER:EXPECTED:POWER 14 DBM"
   ```

8. To make the measurement, set up the mobile station to transmit at 895 MHz and at a power level of 14 dBm.

BCH + TCH Test Function Behavior

- The test set generates BCH + TCH on the downlink path. The BCH + TCH burst modulation is the same as when the operating mode is set to active cell.
- Cell power is set using the "CALL:POWer" on page 267 command.
- Manually synchronizing the mobile station to the BCCH is not under direct control of the test set, it is the user's responsibility.
- Changes to the TCH timeslot and TCH ARFCN will reconfigure the downlink (although no channel assignment signaling will take place).
- By default, the test set's receiver is configured to receive the mobile station's signal at the TCH uplink frequency. The test set's receiver frequency can be set manually, which decouples the automatic setting.
- Changes to the MS TX level will couple to the expected power, and the MS TX Level parameter will be transmitted on the downlink BCCH and SACCH.
- Changes to TCH timing advance will also appear on the downlink SACCH. Whether the mobile station makes use of these parameters is a function of the mobile station.
- All measurements are available to the user, the same as if operating mode was active mode.

Example BCH + TCH Test Function Using Auto Receiver Control

The following example shows how to set up a test mode measurement using the test function BCH + TCH. In this example the test set is configured to transmit a BCH on PGSM channel 21, a TCH on PGSM channel 31, and receive the mobile station on PGSM channel 31 at power level 12.

1. Select test mode.

   ```
   OUTPUT 714;"CALL:OPERATING:MODE TEST"
   ```

2. Select PGSM as the broadcast band (traffic channel band will automatically be set to this band).

   ```
   OUTPUT 714;"CALL:CELL:BAND PGSM"
   ```

3. Select BCH as the test function.

   ```
   OUTPUT 714;"CALL:FUNCTION:DOWNLINK BCHTCH"
   ```

4. Configure the receiver control to auto.

   ```
   OUTPUT 714;"RFANALYZER:CONTROL:AUTO ON"
   ```

5. Set the BCH to channel 21.

   ```
   OUTPUT 714;"CALL:BCH:PGSM 21"
   ```

6. Set the TCH to channel 31.

   ```
   OUTPUT 714;"CALL:TCH:PGSM 31"
   ```

7. Set the MS TX Level to 12.

   ```
   OUTPUT 714;"CALL:MS:TXLEVEL 12"
   ```

8. To make the measurement, set the mobile station to transmit on PGSM channel 31 at a power level of 12.

Example BCH + TCH Test Function Using Manual Receiver Control

The following example shows how to set up a test mode measurement using the test function BCH + TCH. In this example the test set transmits a BCH on PGSM channel 21 and a TCH on PGSM channel 31. Manual receiver control is used to configure the test set to measure a signal from the mobile station at 895 MHz, the frequency can also be tuned by channel number with the manual channel parameter. Expected power is set at +14 dBm.

1. Select test mode.

   ```
   OUTPUT 714;"CALL:OPERATING:MODE TEST"
   ```

2. Select PGSM as the broadcast band (the TCH will automatically be set to this band).

   ```
   OUTPUT 714;"CALL:CELL:BAND PGSM"
   ```

3. Select BCH + TCH as the test function.

   ```
   OUTPUT 714;"CALL:FUNCTION:DOWNLINK BCHTCH"
   ```

4. Set the BCH to channel 21.

   ```
   OUTPUT 714;"CALL:BCH:PGSM 21"
   ```

5. Set the TCH to channel 31.

   ```
   OUTPUT 714;"CALL:TCH:PGSM 31"
   ```

6. Configure the receiver control to manual.

   ```
   OUTPUT 714;"RFANALYZER:CONTROL:AUTO OFF"
   ```

7. Configure the test set's receiver frequency to 895 MHz.

   ```
   OUTPUT 714;"RFANALYZER:MANUAL:FREQUENCY 895 MHZ"
   ```

   If tuning by channel number, see "RFANalyzer:MANual:CHANnel[:SELected]" on page 366

8. Set the receivers expected power level to 14 dBm.

   ```
   OUTPUT 714;"RFANALYZER:EXPECTED:POWER 14 DBM"
   ```

9. To make the measurement, set up the mobile station to transmit at 895 MHz and at a power level of 14 dBm.

CW Test Function Behavior

When the test set's downlink function is set to CW the test set operates like a signal generator with level and frequency controls. The Call Parms selections change from Cell Power to RF Gen Power, from Cell Band to RF Gen Band, from Broadcast Chan to RF Gen Channel. The CW setting also gives the user the opportunity to set output frequency using the RF Gen Freq parameter.

- The test set generates an unmodulated CW downlink signal.
- The RF generator's power is set using the "CALL[:CELL]:RFGenerator:POWer[:SAMPLitude]" on page 274 command.
- The RF generator's band is set using the "CALL[:CELL]:RFGenerator:BAND" on page 270 command.
- The downlink frequency is controlled by the RF Gen Channel and RF Gen Freq fields. The RF Gen Channel field sets the generator to the frequency corresponding to the channel number in the current RF Gen Band field using the "CALL[:CELL]:RFGenerator:CHANnel[:SELected]" on page 271 command.
- The RF generator's frequency is set using the "CALL[:CELL]:RFGenerator:FREQuency" on page 274 command, in this mode the user has direct control of the output frequency without making a channel selection.
- By default, the test set's receiver is configured to receive the mobile station's signal at the current RF generator channel setting. The test set's receiver frequency can be set manually, which decouples the automatic setting.
- No uplink demodulation or channel decoding is available. BER and uplink audio measurements will not return any results.

When the user updates the RF Gen Channel parameter the RF Gen Freq parameter changes to indicate the frequency for that channel. When RF Gen Freq is changed the RF Channel parameter does not change, this is because the user may choose to select a frequency that is not a channel.

Example CW Test Function Using RF Generator Frequency

The following example shows how to set up a test mode using the CW test function. In this example the test set transmits a CW signal on DCS frequency 1805.4 mHz at an output power level of -80 dBm.

1. Set the RF generator output power to -80 dBm.

   ```
   OUTPUT 714;"CALL:CELL:RFGENERATOR:POWER -80"
   ```

2. Select test mode.

   ```
   OUTPUT 714;"CALL:OPERATING:MODE TEST"
   ```

3. Select PGSM as the RF generator band.

   ```
   OUTPUT 714;"CALL:CELL:RFGENERATOR:BAND DCS"
   ```

4. Select CW as the test function.

   ```
   OUTPUT 714;"CALL:FUNCTION:DOWNLINK CW"
   ```

5. Configure the test set's output frequency to 1805.4 MHz.

   ```
   OUTPUT 714;"CALL:CELL:RFGENERATOR:FREQUENCY 1805.4MHZ"
   ```

Related Topics

****

"Configuring the Broadcast Channel (BCH)" on page 491

"Configuring the Traffic Channel (TCH)" on page 501

"CALL:OPERating" on page 260

"Receiver Control" on page 498

****

Testing a Mobile for Enhanced Full Rate Speech Channel Mode

The channel mode function allows you to command a mobile to switch between full rate speech and enhanced full rate speech either before a call is originated, or during a call connected state with any or all of the supported measurements running.

The following measurements are supported in enhanced full rate speech mode:

- Analog Audio (AAUDio)
- Bit Error Rate (BERRor)
- Fast Bit Error Rate (FBERror)
- Dynamic Power (DPOWer)
- I/Q Tuning (IQTuning)
- Output RF Spectrum (ORFSpectrum)
- Phase and Frequency Error (PFERror)
- Power versus Time (PVTime)
- Transmitter Power (TXPower)

You can initiate a Decoded Audio (DAUDio) measurement in enhanced full rate speech mode. However, this measurement is not supported in this channel mode and the integrity indicator will report that the results are questionable (see “Decoded Audio (DAUDio) Troubleshooting” on page 61).

If you change the channel mode when no call is connected, the mobile is requested to go into the selected channel mode the next time a mobile originated or mobile terminated call is initiated.

If you change the channel mode when a call is connected, the mobile is requested to go into the selected channel mode immediately.

The channel mode should only be changed when the test set is in active cell operating mode, not test operating mode.

NOTE GSM Phase 1 mobiles are not required to support enhanced full rate speech vocoder. Therefore, the behavior of a GSM Phase 1 mobile which does support enhanced full rate speech vocoder may be manufacturer dependent when used with the channel mode function.

If you switch the channel mode between enhanced full rate speech and full rate speech when the downlink speech source is set to Echo (see “CALL:TCHannel:DOWNlink:SPEech” on page 284), you may hear momentary unpleasant audio bursts from the mobile.

Related Topics

****

“Programming a Channel Mode Change” on page 119

****

Preset Descriptions

Description

The test set is capable of accepting several different preset commands.

At no time during a preset operation, will transmit power exceed the last user setting of the transmit power. The input power will not be set to any value lower than the last user setting of the input power. This is to avoid power spikes on the output and possible receiver damage on the input during transitions associated with preset operations.

Examine the results in Tables 4 and 5 to determine which preset to use for your situation.

Partial Preset

```
OUTPUT 714;"SYSTEM:PRESET3" !Command for a partial preset when user in
                            !remote operation.
```

SYSTEM:PRESET3 is the recommended command for a Partial Preset operation. The SYSTEM:PRESET[1] command is not recommended for use at this time.

Full Preset

A full preset requires the user to setup new measurements and their parameters. If new setup parameters are not needed, use a partial preset to save time. Transmit power is set to its default value. Transmit power is not set to OFF during a full preset.

Full preset behavior is the same as partial preset behavior with the exception of Trigger Arm and Measurement Parameters, see the results listed below.

Press the blue SHIFT key and then the green PRESET key to perform a full preset.

Table 5. Full Preset Behavior

Function	Result
Trigger Arm	Continuous (manual full preset)
Trigger Arm	Single (remote full preset)
Measurement Parameters	all set to defaults

Example

```
OUTPUT 714;"*RST" !Command for a full preset when user in remote operation.
```

The *RST common command is the recommended command for a Full Preset operation. The SYSTEM:PRESET2 command is not recommended for use at this time.

Status Preset

The STATUS:PRESET command will set the status system as defined in “SCPI 1995 Volume 2: Command Reference” section 20.7. All of the enable registers will be set to 0, all PTR registers will be set to 1, and all

NTR registers will be set to 0.

Example

```
OUTPUT 714;"STATUS:PRESET" !Presets the STATus subsystem.
```

Related Topics

****

"SYSTem:PRESet" on page 471

"*RST" on page 477

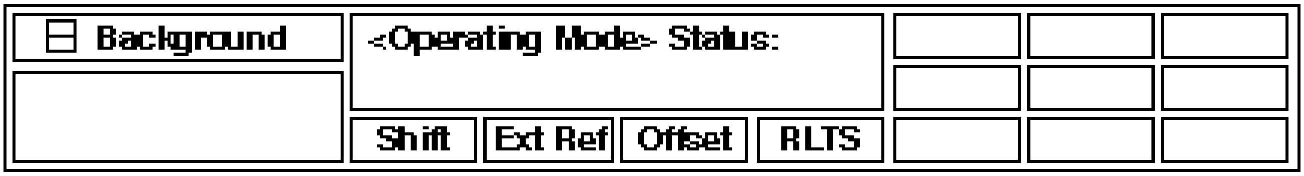
****

Instrument Status Area

Description

The Instrument status area is found on the bottom center of the test set's display.

Figure 2. Status Area of the Test Set Display



Background

Users are able to initiate more than one measurement at a time with the test set. The test set's display will show a maximum of 2 measurements. When 3 or more measurements are initiated, or the MEASUREMENT screen is not displayed, the Background annunciator reminds the user that measurements are active but not displayed.

<Operating Mode> Status

The call processing status and the operating modes are displayed in this area. This area may change (depending on the TA that is active) in order to provide TA specific information.

Shift

This annunciator indicates that the blue SHIFT key has been pressed, and that the next key you press will perform the shifted function indicated, also in blue.

Ext Ref

When a suitable external time base is connected to the rear panel 10MHz REF IN connector, this annunciator will turn on.

Offset

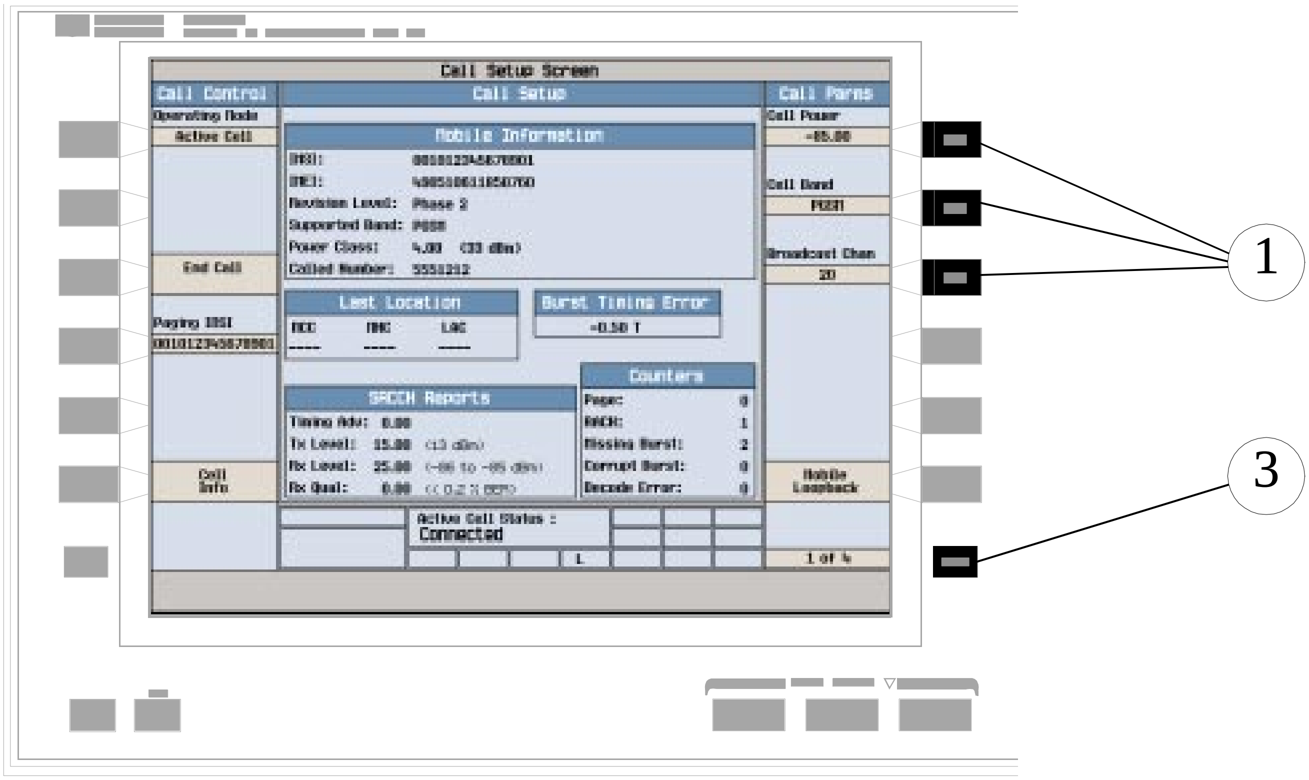
Indicates that the Amplitude Offset state is set to On.

R L T S

This annunciator indicates the state of four different conditions of the test set:

- Remote annunciator. 'R' turns on when the test set is operated remotely.
- Listen annunciator. 'L' turns on when the test set is listening to a command.
- Talk annunciator. 'T' turns on when the test set is providing information over GPIB.
- SRQ annunciator. 'S' turns on when an SRQ is active.

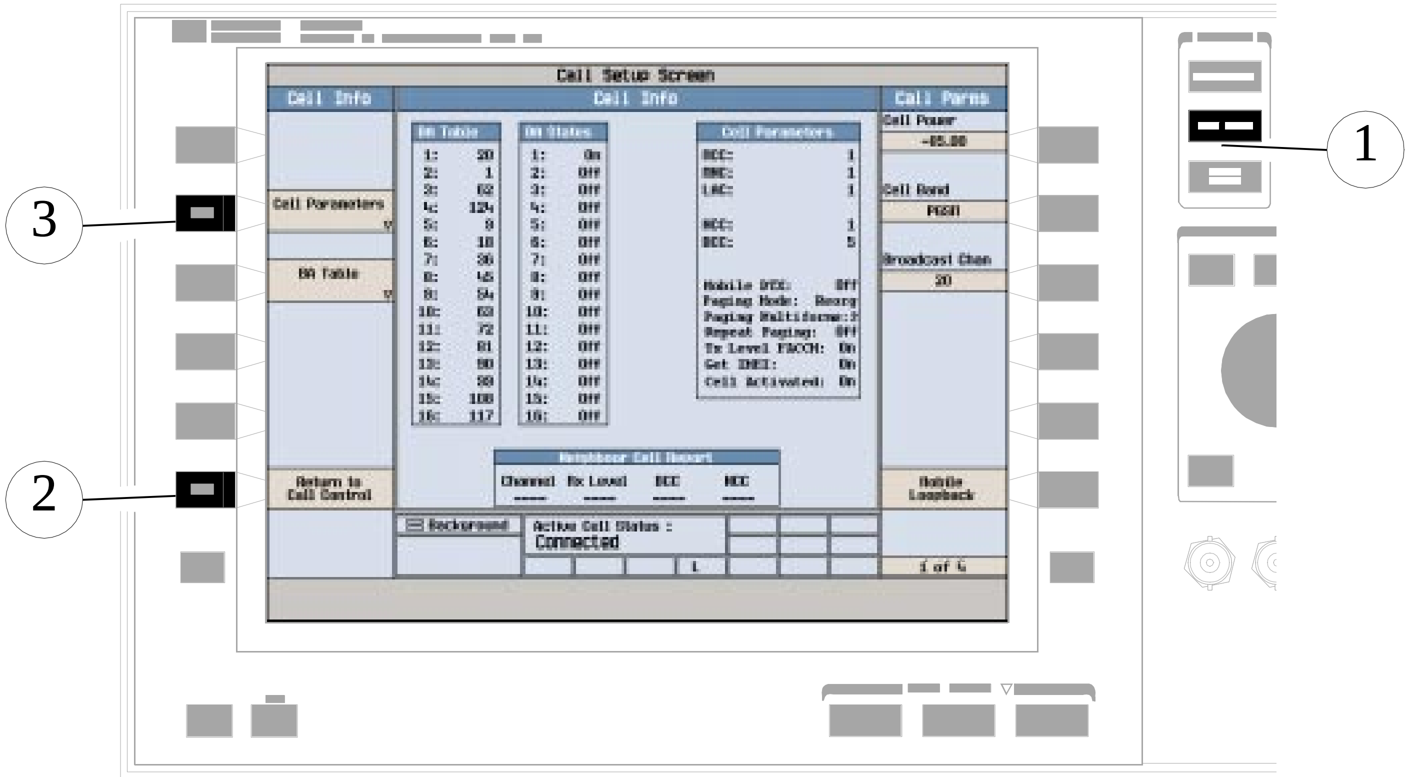
How Do I Change Call Parameters?



1. Press F7, F8, or F9.
2. Enter a value or highlight a selection and press the knob.
3. Press the MORE key for additional call parameters (Call Parms). Note: For a dual-band handover, change Traffic Band selection (F7 on Call Parms menu 2 of 4).

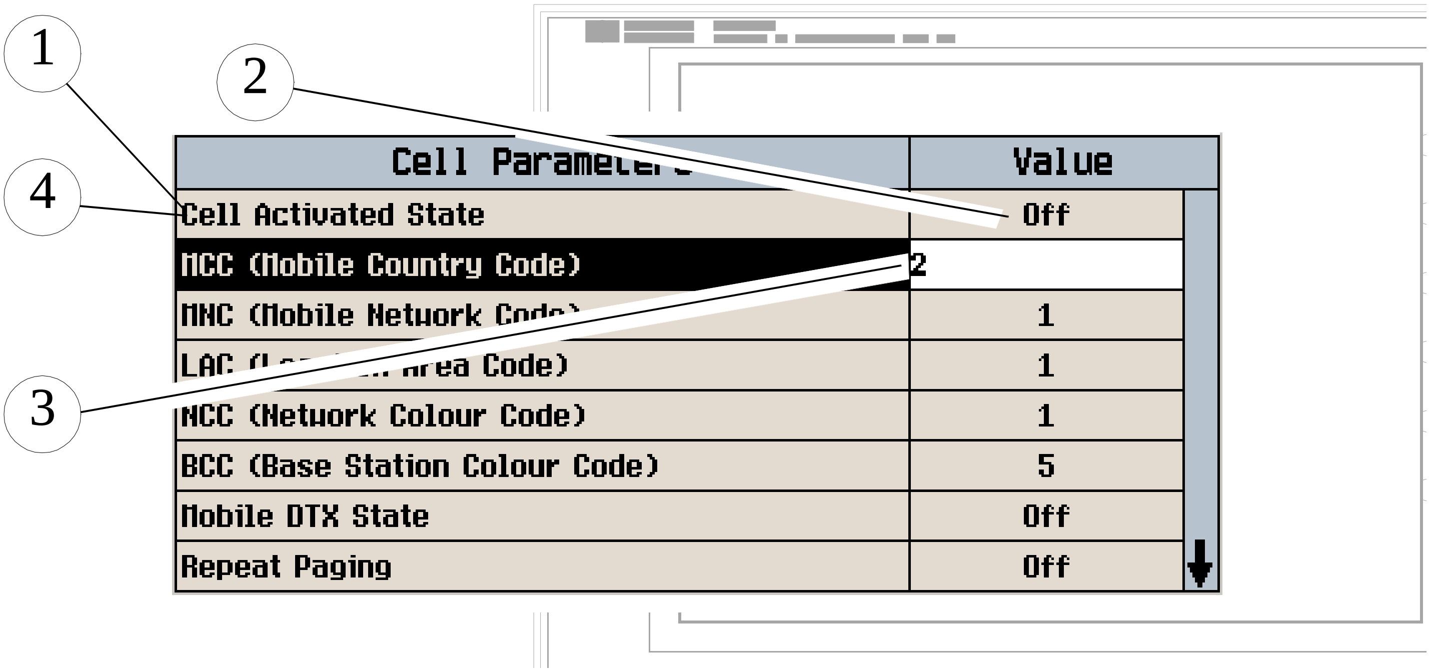
How Do I Change Cell Parameters?

A. Select the cell parameters menu.



1. Press the CALL SETUP key.
2. Press Cell Info (F6).
3. Press Cell Parameters (F2).

B. Set a cell parameter.



To Change "Network" cell parameters follow the instructions below. For all other cell parameters:

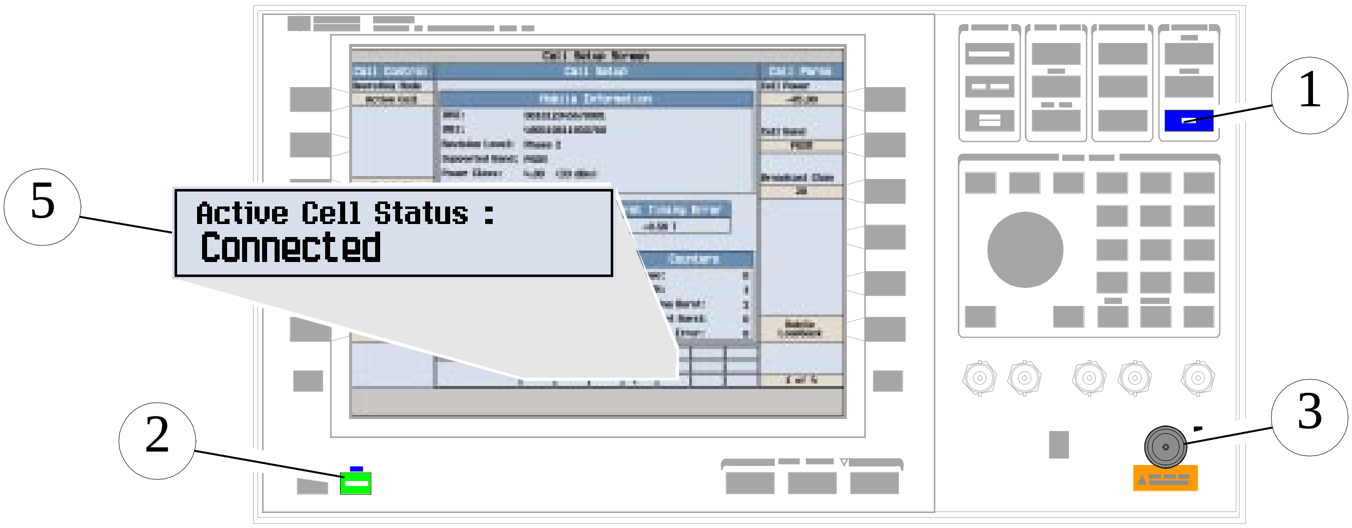
Highlight the parameter, press the knob, enter a value, and press the knob.

To Change "Network" cell parameters:

1. Highlight Cell Activated State and press the knob.
2. Set Cell Activated State to Off. (Highlight "Off" and press the knob.)
3. Set "Network" cell parameter to the desired value. (Highlight the parameter, press the knob, enter a value, and press the knob.)
4. Set Cell Activated State to On.

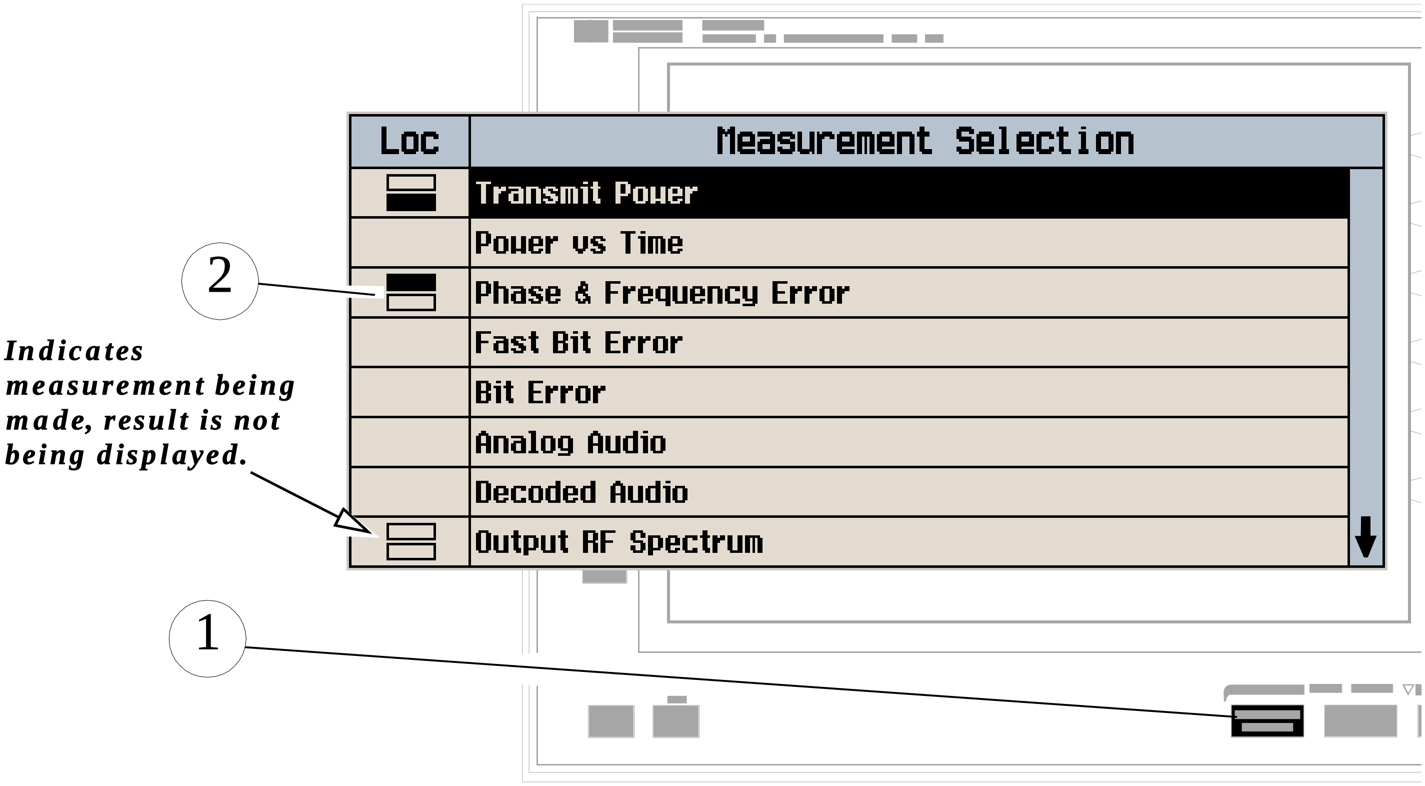
How Do I Make Measurements on a Mobile?

A. Establish a call.



1. Press the SHIFT key.
2. Press the PRESET key.
3. Connect the mobile. Note: Is the mobile camped? PGSM is default Cell Band setting.
4. On the mobile press 1, 2, 3, and then press send.
5. Check for “Connected” in the Active Cell Status field.

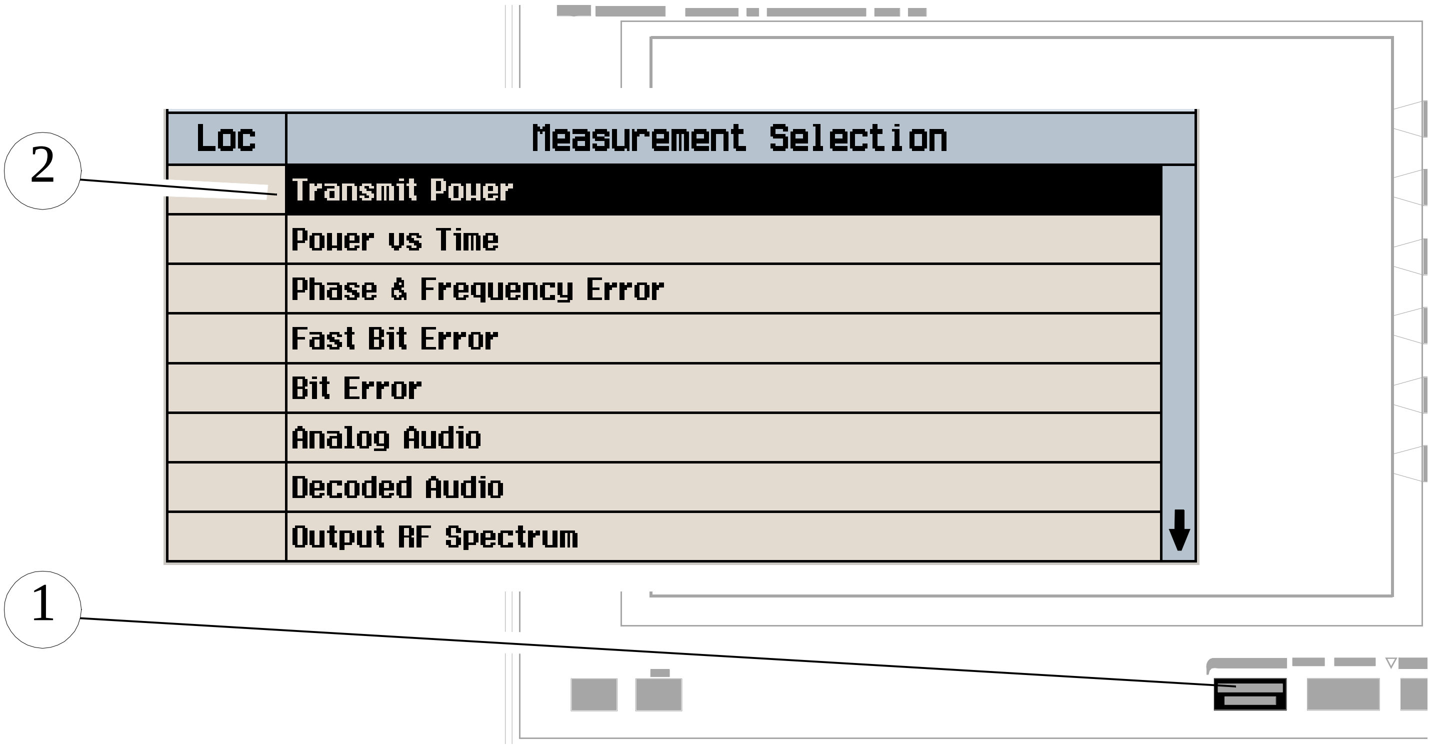
B. Select measurements.



1. Press the MEASUREMENT SELECTION key.
2. Highlight a measurement and press the knob.
3. Repeat steps 1 and 2 to add measurements.

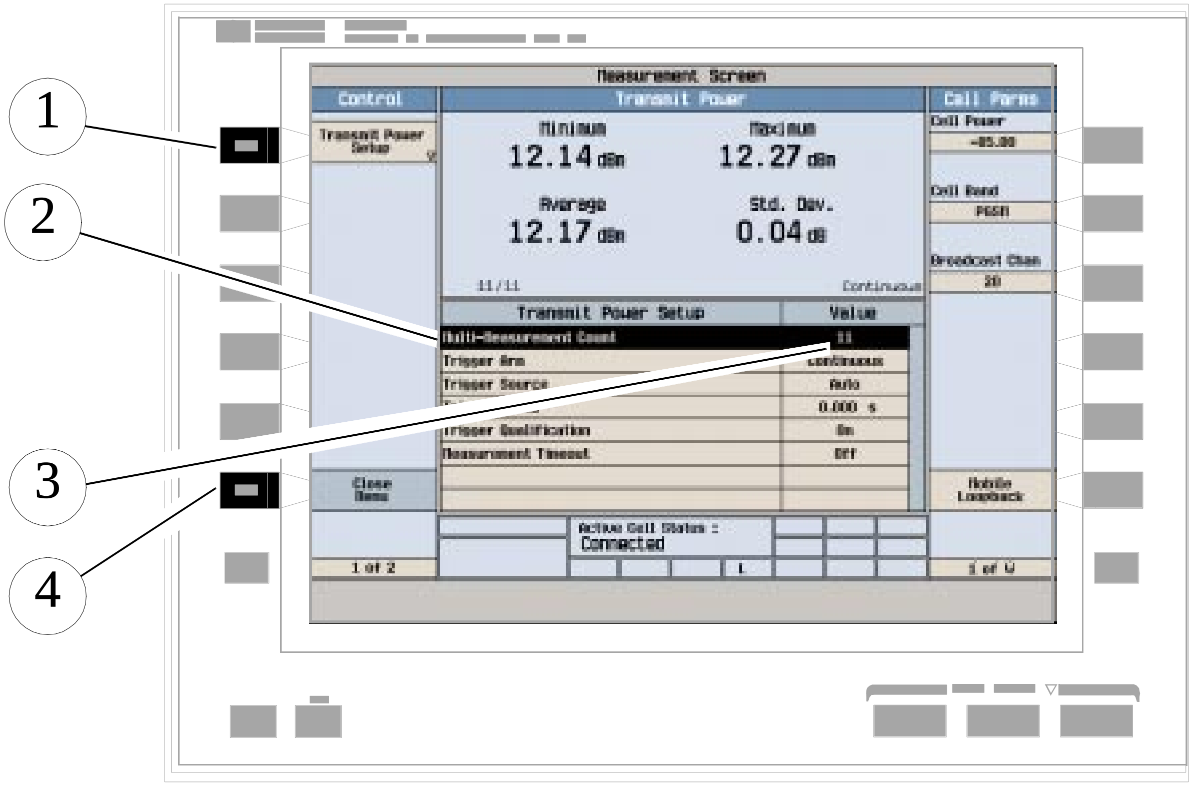
How Do I Change Measurement Setup?

A. Select a measurement.



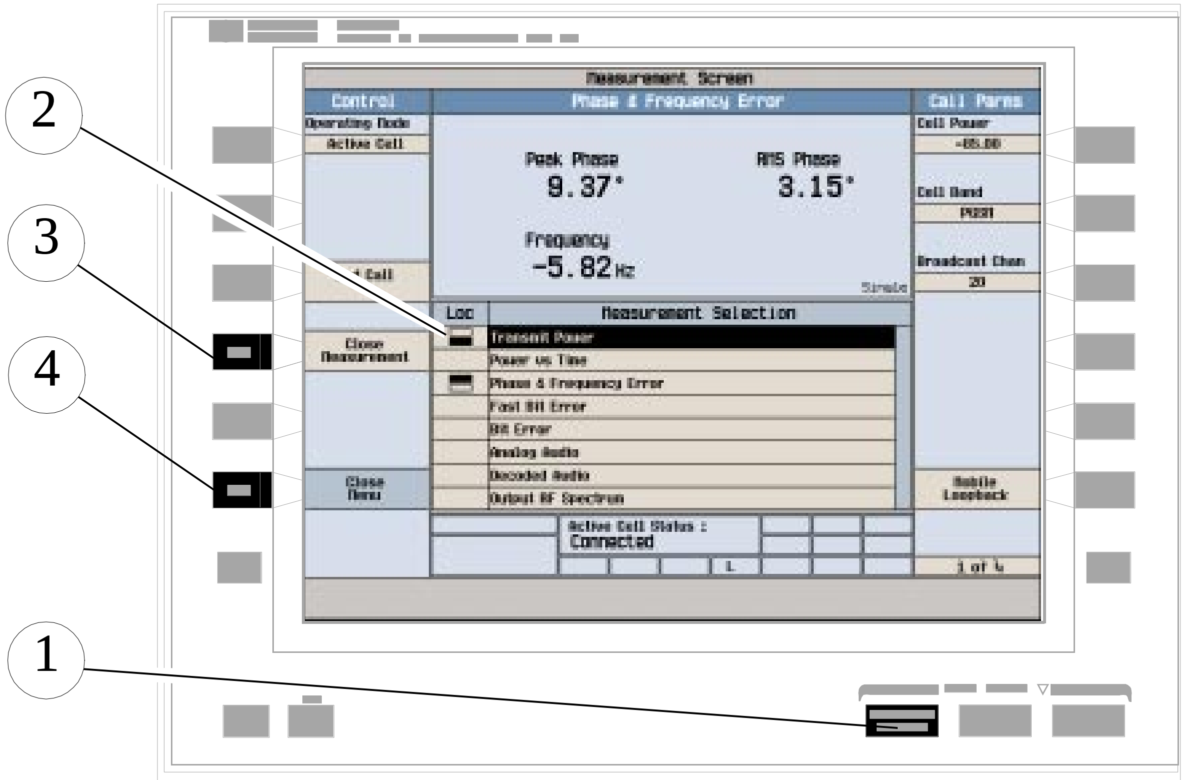
1. Press the MEASUREMENT SELECTION key.
2. Highlight a measurement to setup and press the knob.

B. Set up the measurement.



1. Press the setup key (F1).
2. Highlight a parameter and press the knob.
3. Enter a value or selection and press the knob. Note: For statistical measurement results, change the Multi-Measurement Count Number parameter from “Off” to a number >1.
4. Press Close Menu (F6).

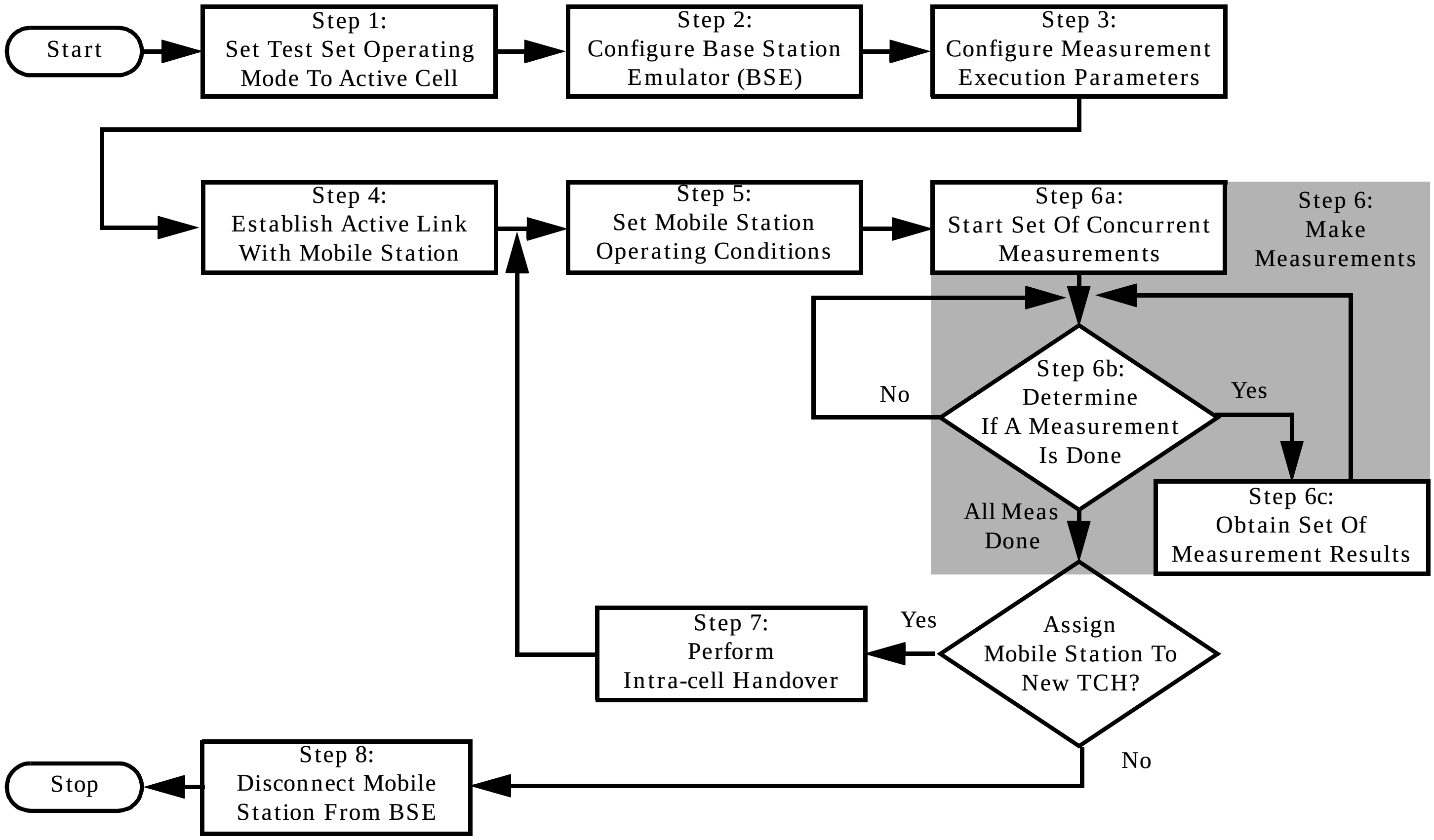
How Do I Turn Off a Measurement?



1. Press the MEASUREMENT SELECTION key.
2. Highlight the measurement you want to turn off.
3. Press Close Measurement (F4).
4. Press Close Menu (F6).

Programming Overview

Figure 3. Typical Flow Of Tasks Performed By Control Program



Related Topics

****

“Programming a Phase and Frequency Error Measurement” on page 87

“Programming a Transmit Power Measurement” on page 110

“Programming an Output RF Spectrum Measurement” on page 80

“Programming a Power versus Time Measurement” on page 95

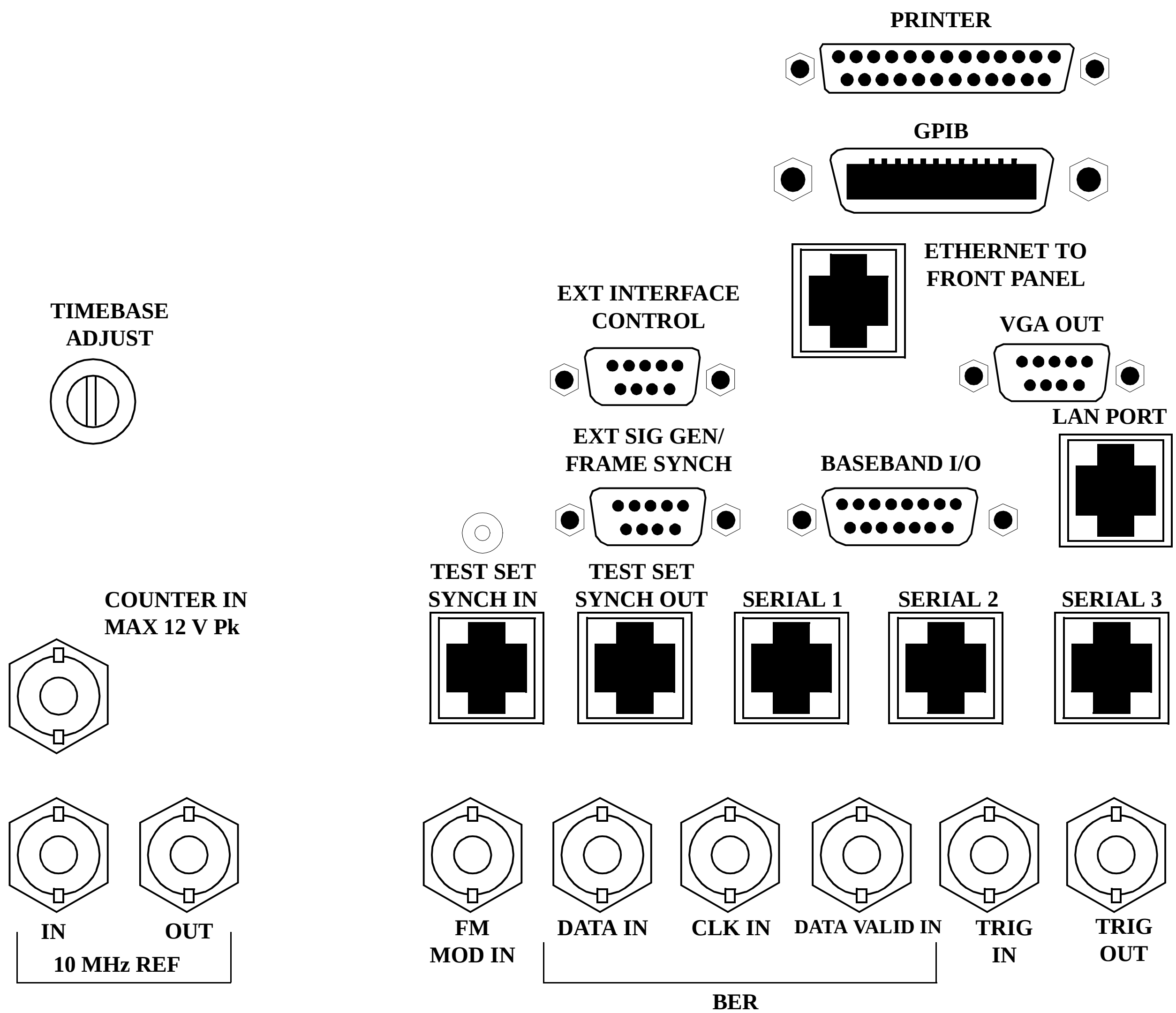
“Programming a Fast Bit Error Measurement” on page 74

“Establishing an Active Link with the Mobile Station” on page 26

****

Rear Panel Connectors

Description



BASEBAND I/0

Not functional for this release.

CLK IN

Not functional for this release.

COUNTER IN

Not functional for this release.

DATA IN

Not functional for this release.

DATA VALID IN

Not functional for this release.

ETHERNET TO FRONT PANEL

This RJ-45 connector is used with a separate LAN jumper cable to connect the front panel DATA connector to the rear panel LAN PORT.

The ETHERNET TO FRONT PANEL connector on the rear panel is connected to the DATA connector on the front panel internally, as a convenience to the user the LAN connection to the test set may be routed to the front panel DATA connector for access. The user must connect the rear panel LAN PORT to the rear panel ETHERNET TO FRONT PANEL connector with the LAN jumper cable in order to use the front panel DATA connector.

The LAN jumper cable, part number E5515-61160, is supplied with the test set.

EXT INTERFACE CONTROL

Not functional for this release.

EXT SIG GEN/FRAME SYNCH

Not functional for this release.

FM MOD IN

Not functional for this release.

GPIB

The GPIB connector allows communications with compatible devices.

LAN PORT

This RJ-45 connector provides for LAN communication between the test set and the network.

PRINTER

Not functional for this release.

SEARIAL 1

Not functional for this release.

SERIAL 2

Not functional for this release.

SERIAL 3

Not functional for this release.

TEST SET SYNCH IN

Not functional for this release.

TEST SET SYNCH OUT

Not functional for this release.

TIMEBASE ADJUST

This is the timebase adjust cover, removing this screw allows access for timebase adjustment.

TRIG IN

Not functional for this release.

TRIG OUT

This BNC connector allows for synchronization of the test set to other equipment and is configured by setting Frame Trigger Parameters.

VGA OUT

This DB-15 connector allows the user to simultaneously route the test set's display to another monitor.

10 MHZ REF IN

This BNC connector accepts an external 10 MHz timebase signal. The nominal input impedance is 50 ohm. This version of test set can only accept a 10 MHz timebase signal.

10 MHZ REF OUT

This BNC connector provides a 10 MHz timebase signal to external test equipment. The accuracy of this signal is determined by the timebase used. The nominal output impedance is 50 ohm with a typical level of 0.5 V rms.

Related Topics

****

“Setting Frame Trigger Parameters” on page 495

“Timebase Description/Configuration” on page 545

“SYSTem:ROSCillator” on page 473

“Configuring the Test Set’s GPIB Address” on page HIDDEN

“Configuring the Test Set’s LAN” on page 537

****

Remote/Local Mode

Description

Remote Mode

When the test set is operated remotely, all of the keys on the front panel of the test set are disabled (except the LOCAL key and the power switch). During remote operation the test set is controlled by the Remote User Interface, (RUI).

Any open menus will be closed, and any manual entries will be aborted when the test set transitions from local mode to remote mode.

The user will need to press the LOCAL key on the front panel in order to gain manual control of the test set, if the test set is in remote mode.

The remote annunciator (R) will appear on the test set's display to indicate that the test set is in remote mode.

Local Mode

During local mode all front panel keys and the knob are enabled. During local operation the test set is controlled by the Manual User Interface, (MUI).

The remote annunciator (R) is turned off when the test set is operated in local mode.

7 Installation/Configuration

Test Set Beeper

Description

This parameter allows the user to change the beeper state to on or off. A beep will indicate error conditions caused during manual or remote operation of the test set.

A 100 ms, 1.24 kHz audible tone (beep) is generated when an error message is logged and the beeper state is set to on. If two errors are generated in quick succession, two beeps are generated to indicate that more than one error has been logged.

The beeper state can be manually set in the Instrument Setup window found in the SYSTEM CONFIG screen.

Example

```
OUTPUT 714;"SYSTEM:BEEPER:STATE OFF"
```

Related Topics

****

"SYSTem:BEEPer" on page 458

"Error Messages" on page 549

****

Description

The GPIB address is an integer between 0 and 30. The test set comes with a default address of 14 and may be set/queried using the SYSTem subsystem or manually through the system configuration screen by selecting the parameter and changing the number with the knob or the keypad.

The GPIB address is a non-volatile parameter. The GPIB address is not affected by any reset operation and can only be changed by direct access to the parameter itself.

Related Topics

****

“SYSTem:COMMunicate:GPIB:[:SELF]:ADDRess” on page 459

****

Obtaining Identification Information *IDN?

December 1, 1999

Description

The identification query provides information about the origin, nature, and definition of the test set and is divided into four parts Manufacturer, Model Number, Serial Number, and Firmware Revision. *IDN? is defined in IEEE Std. 488.2-1992, 10.14.

*IDN query returns identification information as a common separated string.

*IDN? Programming Example

```
DIM A$[100]
OUTPUT 714;"*IDN?" !returns manufacturer,model number, serial number and "0"
                   !separated by commas
ENTER 714;A$
PRINT A$           !would print, for example "Agilent Technologies, 8960 Series 10 E5515A,
                    !US38020105,0
```

Manufacturer

Example: Agilent Technologies

Model Number

Printable ASCII characters excluding comma and semicolon up to a 15-character string.

Example: 8960 Series 10 E5515A

Serial Number

Printable ASCII characters excluding comma and semicolon up to a 10-character string.

Example: US00000123

Firmware

Printable ASCII characters excluding comma and semicolon up to a 20-character string.

Example: 0

Related Topics

****

"*IDN?" on page 476

"CALibration:DATE" on page 219

"Obtaining Test Application Information" on page 544

"SYSTem:COMMunicate" on page 459

****

Configuring the Test Set's LAN

Description

LAN IP Address

The LAN address is a character string with a maximum of 15 characters and a format of A, B, C, D, where A is between 0 and 223, and B, C, and D are between 0 and 255. No embedded spaces are allowed. The address may be manually set/viewed in the system configuration screen. The LAN address can be set/queried using the SYSTem subsystem.

The LAN address is a non-volatile parameter. The LAN address is not affected by any reset operation and can only be changed by direct access to the parameter itself.

NOTE If the LAN address is set to a value in a different network class (than the previous value), the subnet mask will change to the default net mask for the new network class.

For convenience the DATA port on the front panel may be configured as a LAN port. When a RJ45 jumper cable, (part number E5515-61160) is connected from the LAN PORT on the rear panel, to the ETHERNET TO FRONT PANEL port also on the rear panel, the user has LAN access from the front panel of the test set. Without the RJ45 jumper cable, the test set connection to a LAN is the rear-panel, LAN PORT connector.

LAN Default Gateway

The LAN router, (default gateway), is a character string with a maximum of 15 characters and a format of A, B, C, D, where A is between 0 and 223 , and B, C, and D are between 0 and 255, no embedded spaces are allowed. If the default gateway is set to a format not allowed with the LAN address or the subnet mask that have been selected, the default gateway will be set to a null string, indicated by a blank field on the test set display. The address may be manually set/viewed in the system configuration screen. The LAN default gateway can be set/queried using the SYSTem subsystem.

The LAN default gateway is the address of a router that routes messages between networks and or subnets. If this value is not specified, LAN communications will be limited to the network and subnet specified by the LAN IP address and the subnet mask. Your network administrator will know if a default gateway is needed and if so, the address of the router. If the default gateway address is not needed by your network, it may be disabled by entering any of the following values: "0" (zero), "" (null string), "0.0.0.0"

The LAN default gateway is a non-volatile parameter. The LAN default gateway is not affected by any reset operation and can only be changed by direct access to the parameter itself.

LAN Subnet Mask

The LAN subnet mask address is a character string with a maximum of 15 characters and a format of A, B, C, D, where A , B, C, and D are between 0 and 255. No embedded spaces are allowed. The address may be manually set/viewed in the system configuration screen. The LAN subnet mask address can be set/queried using the SYSTem subsystem.

The subnet mask number combined with the IP address identifies which network and subnet your computer is on. Contact your system administrator for the correct subnet mask for your network.

The subnet mask determines the boundaries between the subnet ID and the host ID.

The LAN subnet mask is a non-volatile parameter. The LAN subnet mask is not affected by any reset operation and can only be changed by direct access to the parameter itself.

NOTE If the LAN address is set to a value in a different network class (than the previous value), the subnet mask will change to the default net mask for the new network class.

The subnet mask number is obtained from your network administrator.

Related Topics

****

"SYSTem:COMMunicate:LAN[:SELF]:ADDRess" on page 460

"SYSTem:COMMunicate:LAN[:SELF]:DGATeway" on page 461

"SYSTem:COMMunicate:LAN[:SELF]:SMASk" on page 461

****

Hardware Configuration Report

Description

You can generate a list of the test set's hardware configuration over the LAN or GPIB. The report includes: model number, serial number, revision number, board ID, and cal file information.

LAN Query

Connect the test set to the LAN and determine the LAN IP address. It can be found in the SYSTEM CONFIG screen. Open a WEB browser. In the address field, enter the test set's LAN IP address, followed by the "iconfig" command.

LAN Example:

15.2.2.147/iconfig

GPIB Query

Data from the GPIB query must be saved as html, and then read with a WEB browser in order for the information to be presented in the same format as the LAN query.

GPIB Example:

```
10     DIM Buf1$[20000],Buf2$[20000] ! This is the minimum space for the arrays
20     OUTPUT 714;"SYSTEM:CONFIGURE:INFORMATION:HARDWARE:VERBOSE?"
30     ENTER 714;Buf1$,Buf2$
40     CREATE "HW.htm",1              ! Create an HTML file
50     ASSIGN @File TO "HW.htm"
60     OUTPUT @File;Buf1$,Buf2$
70     END
```

In the future, the hardware configuration report may increase in length. More space would then need to be allocated for the arrays.

Related Topics

****

"Rear Panel Connectors" on page 525

"SYSTem:CURRent:TA" on page 465

"Obtaining Test Application Information" on page 544

"Obtaining Identification Information *IDN?" on page 535

****

Measurement Related Configuration

Amplitude Offset (RF In/Out port)

Amplitude offset is provided in order to offset RF levels at the RF IN/OUT port of the test set and represent the power level at the device under test. The offset is the same for both transmit and receive power so the network being compensated for must have the same gain or loss in both directions. The amplitude offset value is found in the SYSTEM CONFIG screen, Port Configuration key, F5.

Examples

The SYSTEM:CORRECTION:STATE command turns amplitude offset on or off. When SYSTEM:CORRECTION:STATE is on; the annunciator “Offset” will be shown on the display. see “SYSTem:CORRection” on page 463

```
OUTPUT 714;”SYSTEM:CORRECTION:STATE ON” !Set amplitude offset state ON.
OUTPUT 714;”SYSTEM:CORRECTION:GAIN -3DB” !Set amplitude offset to 3 dB loss in network.
OUTPUT 714;”SYSTEM:CORRECTION:GAIN 6DB” !Set amplitude offset to 6 dB gain in network.
OUTPUT 714;”SYSTEM:CORRECTION:SGAIN -2DB” !Set amplitude offset to ON and a 2 dB loss
                                              !in the network.
```

Measurements reflect the actual power at the connection to the device under test, known as the DUT plane. The test set; cell power indicates a change to compensate for loss or gain in the network; however, the expected power setting remains unchanged. See “CALL:POWer” on page 267 for cell power or “RFANalyzer:EXPected:POWer[:SELected]” on page 363 for expected power details.

Transmitter example

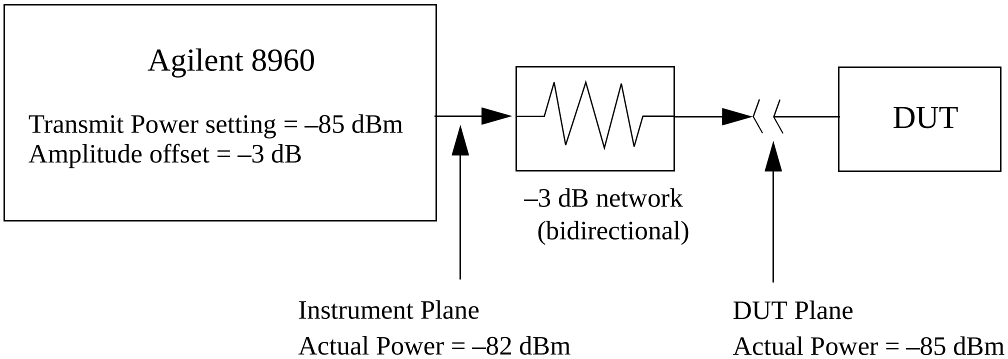
Cell power reflects the actual power at the device under test, including any gain or loss entered as an amplitude offset.

If the cell power setting is –85 dBm, and the SYSTEM:CORRECTION:SGAIN -3DB command is sent, the cell power setting indicates –88 dBm, which represents the cell power at the mobile station after a 3 dB loss in the network.

When you set Cell Power level, the test set uses the amplitude offset value to adjust the actual power so that, power at the devise under test will match the Cell Power setting.

The following figure shows a transmitter example. Transmit power is the combination of the cell power and the amplitude offset values.

Figure 4. Amplitude Offset Transmitter Example



When amplitude offset is non-zero, the transmit power setting reflects the actual power at the DUT plane.

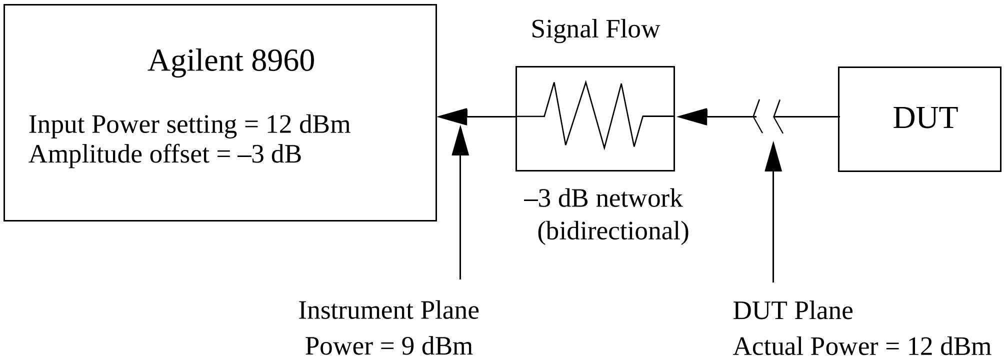
Receiver example

The expected power setting reflects the actual power at the device under test. This means the value displayed for expected power does not change; however, the test set's hardware changes internally to expect a level that includes the offset.

If the expected power setting is 12 dBm, and then the SYSTEM:CORRECTION:SGAIN -3DB command is sent, the expected power remains unchanged at 12 dBm to reflect the level at the device under test, but the test set's internal hardware changes to receive 9 dBm the actual power received at the test set's RF IN/OUT connector.

The following figure shows a receiver example. Input power is the combination of the expected power and amplitude offset values.

Figure 5. Amplitude Offset Receiver Example



When amplitude offset is non-zero, the input power setting reflects the actual power at the DUT plane.

Related Topics

****

"RFANalyzer" on page 362

****

Display Mode (Track/Fast)

Description

There are two display modes to select from when operating the test set remotely.

- Display mode fast
- Display mode track

Fast Mode

When operating remotely, there is often no need for the display to be updated as measurements are made. Using the fast display mode will increase the speed of the test set when it is operated remotely.

Fast mode is designed for remote use only. The test set returns to track mode if the user changes to manual operation.

- No screen or menu items are visible (except error messages).
- Error messages will be displayed in their normal location.
- "This instrument is being operated remotely" will be displayed at the bottom of the screen.

Example

```
OUTPUT 714;"DISPLAY:MODE FAST" !Selects fast mode
```

Track Mode

The track display mode is used to allow users to see what the test set is doing while it is being controlled remotely. Track mode is the default mode of the test set.

- Any changes made remotely will be updated on the screen if that screen is displayed.
- The error message window will be displayed as required when an error occurs.

Example

```
OUTPUT 714;"DISPLAY:MODE TRACK"!Selects track mode
```

Related Topics

****

"DISPlay:MODE" on page 286

****

Obtaining Test Application Information

December 1, 1999

Description

Test Application information may be manually viewed from the SYSTEM CONFIG screen or using the GPIB queries shown below.

Test Application Model Number

This query provides the user with the model number of the test application running.

Example: E1960A

Test Application Name

This query provides the user with the name of the test application running.

Example: GSM Mobile Test

Test Application Coordinated Codeware Revision

This query provides the user with the coordinated codeware revision of the test application running. The revision is coordinated because the revision number identifies a set of codeware components for the Digital Signal Processor, Host, and Protocol subsystems.

Example: A.01.04

Related Topics

****

"SYSTem:CURRent:TA:MODel?" on page 465

"SYSTem:CURRent:TA:NAME?" on page 465

"SYSTem:CURRent:TA:REVision?" on page 465

"Obtaining Identification Information *IDN?" on page 535

"SYSTem:COMMunicate" on page 459

"CALibration:DATE" on page 219

****

Timebase Description/Configuration

December 1, 1999

Description

The time base source is selected by the test set, either an internal time base or an external source (if a suitable signal is detected) is used as the reference oscillator. If a 10 MHz +/- 100 ppm signal, that has an input level from 0 to +13 dBm is connected to the 10 MHz REF IN connector on the rear panel, the test set will automatically select the external timebase.

The user can read the status window at the bottom of the test set display for the EXT REF indicator, or query the test set to verify if it is using an external time base or an internal time base. The user may also query the test set to verify if the time base is locked. The reference oscillator functionality is controlled through the SYSTEM subsystem.

Example:

```
OUTPUT 714;”SYSTEM:ROSCILLATOR[:TIMEBASE]?” !returns INT or EXT
                                            !(internal or external) timebase.
OUTPUT 714;”SYSTEM:ROSCILLATOR:LOCKED?” !returns 1 or 0 (locked or unlocked)
                                        !condition for timebase
```

Related Topics

****

“SYSTem:ROSCillator” on page 473

“Rear Panel Connectors” on page 525

****

Selecting a Radio Personality

Description

Radio personality description and process for selecting a new one when it becomes necessary. Not available in this version of the test set.

Related Topics

****

x-refs to related files

****

8 Error Messages

Error Messages

Error Message Descriptions

Reading Error Messages

Each error message that is generated is recorded in either the error/event queue or the message log or both. Error messages are shown in a message window at the center of the test set's display.

When an error message is displayed an audio beep occurs, the beeper state can be set to on or off, see "Test Set Beeper" on page 533.

The error/event queue is read remotely using the SYSTem:ERRor? query, see "SYSTem:ERRor?" on page 467. The error/event queue is able to hold 100 messages. To read the entire error/event queue use the following program.

```
10 DIM Err_msg$[255]
20 REPEAT
30 OUTPUT 714;"SYSTEM:ERROR?"
40 ENTER 714; Err_num,Err_msg$
50 PRINT Err_num,Err_msg$
60 UNTIL Err_num = 0
```

The message log may be viewed on the test set's display by pressing the SYSTEM CONFIG screen's Message Log key. The message log can display up to 24 entries over two pages.

Error messages can be cleared from the test set's display with the "DISPlay:WINDow:ERRor:CLEar" command. Pressing any functional front panel key, i.e. the LOCAL key, will clear an error message for the test set's display.

Classes of Errors

Error messages are divided into classes, each class of error is handled differently by the test set. The message log is cleared when the test set is power cycled.

Measurement Integrity Errors

These errors occur while a measurement is being performed. They indicate something happened during the measurement to invalidate the result, or make the accuracy questionable, see "Integrity Indicator" on page 126. These errors can be read by using the FETCh command, see "FETCh? Subsystem" on page 289, for a given measurement.

Non-Persistent Errors

These messages are generated when a condition occurs that is incorrect, but has no serious or long lasting effect on the test set's operation. Examples could include an out of range value to a parameter, or an invalid GPIB mnemonic. The message window is cleared when any front panel key is pressed.

Persistent Errors

These errors are generated when a non-transitory error condition exists. Persistent errors occur when a hardware failure is found, or when damage or injury to a person or the test set may occur.

The test set displays these errors in the error message window and as a prompt at the bottom of the display screen where it remains until the error condition no longer exists.

Fatal Errors

When these errors occur no further operation of the test set is possible without cycling the power switch. Fatal errors are not saved in the error message log. The test set display will provide the user with information about what to do next and some details about what the test set was doing when the fatal error occurred.

Related Topics

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"SYSTem:COMMunicate:GPIB:DEBug[:STATe]" on page 460

****

Fixed Timer Messages

This is the list of fixed timers with a brief explanation and their values. A timer expiry message appears in its own window, on the test set display. The user has no access to these values and can not change them. None of the fixed timers are active when operating mode is Test Mode.

Timer Name	**Description**	**Value**
T100 RADIO-LINK-TIMEOUT	Detects the presence of the radio link by detecting SACCH frames every 480 ms.	4 SACCH multiframes. That is 1.92 seconds if the SACCH is completely absent.
T200 Data link timer	Used for re-transmission on the data link. The value varies depending on the message type.	155 ms for FACCH
T301 Alerting (ringing) timer	Timer used to limit the amount of time a user has to answer a call.	20 seconds
T303 Mobility Management connection timer	Time the network waits after sending a CM SERVICE REQUEST until receiving a response. This occurs before initiating call clearing procedures towards the MS.	10 seconds
T305 Release timer	Time the network waits after transmitting a DISCONNECT message until receiving a RELEASE message.	10 seconds
T306 In-band tones release timer	Time the network waits after transmitting a DISCONNECT message while in-band tones/announcements are provided, until receiving a RELEASE message.	10 seconds
T308 Release timer	Time the network waits after sending a RELEASE message until receiving a RELEASE COMPLETE message. This occurs before re-transmitting the RELEASE or releasing the Mobility Management connection.	10 seconds
T310 Call proceeding timer	Time the network waits after receiving a CALL CONFIRMED message until receiving a ALERTING, CONNECT, or DISCONNECT message before initiating clearing procedures towards the MS.	10 seconds
T313 Connect acknowledge timer	Time the network waits after transmitting a CONNECT message until receiving the CONNECT ACKNOWLEDGE message before performing clearing procedures with the MS.	10 seconds

Timer Name	Description	Value
T323 Modify complete timer	Time the network waits after sending a MODIFY message during call mode changes, until receiving a MODIFY COMPLETE or MODIFY REJECT message before initiating call clearing procedures.	10 seconds
T3101 Immediate assignment timer	Time the network waits after sending the IMMEDIATE ASSIGNMENT or IMMEDIATE ASSIGNMENT EXTENDED message until the main signalling link is established before releasing the newly allocated channels.	1 second
T3103 Handover timer	Time the network waits after transmitting a HANDOVER COMMAND message until receiving HANDOVER COMPLETE or HANDOVER FAILURE or the MS re-establishes the call before the old channels are released. If the timer expires and the network has not received a correctly decoded L2 (format A or B) or TCH frame, then the newly allocated channels are released.	2 seconds
T3105 Physical information repetition timer	Time the network waits after sending the PHYSICAL INFORMATION message until receiving a correctly decoded L2 (format A or B) or TCH frame. This occur before re-transmitting the PHYSICAL INFORMATION message or releasing the newly allocated channels.	50 ms
T3107 Channel assignment timer	Time the network waits after transmitting an ASSIGNMENT COMMAND message until receiving the ASSESSMENT FAILURE message or the MS re-establishes the call before releasing the old and the new channels.	3 seconds
T3109 Signalling disconnection timer	Time the network waits after sending the CHANNEL RELEASE message before disconnecting the signalling link.	5 seconds
T3111 Channel deactivation after disconnection timer	Time the network waits after disconnecting the signalling link before deactivating the channel.	500 ms

Timer Name	Description	Value
T3113 Paging timer	Time the network waits after transmitting the PAGING REQUEST message until receiving the PAGING RESPONSE message. This occurs before re-transmitting the PAGING REQUEST (if the maximum number of re-transmissions have not been exceeded).	5 seconds
T3212 Location update timer	The location update timer is set to zero, periodic location update by the MS are disabled. If the MS camps to the BCH and decodes a new MCC or MNC from the one it last camped on, it should perform a location update.	zero = infinite time
T3250 TMSI reallocation timer	Time the network waits after sending the TMSI REALLOCATION COMMAND until receiving TMSI REALLOCATION COMPLETE. This occurs before aborting the procedure and releasing the Radio Resource connection.	5 seconds
T3260 Authentication response timer	Time the network waits after an AUTHENTICATION REQUEST until receiving AUTHENTICATION RESPONSE. This occurs before aborting the procedure and releasing the Radio Resource connection.	5 seconds

Manual User Error Messages

These errors are only intended to be displayed on the manual user interface only, they are not entered into the Error/Event Queue.

Error Message	Description
MUI1 The function you requested is not yet available.	The test set does not have this capability.
MUI2 IQ Calibration completed successfully for modulator <N>. Cycle power to continue.	<N> is the IQ modulator number that the user is attempting to calibrate, <N> is 1 or 2.
MUI3 IQ Calibration failed for modulator <N>. Cycle power to continue.	<N> is the IQ modulator number that the user is attempting to calibrate, <N> is 1 or 2.
MUI4 The function you requested is not available in this radio personality.	This function is used in another radio personality.
MUI5 IQ Calibration for modulator <N> in progress. Call processing disabled	<N> is the IQ modulator number that the user is attempting to calibrate, <N> is 1 or 2.

-100 to -199 Command Errors

A command error indicates that the test set's GPIB parser has detected an IEEE 488.2 syntax error.

When one of these errors is generated, the command error bit in the event status register is set. Refer to "Standard Event Status Register" on page 455 for information on this register.

Error Message	Description
-100 Command error	This event bit (Bit 5) indicates a syntax error, or a semantic error, or a GET command was entered, see IEEE 488.2, 11.5.1.1.4.
-101 Invalid character	Indicates a syntactic elements contains a character which is invalid for that type.
-102 Syntax error	Indicates that an unrecognized command or data type was encountered. For example, a string was received when the device does not accept strings.
-103 Invalid separator	The parser was expecting a separator and encountered an illegal character. For example, the semicolon was omitted after a program message unit.
-104 Data type error	The parser recognized a data element different than one allowed. For example, numeric or string data was expected but block data was encountered.
-105 Get not allowed	Indicates a Group Execute Trigger was received within a program message. Correct the program so that the GET does not occur within the program code.
-108 Parameter not allowed	Indicates that more parameters were received than expected for the header. For example, *ESE common command only accepts one parameter, so *ESE 0,1 is not allowed.
-109 Missing parameter	Indicates that less parameters were received than required for the header. For example, *ESE requires one parameter, *ESE is not allowed.
-110 Command header error	Indicates an error was detected in the header. This error is used when the device cannot detect the more specific errors -111 through -119.
-111 Header separator error	Indicates that a character that is not a legal header separator was encountered while parsing the header.
-112 Program mnemonic too long	Indicates that the header contains more that twelve characters, see IEEE 488.2, 7.6.1.4.1.
-113 Undefined header	Indicates the header is syntactically correct, but it is undefined for this specific device. For example, *XYZ is not defined for any device.
-114 Header suffix out of range	Indicates the value of a header suffix attached to a program mnemonic makes the header invalid.

Error Message	Description
-120 Numeric data error	This error, as well as errors -121 through -129, are generated when parsing a data element which appears to be numeric, including non-decimal numeric types. This particular error is used if the device cannot detect a more specific error.
-121 Invalid character in number	Indicates an invalid character for the data type being parsed was encountered. For example, an alpha in a decimal numeric or a "9" in octal data.
-123 Exponent too large	Indicates the magnitude of an exponent was greater than 32000, see IEEE 488.2, 7.7.2.4.1.
-124 Too many digits	Indicates the mantissa of a decimal numeric data element contained more than 255 digits excluding leading zeros, see IEEE 488.2, 7.7.2.4.1.
-128 Numeric data not allowed	Indicates that a legal numeric data element was received, but the device does not accept one in this position for the header.
-130 Suffix error	This error, as well as errors -131 through -139, are generated when parsing a suffix. This particular error message is used if the device cannot detect a more specific error.
-131 Invalid suffix	Indicates the suffix does not follow the syntax described in IEEE 488.2, 7.7.3.2, or the suffix is inappropriate for this device.
-134 Suffix too long	Indicates the suffix contain more than 12 characters, see IEEE 488.2, 7.7.3.4.
-138 Suffix not allowed	Indicates that a suffix was encountered after a numeric element that does not allow suffixes.
-140 Character data error	This error, as well as errors -141 through -149, are generated when parsing a character data element. This particular error message is used if the device cannot detect a more specific error.
-141 Invalid character data	Indicates that the character data element contains an invalid character or the particular element received is not valid for the header.
-144 Character data too long	Indicates the character data element contains more than twelve characters, see IEEE 488.2, 7.7.1.4.
-148 Character not allowed	Indicates a legal character data element was encountered where prohibited by the device.
-150 String data error	This error, as well as errors -151 through -159, are generated when parsing a string data element. This particular error message is used if the device cannot detect a more specific error.

Error Message	Description
-151 Invalid string data	Indicates that a string data element was expected, but was invalid, see IEEE 488.2, 7.7.5.2. For example, an END message was received before the terminal quote character.
-158 String data not allowed	Indicates that a string data element was encountered but was not allowed by the device at this point in parsing.
-160 Block data error	This error, as well as errors -161 through -169, are generated when parsing a block data element. This particular error message is used if the device cannot detect a more specific error.
-161 Invalid block data	Indicates a block data element was expected, but was invalid, see IEEE 488.2, 7.7.6.2. For example, and END message was received before the end length was satisfied.
-168 Block data not allowed	Indicates a legal block data element was encountered, but not allowed by the device at this point in parsing.
-170 Expression error	This error, as well as errors -171 through -179, are generated when parsing an expression data element. This particular error message is used if the device cannot detect a more specific error.
-171 Invalid expression	Indicates the expression data element was invalid, see IEEE 488.2, 7.7.7.2. For example, unmatched parentheses or an illegal character.
-178 Expression data not allowed	Indicates a legal expression data was encountered, but was not allowed by the device at this point in parsing.
-180 Macro error	This error, as well as error -181 through -189, are generated when defining a macro or execution a macro. This particular error message is used if the device cannot detect a more specific error.
-181 Invalid output macro definition	Indicates that a macro parameter place holder was encountered outside of a macro definition.
-183 Invalid inside macro definition	Indicates that the program message unit sequence, sent with a *DDT or a *DMC command, is syntactically invalid, see IEEE 488.2, 10.7.6.3.
-184 Macro parameter error	Indicates that a command inside the macro definition had the wrong number or type of parameters.

-200 to -299 Execution Errors

July 27, 1999

These errors are generated when something occurs that is incorrect in the current state of the instrument. These errors may be generated by a user action from either the remote or the manual user interface.

Error Message	Description
-200 Execution error	This event bit (Bit 4) indicates a PROGRAM DATA element following a header was outside the legal input range or otherwise inconsistent with the device’s capabilities, see IEEE 488.2, 11.5.1.1.5.
-203 Command protected	Indicates that a legal password-protected program command or query could not be executed because the command was disabled.
-220 Parameter error	Indicates that a program data element related error occurred.
-221 Setting conflict	Indicates that a legal program data element was parsed but could not be executed due to the current device state.
-222 Data out of range	Indicates that a legal program data element was parsed but could not be executed because the interpreted value was outside the legal range defined by the devices
-223 Too much data	Indicates that a legal program data element of block, expression, or string type was received that contained more data than the device could handle due to memory or related device-specific requirements.
-224 Illegal parameter value	Indicates that the value selected was not part of the list of values given.
-225 Out of memory	The device has insufficient memory to perform the requested operation.
-226 Lists not the same length	Attempted to use LIST structure having individual LIST’s of unequal lengths.
-230 Data corrupt or stale	Indicates invalid data, a new reading started but not completed since the last access.
-231 Data questionable	Indicates that measurement accuracy is suspect.
-233 Invalid version	Indicates that a legal program data element was parsed but could not be executed because the version of the data is incorrect to the device. For example, a not supported file version, a not supported instrument version.

Error Message	Description
-240 Hardware error	Indicates that a legal program command or query could not be executed because of a hardware problem in the device.
-241 Hardware missing	Indicates that a legal program command or query could not be executed because of missing device hardware. For example, an option was not installed.
-250 Mass storage error	Indicates that a mass storage error occurred. The device cannot detect the more specific errors described for errors -251 through -259.
-251 Missing mass storage	Indicates that a legal program command or query could not be executed because of missing mass storage.
-252 Missing media	Indicates that a legal program command or query could not be executed because of missing media. For example, no disk.
-253 Corrupt media	Indicates that a legal program command or query could not be executed because of corrupt media. For example, bad disk or wrong format.
-254 Media full	Indicates that a legal program command or query could not be executed because the media is full. For example, there is no room left on the disk.
-255 Directory full	Indicates that a legal program command or query could not be executed because the media directory was full.
-256 File name not found	Indicates that a legal program command or query could not be executed because the file name was not found on the media.
-257 File name error	Indicates that a legal program command or query could not be executed because the file name on the device media was in error. For example, an attempt was made to read or copy a nonexistent file.
-258 Media protected	Indicates that a legal program command or query could not be executed because the media was protected. For example, the write-protect switch on a memory card was set.
-270 Macro error	Indicates that a macro related execution error occurred.
-271 Macro syntax error	Indicates that a syntactically legal macro program data sequence, according to IEEE 488.2, 10.7.2, could not be executed due to a syntax error within the macro definition.
-272 Macro execution error	Indicates that a syntactically legal macro program data sequence could not be executed due to some error in the macro definition, see IEEE 488.2, 10.7.6.3.

Error Message	Description
-273 Illegal macro label	Indicates that the macro label was not accepted, it did not agree with the definition in IEEE 488.2, 10.7.3
-274 Macro parameter error	Indicates that the macro definition improperly used a macro parameter placeholder, see IEEE 4882, 10.7.3.
-275 Macro definition too long	Indicates that a syntactically legal macro program data sequence could not be executed because the string of block contents were too long for the device to handle, IEEE 488.2, 10.7.6.1.
-276 Macro recursion error	Indicates that a syntactically legal macro program data sequence count not be executed because it would be recursive, see IEEE 488.2, 10.7.6.6.
-277 Macro redefinition not allowed	Indicates that redefining an existing macro label, see IEEE 488.2, 10.7.6.4.
-278 Macro header not found	Indicates that a legal macro label in the *GMS?, see IEEE 488.2, 10.13, could not be executed because the header was not previously defined.

-300 to -399 SCPI Specified Device-Specific Errors

July 27, 1999

A device-specific error indicates that the instrument has detected an error that occurred because some operations did not properly complete, possibly due to an abnormal hardware or firmware condition. For example, an attempt by the user to set an out of range value will generate a device specific error. When one of these errors is generated, the device specific error bit in the event status register is set. Refer to "Standard Event Status Register" on page 455 for information on this register.

Error Message	Description
-300 device specific error	This event bit (Bit 3) indicates that a device operation did not properly complete due to some condition, such as overrange see IEEE 488.2, 11.5.1.1.6.
-311 Memory error	Indicates some physical fault in the devices memory, such as a parity error.
-312 PUD memory lost	Indicates protected user data saved by the *PUD command has been lost, see IEEE 488.2, 10.27.
-313 Calibration memory lost	Indicates that nonvolatile calibration data used by the *CAL? command has been lost, see IEEE 488.2, 10.2.
-314 Save/recall memory lost	Indicates that the nonvolatile data saved by the *SAV command has been lost, see IEEE 488.2, 10.33.
-315 Configuration memory lost	Indicates that nonvolatile configuration data saved by the device has been lost.
-320 Storage fault	Indicates that the firmware detected a fault when using data storage. This is not an indication of physical damage or failure of any mass storage element.
-321 Out of memory	An internal operation needed more memory than was available
-330 Self test failed	Indicates a problem with the device that is not covered by a specific error message. The device may require service.
-340 Calibration failed	Indicates a problem during calibration of the device that is not covered by a specific error.
-350 Queue overflow	Indicates that there is no room in the queue and an error occurred but was not recorded. This code is entered into the queue in lieu of the code that caused the error.
-360 Communication error	This is the generic communication error for devices that cannot detect the more specific errors described for error -361 through -363.
-361 Parity error in program message	Parity bit not correct when data received for example, on a serial port.

Error Message	Description
-362 Framing error in program message	A stop bit was not detected when data was received for example, on a serial port (for example, a baud rate mismatch).
-363 Input buffer overrun	Software or hardware input buffer on serial port overflows with data caused by improper or nonexistent pacing.

-400 to -499 Query Errors

A Query error is generated either when data in the instrument's GPIB output queue has been lost, or when an attempt is being made to read data from the output queue when no output is present or pending.

Error Message	Description
-400 Query error	This event bit (Bit 2) indicates that an attempt to read data from the Output Queues when no output is present or pending, to data in the Output Queue has been lost see IEEE488.2, 11.5.1.1.7.
-410 Query INTERRUPTED	Indicates the test set has been interrupted by a new program message before it finishes sending a RESPONSE MESSAGE see IEEE 488.2, 6.3.2.3.
-420 Query UNTERMINATED	Indicates an incomplete Query in the program see IEEE 488.2, 6.3.2.2.
-430 Query DEADLOCKED	Indicates that the Input Buffer and Output Queue are full see IEEE 488.2, 6.3.1.7.
-440 Query UNTERMINATED after indefinite response	Indicates that a query was received in the same program message after a query requesting an indefinite response was executed see IEEE 488.2, 6.5.7.5.

+100 to +199 Core Device-Specific Error

A device-specific error indicates that the instrument has detected an error that occurred because some operations did not properly complete, possibly due to an abnormal hardware or firmware condition. For example, an attempt by the user to set an out of range value will generate a device specific error.

These are general errors generated by the core instrument. When one of these errors is generated, the '+100 errors' bit in the questionable error status register is set.

Error Message	Description
+101 Assert; Cycle power. Assert message<message1>	<message1> will appear as: If the DSP generated the assert: ;P:DSP T:<task ID> E:<error code> C:<error classif.> F1:<flag 1> F2:<flag 2> If the Protocol processor generated the assert: ;P:Protocol T:<task ID> L:<line number> F:<file name> If the Host processor generated the assert: ;P:Host T:<task ID> L:<line number> F:<file name>
+102 Exception; Cycle power. Exception message<message2>	<message2> will appear as: T:<task ID> or V:<vector number> or PC:<program counter> or DA:<data adrs reg value>. Vector number, program counter and data address register values are hexadecimal format.
+103 Failure; No measurements or settings can be made	Indicates none of the VI's are operational because a serious problem exists.
+104 Failure; No settling operations will take place	Indicates none of the VI's are operational because a serious problem exists.
+105 Failure; No measurements or setting can be made for the function selected	Indicates none of the VI's are operational because a serious problem exists.
+110 Input pacing; Internal communication queue overflow likely	Indicates that GPIB commands are too fast for the device input queue and should be slowed.
+111 Input pacing; Internal communication queue overflow imminent. Pacing increased	Indicates that GPIB commands were too fast and the device input queue has not kept pace.
+112 Internal error; Protocol error <message3>	<message3> is an eight digit hexadecimal number that is the error code reported by protocol.
+113 Internal error; <VI NAME> forced inactive	Indicates that a VI is inactivated when not executed. <VI NAME> could be : "IntVmVI", "GSMFixedVI", "MiscVI", or "GSMSacchMriVI"
+114 Internal error; <VI NAME> not responding	Indicates that a VI has not been instantiated or the state is not available.

+100 to +199 Core Device-Specific Error

Error Message	Description
+120 Warning; Receiver overrange due to present setting of amplitude offset (SYST:CORR:GAIN)	Indicates the combination of Expected Power and Amplitude Offset are out of range for the test set.
+121 Warning; Receiver underrange due to present setting of amplitude offset (SYST:CORR:GAIN)	Indicates the combination of Expected Power and Amplitude Offset are out of range for the output level of the MS.
+122 Warning; Reference out of lock	Indicates the test set's internal reference is out of lock.

+200 to +299 Call Processing Device-Specific Error

These errors are generated when a problem occurs maintaining the link between the test set and the DUT. These errors generally occur as a result of a problem on the link such as if the DUT did not respond to a message, or the user attempted to perform an invalid operation in the current instrument state.

Errors with a description beginning with “GSM call disconnected” mean that the call is dropped when the error occurs. Errors beginning with “GSM protocol failure” mean that the call is not necessarily dropped, these are informational messages.

Error Message	Description
+201 GSM call disconnected; Radio link failure (Timer T100 expiry)	“Fixed Timer Messages” on page 552
+202 GSM call disconnected; Immediate assignment failure (Timer T3101 expiry)	“Fixed Timer Messages” on page 552
+203 GSM call disconnected; Handover failure (Timer T3103 expiry)	“Fixed Timer Messages” on page 552
+204 GSM call disconnected; Channel assignment failure (Timer T3107 expiry)	“Fixed Timer Messages” on page 552
+205 GSM call disconnected; No response to page (Timer T3113 expiry)	“Fixed Timer Messages” on page 552
+206 GSM call disconnected; No answer (Timer T301 expiry)	“Fixed Timer Messages” on page 552
+207 GSM call disconnected; No response to setup (Timer T303 expiry)	“Fixed Timer Messages” on page 552
+210 GSM call disconnected; No response to release 2 times (Timer T308 expiry)	“Fixed Timer Messages” on page 552
+211 GSM call disconnected; No alert from mobile (Timer T310 expiry)	“Fixed Timer Messages” on page 552
+212 GSM call disconnected; No response to connect (Timer T313 expiry)	“Fixed Timer Messages” on page 552
+213 GSM call disconnected; Data link failure (Timer T200 expiry)	“Fixed Timer Messages” on page 552
+214 GSM call disconnected; Physical information repetition failed (Timer T3105 expiry)	“Fixed Timer Messages” on page 552
+217 GSM call disconnected; TMSI (Temporary Mobile Subscriber Identity) reallocation failed (Timer T3250 expiry)	“Fixed Timer Messages” on page 552
+218 GSM call disconnected; Authentication failed (Timer T3260 expiry)	“Fixed Timer Messages” on page 552

Error Message	Description
+219 GSM Call disconnected; Mobile not capable of supporting the selected Channel Mode	Indicates that the mobile station cannot support the requested channel mode.
+220 GSM call processing failure; (Call processing not available	Indicates the BS Emulator VI cannot be instantiated.
+230 GSM operation rejected; Call processing disabled	Indicates an attempt to perform a BS Emulator action when the BS emulator VI is inactive.
+231 GSM operation rejected; Attempting to set MCC while generating a BCH	Indicates that the Cell Activated State is still On. The Cell Activated State must be turned Off before setting the BCC.
+232 GSM operation rejected; Attempting to set LAC while generating a BCH	Indicates that the Cell Activated State is still On. The Cell Activated State must be turned Off before setting the BCC.
+233 GSM operation rejected; Attempting to set BCC while generating a BCH	Indicates that the Cell Activated State is still On. The Cell Activated State must be turned Off before setting the BCC.
+234 GSM operation rejected; Attempting to set NCC while generating a BCH	Indicates that the Cell Activated State is still On. The Cell Activated State must be turned Off before setting the BCC.
+235 GSM operation rejected; Attempting to set MNC while generating a BCH	Indicates that the Cell Activated State is still On. The Cell Activated State must be turned Off before setting the BCC.
+236 GSM operation rejected; Only one call can be supported at a time	Indicates an attempt at a second call being activated.
+237 GSM operation rejected; Requested TCH Band is invalid in current state	Indicates that there is not an active link between the MS and the test set.
+250 GSM protocol failure; No response to disconnect (Timer T305 expiry)	“Fixed Timer Messages” on page 552
+251 GSM protocol failure; No response to release (Timer T308 expiry)	“Fixed Timer Messages” on page 552
+252 GSM protocol failure; Channel release failed (Timer T3109 expiry)	“Fixed Timer Messages” on page 552
+253 GSM protocol failure; (Timer T3270 expiry)	“Fixed Timer Messages” on page 552
+254 GSM protocol failure; Unknown identity type received from mobile	Indicates that an identity type other than 1, 2, 3 or 4 was received from the MS.
+255 GSM protocol failure; Unexpected identity type received from mobile	Indicates that the MS has responded with an unexpected identity type. Example MS returned IMSI when IMEI was queried. See “CALL:MS:REPorted:IMEI?” on page 250.
+256 GSM protocol failure; Channel assignment exceeded specified number of frames	Indicates that the max frames allowed for assignment parameter should be increased.

Error Message	Description
+257 GSM call disconnected; Invalid TMSI received from MS	Indicates that some of the bits received were not set to their normal or expected value for a TMSI (Temporary Mobile Subscriber Identity).
+260 GSM RR Cause; <cause identifier>	The <cause identifier> is a 4 digit hexadecimal number
+261 GSM MM Cause; <cause identifier>	The <cause identifier> is a 4 digit hexadecimal number
+262 GSM CC Cause; <cause identifier>	The <cause identifier> is a 4 digit hexadecimal number

+300 to +399 Link Control Device-Specific Error

July 12, 1999

These errors are generated when a problem occurs in maintaining the link between the test set and a DUT. These errors generally occur when a message is received from the DUT that is unexpected.

When one of these errors is generated, the ‘+300 errors’ bit in the questionable error status register is set. Refer to “Standard Event Status Register” on page 455 for information on this register.

Error Message
+303 GSM data link failure; Unsolicited DM response, multiple frame established state
+309 GSM data link failure; N(R) sequence error

+400 to +499 Core Hardware Device-Specific Error

July 12, 1999

These errors are generated when a problem occurs in one of the test set's hardware modules that is part of the test set's core instrument.

When one of these errors is generated, the '+400 errors' bit in the questionable error status register is set. Refer to "Standard Event Status Register" on page 455 for information on this register.

Error Message
+400 Hardware failure; Hardware is not available
+401 Hardware failure; Protocol processor hardware is not responding
+402 Hardware failure; Demod receiver hardware is not responding
+403 Hardware failure; Measurement receiver hardware is not responding
+404 Hardware failure; RF source 1 hardware is not responding
+405 Hardware failure; RF source 1 digital modulation hardware is not responding
+406 Hardware failure; RF source 1 level hardware is not responding
+407 Hardware failure; DSP demod control hardware is not responding
+408 Hardware failure; 2nd demod receiver hardware is not responding
+409 Hardware failure; Base station emulator trigger hardware is not responding
+410 Hardware failure; Audio source hardware is not responding
+411 Hardware failure; RF source 2 hardware is not responding
+412 Hardware failure; Internal voltmeter hardware is not responding
+413 Hardware failure; Fixed timebase input is not responding
+414 Hardware failure; Fixed external reference output is not responding
+415 Hardware failure; Instrument reference is not responding
+416 Hardware failure; Bit clock A is not responding
+417 Hardware failure; RF source 2 frequency hardware is not responding
+418 Hardware failure; RF source 2 digital modulation hardware is not responding
+419 Hardware failure; RF source 2 level hardware is not responding
+420 Hardware failure; RF source hopping hardware is not responding
+421 Hardware failure; Digital demod hopping hardware is not responding
+422 Hardware failure; Misc VI hardware is not responding
+425 Hardware failure; Invalid EEPROM checksum <EEPROM board ID>
+426 Hardware failure; Unable to write to EEPROM <EEPROM board ID>

Error Message
+427 Hardware failure; Unable to read from EEPROM <EEPROM board ID>
+428 Hardware failure; Board not identified <board ID>
+429 Hardware failure; Could not create board identification <board ID>
+430 Hardware failure; Control version not compatible with FW <board ID>
+431 Hardware failure; RF IO DAC cannot be calibrated due to present temperature

<EEPROM board ID> names are: ;Instrument Eeprom ID State| ;Atten 1 Eeprom ID State| ;Atten 2 Eeprom ID State| ;Audio Eeprom ID State| ;BaseBandGen 1 Eeprom ID State| ;BaseBandGen 2 Eeprom ID State| ;Demod DC Eeprom ID State| ;Digital Mother Board Eeprom ID State| ;IQ Output 1 Eeprom ID State| ;IQ Output 2 Eeprom ID State| ;IVF Meas Eeprom ID State| ; Jumper Board Eeprom ID State| ; Meas DC Eeprom ID State| ;RF Mother Board Eeprom ID State| ;RF Interface Eeprom ID State| ; Ref Mod Eeprom ID State| ;Sig Gen 1 Eeprom ID State| ; Sig Gen 2 Eeprom ID State| ;Time Ref Eeprom ID State| ;Display Interface Eeprom ID State| ;Rear Panel Eeprom ID State

<board ID> names are:

;3 GHZ ATTENUATOR 1| ;3GHZ ATTENUATOR 2| ;AUDIO BD| ;ROM BASEBAND GENERATOR 1| ;ROM BASEBAND GENERATOR 2| ;DEMOD DOWNCONVERTER| ;VECTOR OUTPUT BOARD 1| ;VECTOR OUTPUT BOARD 2| ;IVF MEASUREMENT| ;MEASUREMENT DOWCONVERTER| ;RF POWER DETECTORS| ;REFERENCE MODULE| ;SYNTH DOUBLER 1| ;SYNTH DOUBLER 2| ;TIMING REF| ;MOMENTUM INSTRUMENT| ;RF MOTHER BOARD| ;JUMPER BOARD| ;DIGITAL MOTHER BOARD| ;FLAT PANEL ADAPTER| ;REAR PANEL BOARD

+500 to +599 Test Application Hardware Device-Specific Error

July 12, 1999

These errors are generated when a problem occurs with a hardware module that is required for a particular test application.

When one of these errors is generated, the '+500 errors' bit in the questionable error status register is set. Refer to "Standard Event Status Register" on page 455 for information on this register.

Table 6. Test Application Hardware Device Specific Errors

Error Message
+500 to +599 No errors currently defined

+600 to +699 Instrument Device-Specific Error

July 12, 1999

These errors are generated when a problem occurs that is specific to one of the test set's instruments. These errors are part of the test set's core. Note that these measurements may not be present in every test application and therefore, these errors may not be present in every test application. There is no plan at present to support test application specific instruments.

An instrument in this context refers to the measurement-like functionality such as the audio generator and not to the test set as a whole.

When one of these errors is generated, the '+600 errors' bit in the questionable error status register is set. Refer to "Standard Event Status Register" on page 455 for information on this register.

Error Message	Description
+601 Instrument failure; Audio generator hardware is not responding	Indicates a problem occurs when attempting to control the test set's hardware.

+700 to +799 Test Application Measurement Device-Specific Error

December 1, 1999

These errors are generated when a problem occurs that is specific to one of the test set's measurements (such as BERR, or TX power). These are test application specific.

When one of these errors is generated, the '+700 errors' bit in the questionable error status register is set. Refer to "Standard Event Status Register" on page 455 for information on this register.

Error Message	Description
+701 GSM measurement failure; TX power hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+702 GSM measurement failure; Power vs time hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+703 GSM measurement failure; Phase frequency error hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+704 GSM measurement failure; Output RF spectrum hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+705 GSM measurement failure; Fast bit error hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+706 GSM measurement failure; Bit error hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+707 GSM measurement failure; Decoded audio hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+708 GSM measurement failure; IQ tuning hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+709 GSM measurement failure; Dynamic power hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+721 GSM measurement warning; TX power measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.
+722 GSM measurement warning; Power vs time measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.
+723 GSM measurement warning; Phase frequency error measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.

+700 to +799 Test Application Measurement Device-Specific Error

Error Message	Description
+724 GSM measurement warning; Output RF spectrum measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.
+725 GSM measurement warning; Fast bit error measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.
+726 GSM measurement warning; Bit error measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.
+727 GSM measurement warning; Decoded audio measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.
+728 GSM measurement warning; IQ tuning measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.
+729 GSM measurement warning; Dynamic Power measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.

+800 to +899 Core Measurement Device-Specific Error

July 12, 1999

These errors are generated when a problem occurs that is specific to one of the test set's core measurements (such as analog audio). Note that these measurements may not be present in every test application and therefore, these errors may not be present in every test application.

When one of these errors is generated, the '+800 errors' bit in the questionable error status register is set. Refer to "Standard Event Status Register" on page 455 for information on this register.

Error Message	Description
+801 Measurement failure; Analog audio hardware is not responding	Indicates that a measurement VI cannot be instantiated or a problem occurs when attempting to control the measurement's hardware.
+821 Measurement warning; Analog audio measurement has been closed	Indicates that a VI has been inactivated because of a resource conflict.

Error Message Log

Description

When an error message is displayed, it is also logged in the error message log. This log is only accessible manually; it is not available through GPIB. The error message log can have two pages it can be displayed by pressing the F7 menu key from the SYSTEM CONFIG screen, Next Page and Previous Page controls are provided.

All errors and events that are generated are displayed in the error message log. When the log is full a new message is sent to the log and the oldest message is removed from the log. The log is cleared when the test set powers up or when the user presses F10 (Clear Error Message Log).

Related Topics

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"Error Messages" on page 549

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Known Error Conditions

December 1, 1999

This document describes known error conditions that have been identified in the E1960A GSM Mobile Test Application releases. The tables describe the known error conditions that may occur with the Test Set and the operations necessary to recover from each error. Many of these will never be seen in normal operation.

Select the appropriate link below to view the error conditions for the release you are using.

- "Revision A.03 - December 1999" on page 579
- "Revision A.02 - July 1999" on page 580

Revision A.03 - December 1999

Known Error Conditions

Related Feature	You May Have Observed	Reason for the Condition	How to Recover	Issue Number
Cell Activated State	Setting the cell activated state to OFF while in a dual-band call is slightly slower than expected.	During a dual-band call, the second RF source is active for the TCH. When turning Cell Activated State OFF (during a dual-band call), the Test Set first does a handover such that TCH band and BCH band are the same. After the handover is complete, the Cell Activated State is turned off.	This should not cause issues, it simply adds about 400 msec for each dual band Cell Activated State Off operation.	gsm.hfw_6 spkrd06150
Integer Values	Some integer values (like Last Location and SACCH reports) are displayed as floats instead of integers.	This is a 'inconvenience' to the manual user but should cause no problems. These values are correctly treated as integers on the RUI.	None needed.	Hfw_1825 spkrd04288

Revision A.02 - July 1999

Known Error Conditions

Related Feature	You May Have Observed	Reason for the Condition	How to Recover	Issue Number
Cell Activated State	Setting the cell activated state to OFF while in a dual-band call is slightly slower than expected.	During a dual-band call, the second RF source is active for the TCH. When turning Cell Activated State OFF (during a dual-band call), the Test Set first does a handover such that TCH band and BCH band are the same. After the handover is complete, the Cell Activated State is turned off.	This should not cause issues, it simply adds about 400 msec for each dual band Cell Activated State Off operation.	gsm.hfw_6 spkrd06150
Measurement Results Resolution	On the display the results of a measurement have limited resolution.	The current implementation of settings and measurement results is limited to two decimal places.	This is only a limitation on the display, not the actual Test Set functionality. Use the remote user interface to set or read more resolution.	Hfw_1396 Fixed in Rev A.03
Integer Values	Some integer values (like Last Location and SACCH reports) are displayed as floats instead of integers.	This is a ‘inconvenience’ to the manual user but should cause no problems. These values are correctly treated as integers on the RUI.	None needed.	Hfw_1825 spkrd04288
INIT:ON?	INIT:ON? query doesn’t report the active measurements correctly when using measurement timeouts.	The current implementation of INIT:ON? query is limited and won’t work correctly when also using measurement timeouts.	This feature is seldom used, however if it is necessary, temporarily turn off measurement timeouts for all measurements before using the INIT:ON? query.	Hfw_2584 Fixed in Rev A.03

Unfavorable Operating Conditions

- Do not perform any GPIB or front panel operations before the instrument is fully powered up.

  The instrument does not currently prevent a user from sending a remote command before it is completely powered up. This can cause various unforeseen performance problems and failures.

- "End Call" followed immediately by "Originate Call" may cause the Origination to fail. It is believed that the speed at which the Test Set's protocol processor can "Disconnect" and "Re-originate" is significantly faster than the mobile station's ability to respond.

  This is not a common usage scenario, but this may be performed as part of an evaluation process. To avoid this situation, ensure that the MS is ready for a page before the Test Set is asked to Originate a call.

Revision Information

December 1, 1999

This document describes features and functionality that are part of the E1960A GSM Mobile Test Application releases. This document contains the original features, as well as enhancements that have been added over time.

Select the appropriate link below to view the required release.

A.03 Release - December 1999

Call Processing

- EFS
  The Enhanced Full-rate Speech (EFS) feature provides the ability to set up a call in EFS mode.
- SACCH Tx Level Signalling
  The mobile can now be commanded to use a different Tx level by signalling using the SACCH header alone. In previous releases a FACCH assignment as well as the updated SACCH header was used.

Measurements

- I/Q Tuning
  A new measurement that can be used to determine the quality of an I/Q modulator by measuring the power of spurious signals at harmonics of 67.7 kHz.
- Simultaneous BER results
  An enhancement to the BER measurement now allows all types of BER measurement results to be returned at the same time if required.
- Dynamic Power
  A new feature that performs a series of rapid power measurements on a mobile station. This is only available via the test set's remote user interface.

Other

- Remote clear of error messages on screen
  A new command can be sent over the GPIB to clear error messages from the screen to enhance use of the test set in a remote situation. Previously, error messages on the screen could only be cleared through manual intervention, by pressing a key on the front panel. For further information on this command refer to "DISPlay:WINDow:ERRor:CLEar" on page 287.
- Status field indication of external or internal reference
  A status field has been implemented on the screen to indicate whether the test set has locked to an external or an internal reference.
- Beeper ON/OFF setting is non-volatile
  The ON/OFF setting of the beeper is now maintained through power-off. Previously, a power cycle would reset the beeper to its default state of OFF.
- Enhanced status subsystem for multi-format capability
  The status subsystem has been enhanced with radio system nodes where necessary for future multi-format capability. This will cause some status subsystem commands to be in error condition, unless they are replaced with the modified commands. The commands are:

  — STATus:QUEStionable:ERRors is now STATus:QUEStionable:ERRors:GSM

  — STATus:QUEStionable:CALL is now STATus:QUEStionable:CALL:GSM

  — STATus:OPERation:CALL is now STATus:OPERation:CALL:GSM

  — STATus:OPERation:NMRReady is now STATus:OPERation:NMRReady:GSM
- Instrument configuration information available remotely
  Information on the instrument hardware can be obtained through a remote command over the GPIB, and through a remote command via the LAN and a web browser. For further information on the commands refer to "Hardware Configuration Report" on page 539.
- Enhanced instrument information on the Configuration Screen
  The Instrument Information display on the Configuration Screen, now includes Subnet Mask and Gateway Default information in a new, improved information display.
- *IDN? returns "Agilent Technologies" in the manufacturer's field where previously it returned "Hewlett-Packard".
- RF Generator frequency range is now matched to the RF Receiver frequency range
  Previously the RF Generator had a low end limit of 45 MHz, while the RF Receiver has always had a low end limit of 292.5 MHz. The RF Generator is now limited to 292.5 MHz to enhance testability and supportability of the test set.

A.02 Release - July 1999

Call Processing

- Paging Mode selectable between “Reorganisation” or “Normal”

Measurements

- Automatic closed loop settings as part of Normal BER and Fast BER measurements
- 3 kHz speech selection for Downlink Speech Source

Other

- LAN subnet mask and LAN Default Gateway settable
- Status Subsystem for GPIB queries of instrument status
- Display Brightness
- Display Automatic Backlight Dimming

A.01 Release - March 1999

Call Processing

No new features in this release.

Measurements

- Normal BER
- Pulsed Audio Source (For uplink speech measurement)

Other

Measurement Integrity on Manual User Interface

A.00 Initial Release - January 1999

Call Processing

- GSM 900 (Includes PGSM/EGSM), DCS1800, PCS1900
- MS and BS Originated Calls
- TCH, Timeslot, Timing Advance, MS Tx Level Assignments
- Dual-Band Handover
- Downlink Speech Source
- Test Mode - CW, BCH Only, BCH + TCH

Measurements

- Tx Power
- Output RF Spectrum
- Power versus Time
- Phase / Frequency Error
- Burst Timing
- Analog Audio
- Uplink Speech Measurement (requires pulsed audio source)
- Burst by Burst BER (Fast BER)

Other

- Audio Source
- User settable amplitude offset

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