

**Agilent Technologies 8960 Series 10 E5515B Wireless Communications Test Set  
Agilent Technologies E1961A AMPS/136 Mobile Test Application**

# **Reference Manual**

Test Application Revision A.03

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## Edition/Print Date

All Editions and Updates of this manual and their creation dates are listed below.

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## Safety Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

### GENERAL

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

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.

### ENVIRONMENTAL CONDITIONS

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters. Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

**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.

### BEFORE APPLYING POWER

Verify that the product is set to match the available line voltage, the correct fuse is installed, and all safety precautions are taken. Note the instrument's external markings described under Safety Symbols.

## **GROUND THE INSTRUMENT**

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

## **FUSES**

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

## **DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE**

Do not operate the instrument in the presence of flammable gases or fumes.

## **DO NOT REMOVE THE INSTRUMENT COVER**

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

---

**WARNING**     **The WARNING sign 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.**

---







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**CAUTION**     The CAUTION sign denotes a hazard. It calls attention to an operating procedure, 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 a CAUTION sign until the indicated conditions are fully understood and met.

---



**Safety Symbols**

-  Caution, refer to accompanying documents
-  Warning, risk of electric shock
-  Earth (ground) terminal
-  Alternating current
-  Frame or chassis terminal
-  Standby (supply). Units with this symbol are not completely disconnected from ac mains when this switch is off.

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**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.

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**CERTIFICATION**

*Agilent Technologies 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*

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# Agilent Technologies Warranty Statement for Commercial Products

## Agilent Technologies E1961A AMPS/136 Mobile Test Mode Application

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### **Europe**

(31 20) 547 9900

### **Canada**

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## DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN45014

<b>Manufacturer's Name:</b>	<b>Agilent Technologies UK Ltd.</b>	<b>Agilent Technologies, Inc.</b>
<b>Manufacturer's Address:</b>	<b>Electronic Products &amp; Solutions Group - Queensferry South Queensferry West Lothian, EH30 9TG Scotland, United Kingdom</b>	<b>24001 E. Mission Avenue Liberty Lake Washington 99019-9599 USA</b>

Declares that the product

<b>Product Name:</b>	8960 Series 10 Wireless Communications Test Set
<b>Model Number:</b>	E5515 B,T
<b>Product Options:</b>	This declaration covers all options of the above product.

### EMC:

Conforms with the following product specifications:

<b>Standard:</b>	<b>Limit:</b>
CISPR11:1990 / EN55011:1991	Group 1 Class A
IEC 801-2:1991 / EN 50082-1:1992	4kV CD, 8kV AD
IEC 801-3:1984 / EN 50082-1:1992	3V/m, 27-500 MHz
IEC 801-4:1988 / EN 50082-1:1992	0.5kV signal lines, 1kV power lines

### Safety:

The product conforms to the following safety standards:

IEC 61010-1(1990) +A1(1992) +A2(1995) / EN 61010-1:1993  
Canada / CSA-C22.2 No. 1010.1-93

The 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 mark accordingly.

**South Queensferry, Scotland. 04 May 2000**



R.M. Evans / Quality Manager

**Spokane, Washington, USA. 04 May 2000**



W.V. Roland / Reliability & Regulatory Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent, or distributor.

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

---

## Herstellerbescheinigung

Diese Information steht im Zusammenhang mit den Anforderungen der Maschinenlärminformationsverordnung vom 18 Januar 1991.

- Schalldruckpegel  $L_p < 70$  dB(A).
- Am Arbeitsplatz.
- Normaler Betrieb.
- Nach ISO 7779:1988/EN 27779:1991 (Typprüfung).

# 1 Call Processing



---

## Establishing an Active Link with the Mobile Station

### Making a Base Station Originated Call

The following general process is used to make a base station originated call to a connected mobile using the Active Cell operating mode. See [“Active Cell Operating Mode” on page 544](#).

In most cases, the test set’s power-on default values for the control and traffic channel should work correctly to get an AMPS/136 mobile on a digital traffic channel (DTC). If necessary, you can change the control and traffic channel parameters for analog or PCS band operation.

1. If necessary, configure the control channel that the mobile will camp on (DCCH is default). See [“Configuring the Control Channel \(CCH\)” on page 552](#).
2. If necessary, configure the traffic channel that the mobile will be commanded to go to (DTC is default). See [“Configuring the Traffic Channel \(TCH\)” on page 565](#).
3. Configure the necessary call processing connect/disconnect synchronization conditions to allow your program to detect if the mobile went to its assigned traffic channel. See [“Call Processing State Synchronization” on page 39](#).
4. Enter the mobile’s paging (phone) number. See [“CALL:PAGing:PNUMBER” on page 317](#).
5. Verify that the mobile has camped on the control channel.
6. Send the command to originate the call. See [“CALL:ORIGinate” on page 316](#).
7. Verify that the mobile is on its assigned traffic channel. [“Call Processing State Synchronization” on page 39](#).

### Making a Mobile Station Originated Call

The following process is used to make a mobile station originated call:

1. If necessary, configure the control channel that the mobile will camp on (DCCH is default). See [“Configuring the Control Channel \(CCH\)” on page 552](#).
2. If necessary, configure the traffic channel that the mobile will be commanded to go to (DTC is default). See [“Configuring the Traffic Channel \(TCH\)” on page 565](#).
3. Configure the necessary call processing connect/disconnect synchronization conditions to allow your program to detect if the mobile went to its assigned traffic channel. See [“Call Processing State Synchronization” on page 39](#).
4. 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.

---

5. Verify that the mobile is on its assigned traffic channel. [“Call Processing State Synchronization” on page 39](#).

## Operating Considerations

- The test set must be in active cell operating mode for any call processing operations.
- Be sure to verify the correct frequency band for DCCH and DTC operation (Cellular or PCS). Default channel numbers for these bands are different.

## Call Processing Event 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.

Using the call processing subsystem overlapped command synchronization commands, 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.

---

Call Processing Subsystem Overlapped Command Synchronization Commands

Table 1. Overlapped Commands

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.	<pre>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</pre> <p>The example shown is from the E1960A GSM test application. 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</p>
: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.	<pre>OUTPUT 714;"CALL:TCH:SEQ 65"</pre> <p>The example shown is from the E1960A GSM test application. 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.</p>
:WAIT	Forces the test set to wait until the associated command's pending operation flag is false before executing any more commands.	<pre>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</pre> <p>The example shown is from the E1960A GSM test application. 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 INITiate command until the handover is finished.</p>

**Table 1. Overlapped Commands**

Command	Purpose Of Command	Example
: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.	<pre> 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                     </pre> <p>The example shown is from the E1960A GSM test application. 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 INITiate command.</p>

**Operating Considerations**

When using the call processing subsystem overlapped command synchronization commands, check the conditions that set the operation's pending operation flag (POF) false to avoid unexpected results.

## Call Processing Subsystem Overlapped Commands

### Overlapped Commands

Call Processing Command	Purpose Of Command	Pending Operation Flag (POF) is false when
CALL:END	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:CONNected:ARM[:IMMediate]	Arms the call control status change detector.	The call control status change detector has been disarmed.

## Related Topics

\*\*\*\*\*

[“Call Processing State Synchronization” on page 39](#)

[“Test System Synchronization Overview” on page 44](#)

[“Measurement Event Synchronization” on page 128](#)

\*\*\*\*\*

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## Call Processing State Synchronization

### Call Processing State Query

The CALL:STATUS:STATE query returns the current call processing state.

This is a list of all possible values for this test application.

- “ALER”  
Alerting is returned when an alert message is sent to the MS during a call setup due to a page.
- “CONN”  
Connected is returned when the test set and the MS are connected on a call.
- “HAND”  
Handoff is returned when the test set is in the process of handing off the MS.
- “IDLE”  
Idle is returned when the test set is not on a call, involved with any termination, page, origination, or registration call processing procedures with the MS.
- “PAG”  
Paging is returned when the test set is in the process of paging the MS.
- “REG”  
Registering is returned when the test set is in the process of performing a registration with the MS.
- “REL”  
Releasing is returned when the test set is in the process of releasing the MS from a call using over the air signalling as part of a MS or BS originated release procedure.
- “SREQ”  
Set Up Request is returned when the test set is in the process of assigning a channel to an MS as part of a Page or an MS originated call setup.

The following command returns the current state of a call:

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

See the [“Instrument Status Area” on page 569](#) for call processing state information.

### Description

#### Connected/Idle Query

This query will determine if a call is connected or disconnected by returning an integer value. The value indicates if the call state is idle or connected, not if any call state change has occurred.

Query returns one of the following:

- 0 = idle

**Call Processing State Synchronization**

- 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.

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

**Example 1. Using the Connected/Idle Query - Base Station Originated Call**

The following example illustrates the use of the 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 Change Detector**

This method provides the advantage of indicating that a call state change has occurred. The change detector works in conjunction with the Connected /Idle Query. Arming the CALL:CONNECTED query provides a way for the test set to know when the call state change process is done.

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 Fixed Timers has timed out  
or...
- no call processing state changes occurred within the time period specified by the timeout timer

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.
```

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 change 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. 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.

### Example 2. 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

```

### STATUS:OPERation:CALL 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 to generate interrupts to the external controller. Refer to ["STATUS:OPERation:CALL Condition Register Bit Assignment" on page 477](#) for status bit definitions and GPIB command syntax.

### Call State STATUS:OPERation:CALL Program Example

#### Example 3. 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     CLEAR SCREEN
20     OUTPUT 714;"*CLS"
30     OUTPUT 714;"STATUS:OPERATION:CALL:COMMON:PTR 0;NTR 4"!Enable the

```

**Call Processing State Synchronization**

```

40                                     !negative
50                                     !transition
60                                     !filter for the
70                                     !connected bit.
80  OUTPUT 714;"STATUS:OPERATION:CALL:COMMON:ENABLE 4" !Enable the
90                                     !connected bit
100                                    ! to generate a
110                                    !summary message.
120  OUTPUT 714;"STATUS:OPERATION:CALL:PTR 2;NTR 0" !Enable the
130                                     !positive
140                                     !transition
150                                     !filter for the
160                                     !summary bit.
170  OUTPUT 714;"STATUS:OPERATION:CALL:ENABLE 2" !Enable the
180                                     !connected bit
190                                     !to generate a
200                                     !summary message.
210  OUTPUT 714;"STATUS:OPERATION:PTR 1024;NTR 0" !Enable the positive
220                                     !transition filter for the
230                                     !call summary bit.
240  OUTPUT 714;"STATUS:OPERATION:ENABLE 1024" !Enable the call summary
250                                     !bit to generate a summary
260                                     !message.
270  OUTPUT 714;"*SRE 128" !Enable the service request enable register to
280                                     !generate an SRQ.
290  ON INTR 7,15 CALL Err !Define the interrupt-initiated branch with a
300                                     !priority of 15, the highest.
310  ENABLE INTR 7;2 !Enable interrupt on interface card 7 with a bit mask
320                                     !(for the interface's interrupt-enable register) of 2.
330  PRINT "Step 1. Make a call, and type CONT when connected." !Make a Mobile Station
340                                     !originated call.
350  PAUSE
360  PRINT "Step 2. End the call from the mobile station."
370  LOOP !Put the program into a loop until the interrupt is detected.
380    DISP "CALL STATUS: The call is still connected."
390  END LOOP
400  END
410  SUB Err
420    DISP "CALL STATUS: The call has ended."
430    Clear_interrupt=SPOLL(714)
440    OUTPUT 714;"*CLS"
450    DISABLE INTR 7
460    STOP
470  SUBEND

```

**Related Topics**

\*\*\*\*\*

["Call Processing Event Synchronization" on page 35](#)

["Instrument Status Area" on page 569](#)

["CALL:CONNECTed:TIMEout" on page 287](#)

“CALL:STATus[:STATe]?” on page 338

“CALL:CONNected:ARM[:IMMEDIATE]” on page 286

\*\*\*\*\*

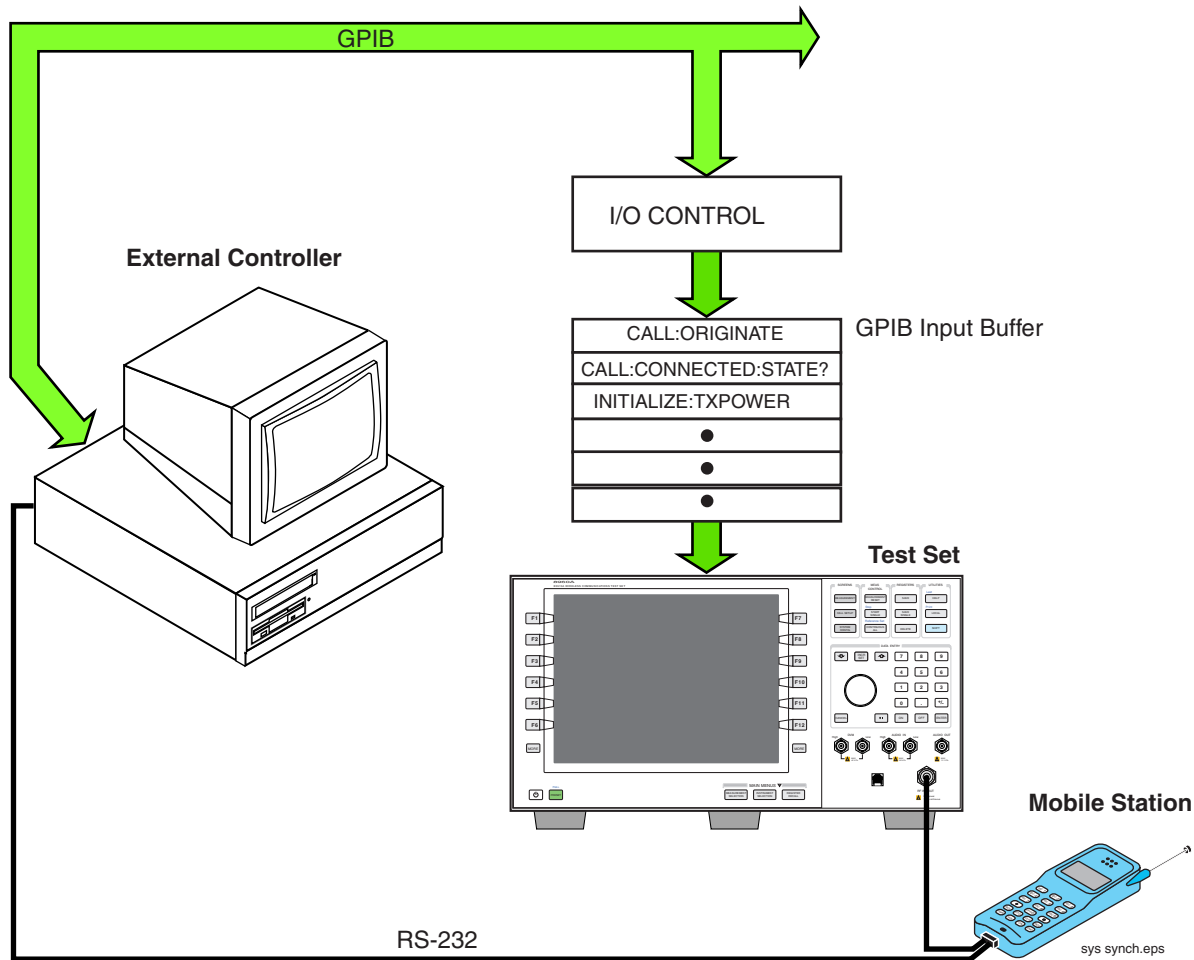
# Test System Synchronization Overview

## 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.

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:

- Sequential commands must finish executing before the next command starts to execute.

- Overlapped commands do not finish executing before the next command starts to execute.

Overlapped commands are more difficult to synchronize 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. Overlapped commands allow the test set to use its internal resources as efficiently as possible.

### Methods for synchronization

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

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.

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.

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.
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 or data connection 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.

### Related Topics

\*\*\*\*\*

[“Call Processing State Synchronization” on page 39](#)

[“Call Processing Event Synchronization” on page 35](#)

[“Measurement Event Synchronization” on page 128](#)

[“SYSTem:SYNChronized” on page 534](#)

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## 2 Measurements

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## Adjacent Channel Power Measurement Description

### How is an Adjacent Channel Power measurement made?

Adjacent Channel Power measures the average power in the three channels immediately above and below the transmitter's expected frequency that are caused by modulation and switching transients. Results for the adjacent ( $\pm 30$  kHz), 1st alternate ( $\pm 60$  kHz) and 2nd alternate ( $\pm 90$  kHz) channels are returned in dBc (the power in each channel relative to the mean output power in the carrier).

The transmitter's expected frequency is specified using either of these methods:

- By using the DTC channel number you specify in the call setup parameters. The base station emulator assumes your mobile is transmitting on the assigned digital traffic channel and sets the receiver accordingly.
- By using manual receiver control and setting the manual measurement frequency.

Refer to IS-137, 3.4.1.2.1 or 3.4.1.2.2, for more information on measuring adjacent channel power.

This measurement is only made on digital traffic channels. Measurement performance is only specified for normal, full-length DTC bursts; however, measurement values and an integrity indicator are always returned when the measurement is triggered, regardless of the input signal characteristics.

### Related Topics

\*\*\*\*\*

[“Programming an Adjacent Channel Power Measurement” on page 49](#)

[“Adjacent Channel Power Troubleshooting” on page 51](#)

[“Measurement Timeouts” on page 124](#)

[“Statistical Measurement Results” on page 133](#)

[“Triggering of Measurements” on page 145](#)

[“Test Adherence to Standards” on page 109](#)

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## Programming an Adjacent Channel Power Measurement

This section provides an example of how to make Adjacent Channel Power measurements via GPIB.

The following program example assumes that the mobile's antenna output is connected to the RF IN/OUT connector, and the mobile is on a Digital Traffic Channel (DTC). For information on configuring the test set to get the mobile on an DTC, see [“Establishing an Active Link with the Mobile Station” on page 33](#) or [“DTC Test Operating Mode” on page 557](#).

The basic procedure to test Adjacent Channel Power is as follows:

1. Enter the expected frequency and power level.
2. Configure the Adjacent Channel Power Setup parameters using the SETup subsystem.
3. Start the Adjacent Channel Power measurement using the INITiate subsystem.
4. Use the FETCh? command to obtain the measurement results. When multi-measurements are used, the minimum, maximum, and standard deviation values for each of the six adjacent channel power measurements can be queried. Even though the following program does use multi-measurements, it queries only the average value for each of the six measurements.

### Programming Example

```
10 !Set the expected frequency and power.
20 OUTPUT 714;"SETup:ACPower:COUNT 5" !Turn multi-measurements on
30                                     !and set to 5.
40 OUTPUT 714;"SETup:ACPower:CONTinuous OFF" !Set the Adjacent Channel Power
50                                     !measurement to single trigger mode.
60 OUTPUT 714;"SETup:ACPower:TRIGger:SOURce AUTO" !Select Auto trigger.
70 OUTPUT 714;"SETup:ACPower:TIMEout 5 S" !Turn on measurement timeouts
80                                     !and set a value of 5 seconds in case the measurement cannot be made.
90 OUTPUT 714;"INITiate:ACPower" !Start the measurement.
100 OUTPUT 714;"FETCh:ACPower?" !Query the integrity indicator and all average adjacent,
110     ! 1st alternate, and 2nd alternate results.
120 ENTER 714;Integrity,Low_adj,Up_adj,Low_1alt,Up_1alt,Low_2alt,Up_2alt !Enter
130     !the returned integrity and measurement results into variables.
140 IF Integrity<>0 THEN !Measurement results are invalid.
150 PRINT "Measurement problem; check for over/under range or trigger problems."
160 END IF
170 END
```

## Returned Values

The results returned by this program are:

- **Integrity** returns the measurement integrity indicator (see [“Integrity Indicator” on page 121](#)); 0 means a successful measurement with no errors.
- **Low\_adj** and **Up\_adj** are the lower and upper adjacent channel results, respectively. **Low\_1alt** and **Up\_1alt** are the lower and upper first alternate channel results. **Low\_2alt** and **Up\_2alt** are the lower and upper second alternate channel results. All returned values are in dBc - the power in each channel relative to the power of the carrier.

## Related Topics

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[“Adjacent Channel Power Measurement Description” on page 48](#)

[“Adjacent Channel Power Troubleshooting” on page 51](#)

[“INITiate” on page 404](#)

[“FETCh:ACPower” on page 351](#)

[“SETup:ACPower” on page 424](#)

[“Comprehensive Program Example” on page 255](#)

[“Receiver Control” on page 561](#)

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## Adjacent Channel Power Troubleshooting

### Possible Setup Issues

During remote operation of the Adjacent Channel Power measurement, you should configure the Trigger Arm to Single. See [“SETup:ACPower” on page 424](#). If single triggering is used during manual operation, press the START SINGLE key to trigger each measurement.

The expected signal amplitude and channel number (or frequency) must be specified for accurate measurements. See [“Active Cell Operating Mode” on page 544](#), [“DTC Test Operating Mode” on page 557](#), and [“Receiver Control” on page 561](#) for information on setting the expected input frequency and power level.

To meet specifications, the input level at the test set’s RF IN/OUT connector must be no lower than -15 dBm, and be within 3 dB of the expected input power level. The measured signal’s frequency must be in the range of 800 MHz to 960 MHz, or 1.7 GHz to 2.0 GHz, and the signal’s center frequency must be within 200 Hz of the expected frequency.

The Trigger Source should normally be set to Auto.

See [“Triggering of Measurements” on page 145](#) for a description of each trigger setting.

### Interpreting Integrity Indicator values

See [“Integrity Indicator” on page 121](#).

If over range (5) is returned; the input power has exceeded the test set’s internal sampler maximum value by at least 3 dB during some part of the sampling or the input power has exceeded the calibrated range of the test set’s power detector for the expected power setting.

If under range (6) is returned; the input power is more than 10 dB below the expected input power level.

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

## Analog Transmit Power Measurement Description

### How is an Analog Transmit Power measurement made?

Analog Transmit Power measures the mean power from the mobile at the test set's RF IN/OUT port when transmitting an analog carrier. The test set correctly measures the level with or without frequency modulation (FM) present to make AMPS power measurements. Tests can be made with the mobile in the analog test mode or when connected on an active voice channel. See IS-137A, section 3.2.1.1, Analog RF Power.

The trigger source for this measurement is always immediate.

### Input Signal Requirements

The Analog Transmit Power measurement meets or exceeds specifications when the following requirements are met:

- The frequency of the signal being measured must be in the range of 800 MHz to 960 MHz or 1.7 GHz to 2.0 GHz, and within 100 kHz of the expected frequency.
- The signal level into the test set's RF IN/OUT connector must be in the range of -25 dBm to +43 dBm peak, and within 3 dBm of the expected input power to meet specifications. Results are provided for signals within +5 dB to -10 dB of the expected power, but performance is not warranted.

See [“Active Cell Operating Mode” on page 544](#), [“AVC Test Operating Mode” on page 548](#), and [“Receiver Control” on page 561](#) for information on setting the expected input frequency and power level.

### Considerations When Making Manual Analog Transmit Power Measurements

When manually controlling the test set from the front panel, all measurements default to using continuous triggering. If you make digital measurements on a DTC using RF Rise or Protocol triggering, and then hand off to an AVC and select an analog measurement, the analog measurement may not trigger and display a result. This is because the digital measurement is still waiting for a burst transmission to trigger it (which it won't get from an analog signal) and therefore the measurements “freeze”. To prevent this from happening when making analog measurements, either turn off the digital measurements or set their trigger source to Immediate.

## Related Topics

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- [“Analog Transmit Power Troubleshooting” on page 56](#)
- [“Programming an Analog Transmit Power Measurement” on page 54](#)
- [“Digital Transmit Power Measurement Description” on page 70](#)
- [“Test Adherence to Standards” on page 109](#)
- [“Statistical Measurement Results” on page 133](#)
- [“Triggering of Measurements” on page 145](#)
- [“Measurement Timeouts” on page 124](#)

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## Programming an Analog Transmit Power Measurement

This section provides an example of how to make Analog Transmit Power (ATXP) measurements via GPIB.

The following program example assumes that the mobile's antenna output is connected to the RF IN/OUT connector, and the mobile is on an analog voice channel (AVC). For information on configuring the test set to get the mobile on an active call, see [“Establishing an Active Link with the Mobile Station” on page 33](#).

The basic procedure to test Analog Transmit Power is as follows:

1. Enter the expected power level (see [“Expected Power” on page 563](#)).
2. Define the Analog Transmit Power Setup parameters as desired for triggering, measurement timeout, and multi-measurements.
3. Use the INITiate:ATXPower command to trigger the measurement.
4. Use the FETCh? command to obtain the measurement results.

### Programming Example

```
10 !Set the expected power level.
20 OUTPUT 714;"SETup:ATXPower:CONTinuous Off" !Set the analog transmit power
30                                     !measurement to single trigger mode.
40 OUTPUT 714;"SETup:ATXPower:TIMEout 1S" !Set a timeout value of 1 second
50                                     !in case the measurement cannot be made.
60 OUTPUT 714;"SETup:ATXPower:COUNT:NUMBer 5" !Set multi-measurements to 5.
70 OUTPUT 714;"INITiate:ATXPower" !Start the measurement.
80 OUTPUT 714;"FETCh:ATXPower?" !Query the returned integrity indicator and the
90                                     !Average analog transmit power measurement.
100 ENTER 714;Integrity,Atxpower !Enter the returned values into variables.
110 IF Integrity=0 THEN !See if the integrity value = 0 (valid measurement).
120 ELSE
130 PRINT "Measurement problem; check for signal level over/under range condition."
140 END IF
150 END
```

### Returned Values

The measurements returned by this program are:

- Integrity returns the measurement integrity indicator (see [“Integrity Indicator” on page 121](#)); 0 means a successful measurement with no errors.
- Atxpower returns the Average Analog Transmit Power measurement value in dBm.

## Related Topics

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[“Analog Transmit Power Measurement Description” on page 52](#)

[“Analog Transmit Power Troubleshooting” on page 56](#)

[“INITiate” on page 404](#)

[“SETup:ATXPower” on page 435](#)

[“Description” on page 599](#)

[“FETCh:ATXPower” on page 364](#)

[“Comprehensive Program Example” on page 255](#)

[“Receiver Control” on page 561](#)

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## Analog Transmit Power Troubleshooting

### Possible Setup Issues

During remote operation of the Analog Transmit Power measurement, you should configure the Trigger Arm to Single. See [“SETup:ATXPower” on page 435](#). If single triggering is used during manual operation, press the START SINGLE key to trigger each measurement.

If digital measurements are active, turn them off or set their trigger source to Immediate. See [“Triggering Process Description” on page 146](#).

The measurement results are altered by the Amplitude Offset value. See [“Description” on page 599](#).

The expected signal amplitude and channel number (or frequency) must be specified for accurate measurements. See [“Active Cell Operating Mode” on page 544](#), [“AVC Test Operating Mode” on page 548](#), and [“Receiver Control” on page 561](#) for information on setting the expected input frequency and power level.

The trigger source is always immediate for the Analog Transmit Power measurement. No synchronization or external signals are required.

Over range and under range conditions may occur when testing a power class 4 mobile at power levels 0 or 1, or when testing a power class 1 mobile at power levels 8, 9, and 10 (digital mode only). See [“Cellular Band \(800 MHz\) Mobile Power Class Considerations for Expected Input Level” on page 563](#) for an explanation of why this occurs and what to do about it.

### Interpreting Integrity Indicator values

See [“Integrity Indicator” on page 121](#).

If over range (5) is returned; the input power has exceeded the test set’s internal sampler maximum value by at least 3 dB during some part of the sampling or the input power has exceeded the calibrated range of the test set’s power detector for the expected power setting.

If under range (6) is returned; the Analog 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 (-30 dBm).

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



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## Audio Analyzer Measurement Description

### How is an analog audio measurement made?

The Audio Analyzer can measure Audio Level (V), SINAD (dB), Distortion (%), and Audio Frequency. Measurements are made through the test set's front panel AUDIO IN connectors. When measuring a mobile's audio output, the audio signal may come from either an acoustic coupler or from a test interface connection to the mobile's audio circuitry.

See [“Audio Analyzer Block Diagram” on page 60](#).

The AUDIO IN connectors feed the inputs to a floating-input differential amplifier, with each input having an impedance of about 100,000 ohms to chassis ground. For best noise immunity, connect the audio signal and its ground reference to the two input ports through shielded coaxial cables, or input the signal to the AUDIO IN HI connector and ground the AUDIO IN LO connector's center contact.

None of the analog audio measurement results are affected by the Amplitude Offset setting.

### SINAD/Distortion State

Select On or Off to enable or disable the SINAD and Distortion measurements. When On, these measurement results are displayed below the Audio Level measurement and the SINAD/Distortion Fundamental Frequency must be entered to specify the audio frequency for the measurement (range: 100 Hz to 10 kHz). When Off, four dashes are displayed in place of the measurement results.

### Audio Frequency State

Select On or Off to enable or disable the Audio Frequency measurement.

### Filter Type

- None - no filtering is provided (default).
- 100 Hz BW Band Pass Filter (Tunable) - The 100 Hz BW BPF Center Frequency setting is available when this filter is selected, and can be set in the range of 300 Hz to 15 kHz.
- C-Message
- 50 Hz to 15 kHz
- 300 Hz to 15 kHz

### Detector Type

Select either Peak or RMS (default) for making and displaying an Audio Level measurement (does not affect other measurements). The type of detector selected is displayed next to the Audio Level measurement results. A 1-volt rms sinewave input signal would measure  $1.414 V_{\text{Peak}}$  when the Peak detector is used. A 1-volt peak input signal would measure  $0.707 V_{\text{RMS}}$  when the RMS detector is used.

## Expected Peak Voltage

The Expected Amplitude sets the analog audio clipping level and must be set. This voltage is always the *absolute peak* audio input signal voltage expected at the AUDIO IN connectors, and must be in the range of  $7.07 \text{ mV}_{\text{peak}}$  ( $5 \text{ mV}_{\text{rms}}$ ) to  $20 \text{ V}_{\text{peak}}$ . Remember, measuring a 1-volt rms sinewave input signal would require a  $1.414 \text{ V}_{\text{peak}}$  expected voltage value to avoid clipping (over-driving) the input.

## De-Emphasis State

Set to On or Off (default) to enable or disable 750 microsecond de-emphasis.

## Expander Reference Level

Set value from  $10 \text{ mV/kHz}$  to  $10 \text{ V/kHz}$ , or Off (default). Entering a numeric value automatically turns the state to On. Entering Off disables the expander (state = off).

## Trigger Source

Audio Analyzer measurements use immediate triggering and are continuously re-triggered by the analyzer any time the Trigger Arm parameter is set to Continuous. Trigger timing is independent of any mobile protocol signaling.

## Considerations When Making Manual Audio Analyzer Measurements

When manually controlling the test set from the front panel, all measurements default to using continuous triggering. If you make digital measurements on a DTC using RF Rise or Protocol triggering, and then hand off to an AVC and select an analog measurement, the analog measurement may not trigger and display a result. This is because the digital measurement is still waiting for a burst transmission to trigger it (which it won't get from an analog signal) and therefore the measurements "freeze". To prevent this from happening when making analog measurements, either turn off the digital measurements or set their trigger source to Immediate.

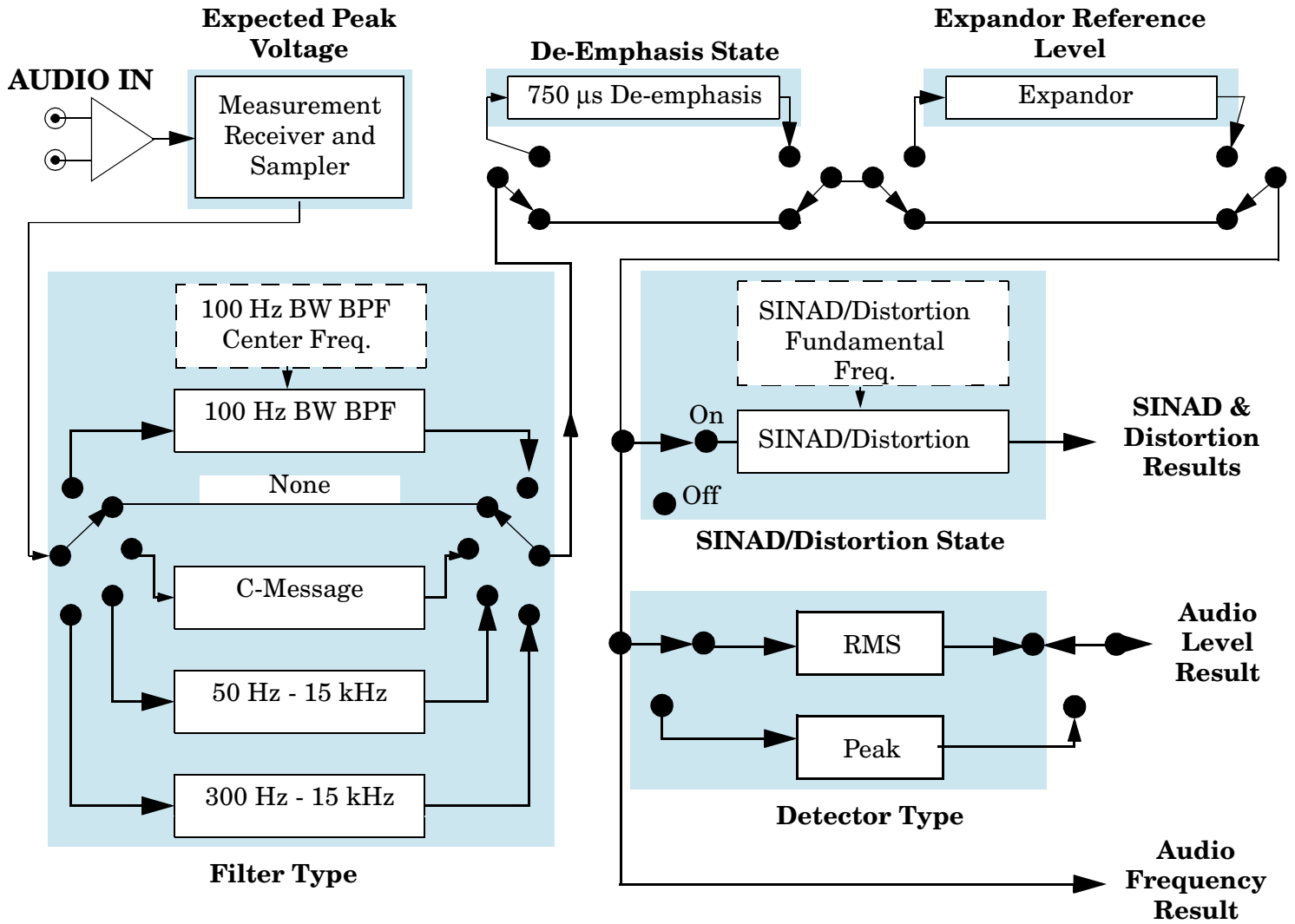
## Related Topics

\*\*\*\*\*

- [“Audio Analyzer Block Diagram” on page 60](#)
- [“AFANalyzer Troubleshooting” on page 61](#)
- [“Audio Level Measurement Description” on page 64](#)
- [“Audio Frequency Measurement Description” on page 62](#)
- [“SINAD Measurement Description” on page 106](#)
- [“Distortion Measurement Description” on page 67](#)
- [“Programming an Audio Frequency Measurement” on page 63](#)
- [“Programming an Audio Level Measurement” on page 65](#)
- [“Programming a SINAD Measurement” on page 107](#)
- [“Programming a Distortion Measurement” on page 68](#)
- [“Statistical Measurement Results” on page 133 \(Multi-measurements\)](#)
- [“Triggering of Measurements” on page 145](#)
- [“Measurement Timeouts” on page 124](#)

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## Audio Analyzer Block Diagram



### Related Topics

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[“Audio Analyzer Measurement Description” on page 57](#)

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## AFANalyzer Troubleshooting

### Possible Setup Issues

During remote operation of the Audio Analyzer, you should always set the Trigger Arm to Single. The length of time required to return a measurement over GPIB using continuous triggering varies, but is always longer than when using single triggering. Continuous triggering can also cause problems when the INITiate:DONE? query is used.

If digital measurements are active, turn them off or set their trigger source to Immediate. See [“Measurement States” on page 147](#).

The Detector Type selected (peak or rms) also sets how Audio Level measurements are displayed; as a peak value or an rms value. When comparing returned values over GPIB to your specifications, be sure to take into account the type of detector being used.

The Expected Peak Voltage is always set in  $V_{\text{peak}}$ , regardless of the Detector Type selected, and cannot exceed  $20 V_{\text{peak}}$  ( $14.1 V_{\text{rms}}$ ).

For accurate measurements, always set all Audio Analyzer setup parameters to their proper settings for the measurement being made. The SINAD and Distortion measurements typically use different settings than the Audio Level measurement. See [“Audio Analyzer Measurement Description” on page 57](#) and [“Audio Analyzer Block Diagram” on page 60](#).

For very low level audio signals, use the 100 Hz BW BPF filter to reduce the affects of noise (see [“Audio Level Measurement Description” on page 64](#)).

For accurate Audio Frequency measurements where more than one signal may be present, use the 100 Hz BW BPF filter to isolate the desired signal (see [“Audio Level Measurement Description” on page 64](#)).

### Interpreting Integrity Indicator Values

See [“Integrity Indicator” on page 121](#).

If over range (5) is returned, the input level is greater than 4.9 dB above the Expected Peak Amplitude value or the maximum input level of 20 volts peak.

If under range (6) is returned, the input level is lower than 8 dB below the Expected Peak Amplitude value.

If the signal has both over range and under range conditions, only the over range condition (5) is indicated.

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## Audio Frequency Measurement Description

### Considerations When Making Manual Audio Frequency Measurements

When manually controlling the test set from the front panel, all measurements default to using continuous triggering. If you make digital measurements on a DTC using RF Rise or Protocol triggering, and then hand off to an AVC and select an analog measurement, the analog measurement may not trigger and display a result. This is because the digital measurement is still waiting for a burst transmission to trigger it (which it won't get from an analog signal) and therefore the measurements "freeze". To prevent this from happening when making analog measurements, either turn off the digital measurements or set their trigger source to Immediate.

### Related Topics

\*\*\*\*\*

["Programming an Audio Frequency Measurement" on page 63](#)

["Audio Analyzer Measurement Description" on page 57](#)

["Audio Analyzer Block Diagram" on page 60](#)

["AFANalyzer Troubleshooting" on page 61](#)

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## Programming an Audio Frequency Measurement

This section provides an example of how to make an audio frequency measurement with the Audio Analyzer (AFANalyzer) via GPIB.

The following procedure assumes that an audio source is connected to the AUDIO IN connectors. See [“Audio Analyzer Measurement Description” on page 57](#).

1. Configure audio analyzer measurement parameters using the SETup subsystem. When more than one audio frequency signal may be present, use the 100 Hz bandpass filter to isolate the desired signal for measurement (see the Programming Example below).
2. Start the audio analyzer measurement using the INITiate subsystem.
3. Use the FETCh? subsystem to obtain audio analyzer measurement results.

### Programming Example

```
10 OUTPUT 714;"SETup:AFANalyzer:CONTinuous OFF" !Set the audio analyzer
20                                     !measurements to single trigger mode.
30 ! OUTPUT 714;"SETup:AFANalyzer:PEAK:VOLTage 3V" !Set the Expected peak voltage
40                                     !for the audio input level in Vpeak.
50 OUTPUT 714;"SETup:AFANalyzer:FREQuency:STATe ON" !Enable audio frequency measurement.
60 OUTPUT 714;"SETup:AFANalyzer:FILTer TBPass" !Select the 100 Hz bandpass filter.
70 OUTPUT 714;"SETup:AFANalyzer:FILTer:TBPass 6000 Hz" !Set the 100 Hz bandpass
80     !filter's center frequency to 6 kHz (example; to measure SAT frequency).
90 OUTPUT 714;"SETup:AFANalyzer:TIMEout 3S" !Set a timeout value of 3 seconds
100                                     !in case the measurement cannot be made.
110 OUTPUT 714;"INITiate:AFANalyzer" !Start the AF Analyzer measurement.
120 OUTPUT 714;"FETCh:AFANalyzer:FREQuency?" !Fetch the Audio Frequency result.
130 ENTER 714;Audio_frequency !Enter the returned value into a variable.
140 END
```

### Related Topics

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[“Audio Frequency Measurement Description” on page 62](#)

[“AFANalyzer Troubleshooting” on page 61](#)

[“Audio Analyzer Measurement Description” on page 57](#)

[“INITiate” on page 404](#)

[“SETup:AFANalyzer” on page 428](#)

[“FETCh:AFANalyzer” on page 355](#)

[“Comprehensive Program Example” on page 255](#)

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## Audio Level Measurement Description

### How is an Audio Level measurement made?

Audio Level measures the AC voltage of the signal applied to the front-panel AUDIO IN connectors, and is one of the Audio Analyzer measurements. Audio Level can be measured for signals in the frequency range of 100 Hz to 20 kHz, at levels from 1 mV<sub>peak</sub> to 20V<sub>peak</sub>. The measurement is made after any filtering is applied, and can be made using an rms or peak detector. The type of detector being used for the measurement is displayed next to the measurement value.

When measuring very low voltages, it may be helpful to use the Audio Analyzer's adjustable bandpass filter and the rms detector to reduce noise components.

For information on using the Audio Analyzer, see [“Audio Analyzer Measurement Description” on page 57](#).

This measurement is not affected by the Amplitude Offset setting.

### Considerations When Making Manual Audio Level Measurements

When manually controlling the test set from the front panel, all measurements default to using continuous triggering. If you make digital measurements on a DTC using RF Rise or Protocol triggering, and then hand off to an AVC and select an analog measurement, the analog measurement may not trigger and display a result. This is because the digital measurement is still waiting for a burst transmission to trigger it (which it won't get from an analog signal) and therefore the measurements “freeze”. To prevent this from happening when making analog measurements, either turn off the digital measurements or set their trigger source to Immediate.

### Related Topics

\*\*\*\*\*

[“Programming an Audio Level Measurement” on page 65](#)

[“AFANalyzer Troubleshooting” on page 61](#)

[“Audio Analyzer Measurement Description” on page 57](#)

[“Audio Analyzer Block Diagram” on page 60](#)

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## Programming an Audio Level Measurement

This section provides an example of how to make an audio level measurement with the Audio Analyzer (AFANalyzer) via GPIB.

The following procedure assumes that an audio source is connected to the AUDIO IN connectors. See [“Audio Analyzer Measurement Description” on page 57](#).

1. Configure audio analyzer measurement parameters using the SETup subsystem. Even though default settings exist for each parameter, it is a good idea to deliberately set each parameter to make sure the setting is correct for the specific audio analyzer measurement you are making.
2. Start the audio analyzer measurement using the INITiate subsystem.
3. Use the FETCh? subsystem to obtain audio analyzer measurement results.

### Programming Example

```

10 OUTPUT 714;"SETup:AFANalyzer:CONTinuous OFF" !Set the audio analyzer
11                                     !measurements to single trigger mode.
20 OUTPUT 714;"SETup:AFANalyzer:PEAK:VOLTage 3V" !Set the Expected Amplitude level for
21                                     !audio input voltage in Vpeak.
30 OUTPUT 714;"SETup:AFANalyzer:SDISortion:STATe OFF" !Turn off the SINAD and
31                                     !distortion measurements since
32                                     !they are not being used.
40 OUTPUT 714;"SETup:AFANalyzer:FILTer NONE" !Bypass all audio filters.
50 OUTPUT 714;"SETup:AFANalyzer:DEMPhasis:STATe OFF" !Turn off de-emphasis.
60 OUTPUT 714;"SETup:AFANalyzer:EXPandor:STATe OFF" !Turn off the expandor.
70 OUTPUT 714;"SETup:AFANalyzer:DETEctor RMS" !Specify the RMS detector for the
71                                     !audio measurement.
80 OUTPUT 714;"SETup:AFANalyzer:TIMEout 3S" !Set a timeout value of 3 seconds
81                                     !in case the measurement cannot be made.
90 OUTPUT 714;"INITiate:AFANalyzer" !Start the AF Analyzer measurement.
100 OUTPUT 714;"FETCh:AFANalyzer:VOLTage?" !Fetch the Audio Level result.
110 ENTER 714;Audio_level !Enter the returned value into a variable.
120 END
  
```

### Returned Values

The results returned by this program are:

- Integrity returns the measurement integrity indicator (0 means a successful measurement with no errors). See [“Integrity Indicator” on page 121](#).
- Audio\_level returns the analog audio level in volts rms.

## Related Topics

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[“Audio Analyzer Measurement Description” on page 57](#)

[“AFANalyzer Troubleshooting” on page 61](#)

[“INITiate” on page 404](#)

[“SETup:AFANalyzer” on page 428](#)

[“FETCh:AFANalyzer” on page 355](#)

[“Comprehensive Program Example” on page 255](#)

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## Distortion Measurement Description

### How is a Distortion measurement made?

Distortion is an audio quality measurement that compares the audio signal level from the mobile at a specified (desired) frequency to the level of signals present at other frequencies. The audio signals from the mobile are typically demodulated tones sent over an analog voice channel (AVC).

The test set makes two measurements to determine distortion. First, the test set measures the total audio signal level into the Audio Analyzer. Next, a precise notch filter is then used to remove the signal at the specified frequency. The remaining signal level indicates the level of unwanted signals (distortion). Distortion is expressed as a percentage of the total audio signal.

Distortion can be measured in the range of 100 Hz to 10 kHz. For information on using the Audio Analyzer, see [“Audio Analyzer Measurement Description” on page 57](#).

The distortion measurement can be used to perform the audio harmonic distortion test. In this test, two audio signals are used: a 1004 Hz tone and the 6000 Hz SAT. The 1004 Hz tone is notched out to make the measurement. See IS-137A, section 2.2.2.5 for more information.

### Considerations When Making Manual Distortion Measurements

When manually controlling the test set from the front panel, all measurements default to using continuous triggering. If you make digital measurements on a DTC using RF Rise or Protocol triggering, and then hand off to an AVC and select an analog measurement, the analog measurement may not trigger and display a result. This is because the digital measurement is still waiting for a burst transmission to trigger it (which it won't get from an analog signal) and therefore the measurements “freeze”. To prevent this from happening when making analog measurements, either turn off the digital measurements or set their trigger source to Immediate.

### Related Topics

\*\*\*\*\*

[“Audio Analyzer Measurement Description” on page 57](#)

[“AFANalyzer Troubleshooting” on page 61](#)

[“Programming a Distortion Measurement” on page 68](#)

[“Test Adherence to Standards” on page 109](#)

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## Programming a Distortion Measurement

This section provides an example of how to make distortion measurements via GPIB. It is patterned after TIA/EIA IS-137, Audio Harmonic Distortion (section 2.2.2.5).

SINAD and Distortion measurements are affected by the same STATE and INITiate commands, so both measurements are enabled and triggered at the same time. However, measurement results are queried separately. See [“Audio Analyzer Measurement Description” on page 57](#).

The following procedure assumes that the mobile’s audio output is connected to the AUDIO IN connectors and the mobile is on an analog voice channel (AVC). The AVC is being modulated with a 1004 Hz tone at  $\pm 8$  kHz peak deviation, and a 6000 Hz SAT at  $\pm 2$  kHz peak deviation. It is also assumed that the Cell Power from the test set is set to -50 dBm (IS-137 standard).

1. Configure audio analyzer measurement parameters using the SETup subsystem.
2. Start the audio analyzer measurement using the INITiate subsystem.
3. Use the FETCh? subsystem to obtain audio analyzer measurement results.

### Programming Example

```
10 OUTPUT 714;"SETup:AFANalyzer:CONTinuous OFF" !Set the audio analyzer
11                                     !measurements to single trigger mode.
20 OUTPUT 714;"SETup:AFANalyzer:PEAK:VOLTagE 3V" !Set the Expected Amplitude level for
30                                     !audio input voltage in Vpeak.
40 OUTPUT 714;"SETup:AFANalyzer:SDISTortion:STATE ON" !Turn on the SINAD and
50                                     !distortion measurements.
60 OUTPUT 714;"SETup:AFANalyzer:SDISTortion:FREQuency 1004 HZ" !Specify the audio
70                                     !frequency to use for the measurements.
80 OUTPUT 714;"SETup:AFANalyzer:FILTer CMessage" !Select the c-message filter.
90 OUTPUT 714;"SETup:AFANalyzer:DEMPHasis:STATE OFF" !Turn off de-emphasis.
100 OUTPUT 714;"SETup:AFANalyzer:EXPandor:STATE OFF" !Turn off the expandor.
110 OUTPUT 714;"SETup:AFANalyzer:TIMEout 3S" !Set a timeout value of 3 seconds
120                                     !in case the measurement cannot be made.
130 OUTPUT 714;"INITiate:AFANalyzer" !Start the AF Analyzer measurement.
140 OUTPUT 714;"FETCh:AFANalyzer:INTEgrity?" !Query the integrity indicator to
150                                     !verify that a reliable measurement was made.
160 ENTER 714;Integrity !Enter the returned value into a variable for comparison
170                                     !with possible integrity indicator values (not shown here).
180 IF Integrity=0 THEN !Only fetch measurement result if integrity indicator is 0.
190 OUTPUT 714;"FETCh:AFANalyzer:DISToRtion?" ! Fetch the Distortion result.
200 ENTER 714;Distortion !Enter the returned value into a variable.
210 END IF
220 END
230 END
```

## Returned Values

The results returned by this program are:

- `Integrity` returns the measurement integrity indicator; 0 means a successful measurement with no errors. See [“Integrity Indicator” on page 121](#).
- `Distortion` returns the Distortion measurement value in percent (%).

## Related Topics

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[“Audio Analyzer Measurement Description” on page 57](#)

[“AFANalyzer Troubleshooting” on page 61](#)

[“Distortion Measurement Description” on page 67](#)

[“INITiate” on page 404](#)

[“SETup:AFANalyzer” on page 428](#)

[“FETCh:AFANalyzer” on page 355](#)

[“Comprehensive Program Example” on page 255](#)

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## Digital Transmit Power Measurement Description

### How is a Digital Transmit Power measurement made?

Digital Transmit Power measures the mean RF burst power from the mobile when transmitting on a Digital Traffic channel in TDMA mode. Power is measured over 140 consecutive symbols, between symbols 6 and 162 in the burst. Measurements can be made with the mobile in active or test mode. See TIA/EIA IS-137, 3.2.1.2, Digital RF Power Output, and 3.2.2, RF Power Output 1900 MHz Equipment.

The Digital Transmit Power measurement meets or exceeds specifications when the following requirements are met:

### Input Signal Requirements

- Normal, full-rate DTC bursts, with a valid sync word, in the frequency range of 800 MHz to 960 MHz or 1.7 GHz to 2.0 GHz, and within 1 kHz of the expected frequency. Abbreviated slot formats are not supported.
- The signal level into the test set's RF IN/OUT connector must be in the range of -25 dBm to +43 dBm peak, and within 3 dBm of the expected input power.

See [“Active Cell Operating Mode” on page 544](#), [“DTC Test Operating Mode” on page 557](#), and [“Receiver Control” on page 561](#) for information on setting the expected input frequency and power level.

### Trigger Source

Accurate measurements rely on detecting a valid sync word. Use Auto triggering when possible for best results. See [“Triggering of Measurements” on page 145](#).

### Related Topics

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[“Description” on page 599](#)

[“Digital Transmit Power Troubleshooting” on page 73](#)

[“Programming a Digital Transmit Power Measurement” on page 71](#)

[“Test Adherence to Standards” on page 109](#)

[“Triggering of Measurements” on page 145](#)

[“Statistical Measurement Results” on page 133](#)

[“Measurement Timeouts” on page 124](#)

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## Programming a Digital Transmit Power Measurement

This section provides an example of how to make Digital Transmit Power measurements via GPIB.

The following program example assumes that the mobile's antenna output is connected to the RF IN/OUT connector, and the mobile is on a Digital Traffic Channel (DTC). For information on configuring the test set to get the mobile on an DTC, see [“Establishing an Active Link with the Mobile Station” on page 33](#) or [“DTC Test Operating Mode” on page 557](#).

The basic procedure to test Digital Transmit Power is as follows:

1. Enter the expected power level (see [“Expected Power” on page 563](#)).
2. Configure the Digital Transmit Power Setup parameters using the SETup subsystem.
3. Start the Digital Transmit Power measurement using the INITiate subsystem.
4. Use the FETCh? command to obtain the measurement results.

### Programming Example

```
10 !Set the expected power level.
20 OUTPUT 714;"SETup:DTXPower:TRIGger:SOURce AUTO" !Select AUTO trigger mode.
30 OUTPUT 714;"SETup:DTXPower:CONTinuous OFF" !Set the digital transmit power
40                                     !measurement to single trigger mode.
50 OUTPUT 714;"SETup:DTXPower:TIMEout 1S" !Set a timeout value of 1 second
60                                     !in case the measurement cannot be made.
70 OUTPUT 714;"SETup:DTXPower:COUNt:NUMBer 5" !Set mult-measurements to 5.
80 OUTPUT 714;"INITiate:DTXPower" !Start the measurement.
90 OUTPUT 714;"FETCh:DTXPower?" !Query the returned integrity indicator and the
100                                     !Average digital transmit power measurement.
110 ENTER 714;Integrity,Dtxpower !Enter the returned values into variables.
120 IF Integrity=0 THEN !See if the integrity value = 0 (valid measurement).
130 ELSE
140 PRINT "Measurement problem; check for sync not found or over/under range."
150 END IF
160 END
```

### Returned Values

The measurements returned by this program are:

- `Integrity` returns the measurement integrity indicator (see [“Integrity Indicator” on page 121](#)); 0 means a successful measurement with no errors.
- `DTXPower` returns the Average Digital Transmit Power measurement value in dBm.

## Related Topics

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[“Digital Transmit Power Measurement Description” on page 70](#)

[“Digital Transmit Power Troubleshooting” on page 73](#)

[“INITiate” on page 404](#)

[“SETup:DTXPower” on page 443](#)

[“Description” on page 599](#)

[“FETCh:DTXPower” on page 369](#)

[“Comprehensive Program Example” on page 255](#)

[“Receiver Control” on page 561](#)

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## Digital Transmit Power Troubleshooting

### Possible Setup Issues

During remote operation of the Digital Transmit Power measurement, you should configure the Trigger Arm to Single. See [“SETup:DTXPower” on page 443](#). If single triggering is used during manual operation, press the START SINGLE key to trigger each measurement.

The measurement results are altered by the Amplitude Offset value. See [“Description” on page 599](#).

The expected signal amplitude and channel number (or frequency) must be specified for accurate measurements. See [“Active Cell Operating Mode” on page 544](#), [“DTC Test Operating Mode” on page 557](#), and [“Receiver Control” on page 561](#) for information on setting the expected input frequency and power level.

The Trigger Source setting is very important to making accurate measurements. Since a mobile’s signal is bursted when transmitting on a digital traffic channel, triggering must occur while the transmitter is on for proper measurements. The input signal must be a normal, full-rate DTC burst with a valid sync word.

See [“Triggering of Measurements” on page 145](#) for a description of each trigger setting.

Over range and under range conditions may occur when testing a power class 4 mobile at power levels 0 or 1, or when testing a power class 1 mobile at power levels 8, 9, and 10. See [“Cellular Band \(800 MHz\) Mobile Power Class Considerations for Expected Input Level” on page 563](#) for an explanation of why this occurs and what to do about it.

### Interpreting Integrity Indicator values

See [“Integrity Indicator” on page 121](#).

If over range (5) is returned; the input power has exceeded the test set’s internal sampler maximum value by at least 3 dB during some part of the sampling or the input power has exceeded the calibrated range of the test set’s power detector for the expected power setting.

If under range (6) is returned; the Analog 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 (-30 dBm).

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

If Sync Not Found (11) is returned; the SYNC word in the mobile’s TDMA burst could not be found to use as a trigger. Either the transmitter is in an analog mode, and therefore not bursting, or the burst does not contain a valid SYNC word, or a Trigger Delay value has been entered that causes the signal to be sampled during a time when the SYNC word is not present. If Protocol triggering is used for the Trigger Source, the test set will not display a measurement value if the SYNC word is not found. If protocol triggering was used, change the trigger source to Auto (recommended for this measurement).

If Trigger Early or Fall Early (8) is returned; the burst is rising or falling in amplitude before the test set expects it. Try changing the Trigger Delay setting to correct for this timing problem. By using the Trigger Delay, you may be able to change the trigger point until the Digital Transmit Power reading rises to about its maximum expected value; providing a good indication of how late or early the trigger is occurring.

## Digital Modulation Accuracy Measurements Description

### How are Digital Modulation Accuracy measurements made?

The Digital Modulation Accuracy measurements measure modulation characteristics of the mobile's transmitted Pi/4 DQPSK modulated signal and the carrier Frequency Error. These measurements can only be made on normal, full-rate, DTC bursts with a valid sync word. See TIA/EIA IS-137, 3.3.2.1, Modulation Type and Accuracy. These measurements are not used with analog signals.

The following measurements are made for Digital Modulation Accuracy:

- **RMS EVM1** - the RMS Error Vector Magnitude over one burst. EVM is the difference (in percent) between the mobile's transmitted waveform and an ideal waveform. EVM1 is always measured, regardless of the EVM10 measurement state.
- **Origin Offset** - the magnitude of the RF carrier relative to the magnitude of the modulated carrier at the detection point (in dB). It is an indication of the amount of imbalance in the mobile's I/Q modulator.
- **RMS Phase Error** - this is the vector phase difference (in degrees) between the mobile's transmitted waveform and an ideal waveform.
- **RMS Magnitude Error** - this is the vector magnitude difference (in percent) between the mobile's transmitted waveform and an ideal waveform.
- **RMS EVM10** - measures the EVM of the first 10 symbols of 10 bursts. This measurement is only enabled if the EVM 10 Measurement setup parameter is set to On.
- **Frequency Error** - is the difference (in Hz) between the frequency of the received mobile signal and the frequency expected by the test set's base station emulator.

These measurements are not affected by the Amplitude Offset setting.

### Multi-Measurement Count

When the EVM10 measurement is off, the number of bursts measured is one (with multi-measurements off) or is equal to the multi-measurement count specified. If the EVM10 measurement is on, the number of bursts measured is equal to 10 times the multi-measurement count (if specified) or at least 10 bursts. Therefore, using multi-measurements with the EVM10 measurement enabled significantly increases measurement times.

## Related Topics

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[“Programming Digital Modulation Accuracy Measurements” on page 76](#)

[“Digital Modulation Accuracy Troubleshooting” on page 78](#)

[“Test Adherence to Standards” on page 109](#)

[“Triggering of Measurements” on page 145](#)

[“Measurement Timeouts” on page 124](#)

[“Statistical Measurement Results” on page 133](#)

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## Programming Digital Modulation Accuracy Measurements

This section provides an example of how to make Digital Modulation Accuracy measurements via GPIB.

The following program example assumes that the mobile's antenna output is connected to the RF IN/OUT connector, and the mobile is on a Digital Traffic Channel (DTC). For information on configuring the test set to get the mobile on an DTC, see [“Establishing an Active Link with the Mobile Station” on page 33](#).

The basic procedure to test Digital Modulation Accuracy is as follows:

1. Configure the Digital Modulation Accuracy setup parameters using the SETUp subsystem.
2. Start the Digital Modulation Accuracy measurement using the INITiate subsystem.
3. Use the FETCh? command to obtain the measurement results. Measurements can be queried one at a time, in groups (such as all EVM measurements at one time), or as the full set of all Digital Modulation Accuracy measurements at one time. The programming example queries the Frequency Error measurement by itself, and then queries the group of EVM1 measurements.

### Programming Example

```
10 OUTPUT 714;"SETUp:MACCuracy:COUNT:NUMBER 5" !Set multi-measurements to 5.
20 OUTPUT 714;"SETUp:MACCuracy:CONTinuous OFF" !Set the Dig. Mod. Accuracy
30                                     !measurement to single trigger mode.
40 OUTPUT 714;"SETUp:MACCuracy:TRIGger:SOURce AUTO" !Select Auto trigger.
50 OUTPUT 714;"SETUp:MACCuracy:TImeout 5 S" !Set a timeout value of 5 seconds
60                                     !in case the measurement cannot be made.
70 OUTPUT 714;"INITiate:MACCuracy" !Start the measurement.
80 OUTPUT 714;"FETCh:MACCuracy:INTEgrity?" !Query the integrity indicator to
90                                     ! see if valid measurements were made (0 returned = valid measurement).
100 ENTER 714;Integrity !Enter the integrity result into a variable.
110 IF Integrity=0 THEN !Measurement results are valid.
120     OUTPUT 714;"FETCh:MACCuracy:FERRor:MINimum?" !Query freq error measurement
130     ENTER 714;Freq_error !and enter the result into a variable.
140     OUTPUT 714;"FETCh:MACCuracy:EVM1:ALL?" !Query all EVM1 results.
150     ENTER 714;Min_evml,Max_evml,Avg_evml,Std_dev_evml !Enter the 4 EVM1
160                                     !measurements (including multi-measurement values) into variables.
170 ELSE
180 PRINT "Measurement problem; check for sync not found or other trigger problems."
190 END IF
200 END
```

### Returned Values

The measurements returned by this program are:

- Integrity returns the measurement integrity indicator (see [“Integrity Indicator” on page 121](#)); 0 means a successful measurement with no errors.
- Freq\_error returns the Frequency Error result in Hz.
- Min\_evml (minimum EVM1), Max\_evml (maximum EVM1), Avg\_evml (average EVM1), and Std\_dev\_evml (standard deviation for the multi-measurements).

## Related Topics

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[“Digital Modulation Accuracy Measurements Description” on page 74](#)

[“Digital Modulation Accuracy Troubleshooting” on page 78](#)

[“INITiate” on page 404](#)

[“SETup:MACCuracy” on page 467](#)

[“FETCh:MACCuracy” on page 389](#)

[“Comprehensive Program Example” on page 255](#)

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# Digital Modulation Accuracy Troubleshooting

## Possible Setup Issues

During remote operation of the Modulation Accuracy measurements, you should configure the Trigger Arm to Single. See [“SETup:MACCuracy” on page 467](#). If single triggering is used during manual operation, press the START SINGLE key to trigger each measurement.

The input level must be at least -15 dBm to make measurements.

If Modulation Accuracy measurement results are extremely bad (such as EVM1 = 100%), use the Digital Transmit Power measurement (with RF Rise triggering) to verify that the mobile is actually transmitting on a digital traffic channel.

The Trigger Source setting should be set to Auto. Modulation Accuracy measurements must be synchronized to the sync word in the mobile's transmitted burst to be accurate.

See [“Triggering of Measurements” on page 145](#) for a description of each trigger setting.

### If the Frequency Error Value Seems High

If a Modulation Accuracy measurement is made immediately after handing off the DTC to a new channel, the Frequency Error value may be higher than expected. This may be due to the test set making a measurement before the mobile's frequency has fully settled to the new value. This situation can usually be corrected by making the Adjacent Channel Power and/or MAHO measurement(s) before measuring Modulation Accuracy. This gives the mobile additional time to settle before making the Frequency Error measurement.

## Interpreting Integrity Indicator values

See [“Integrity Indicator” on page 121](#).

If over range (5) is returned; the input power has exceeded the test set's internal sampler maximum value by at least 3 dB during some part of the sampling or the input power has exceeded the calibrated range of the test set's power detector for the expected power setting.

If under range (6) is returned; the input power 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 (-30 dBm).

If the signal has both over range and under range conditions, only the over range (5) will be indicated: the test set considers the over range condition more critical than an under range condition.

If Sync Not Found (11) is returned; the SYNC word in the mobile's TDMA burst could not be found to use as a trigger. Either the transmitter is in an analog mode, and therefore not bursting, or the burst does not contain a valid SYNC word, or a Trigger Delay value has been entered that causes the signal to be sampled during a time when the SYNC word is not present. If Protocol triggering is used for the Trigger Source, the test set will not display a measurement value if the SYNC word is not found. If protocol triggering was used, change the trigger source to Auto (recommended for this measurement).

If Trigger Early or Fall Early (8) is returned; the burst is rising or falling in amplitude before the test set expects it. Try changing the Trigger Delay setting to correct for this timing problem. By using the Trigger Delay, you may be able to change the trigger point until the test set's sampler may find the SYNC word and make a good measurement.

## Dynamic Power Measurement Description

### How is a Dynamic Power Measurement Made?

The Dynamic Power measurement performs a series of consecutive 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 a TIA/EIA 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, and so does not return minimum, maximum, and standard deviation values. Instead, you specify the number of bursts that you want to measure using the Number of Bursts parameter (see [“SETup:DPOWer:COUNt:NUMBer\[:SELEcted\]\[:DIGital136\]” on page 439](#)). A single measurement returns the integrity indicator and power level for every burst measured. For example, if you set the number of bursts to 15, the returned comma-separated list contains 15 integrity values followed by 15 corresponding measurement values.

### Types of Signals Dynamic Power can Measure

Dynamic Power measurements can be made on normal (DTC) bursts transmitted twice every TDMA frame. The average power is measured across the useful part of the normal burst (140 symbol periods).

### 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 -30 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 in the range of 800 MHz to 960 MHz or 1.7 GHz to 2.0 GHz.

### Trigger Source

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

## Related Topics

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[“SETup:DPOWer” on page 439](#)

[“FETCh:DPOWer” on page 367](#)

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## Frequency Modulation (FM) Measurement Description

### How is a frequency modulation measurement made?

The Analog Frequency Modulation measurement measures the frequency deviation and, if enabled, the total harmonic distortion and modulation frequency, for frequency modulated analog signals (such as AMPS transmitters). Measurements are performed after any filtering, de-emphasis, and expansion are performed (selected by the user in the setup parameters).

The distortion value is not returned if the Distortion State is set to OFF. The modulation frequency value is not returned if the Modulation Frequency State is set to OFF.

The FM deviation and distortion measurements are not affected by a static (constant) frequency error on the input signal as long as the input signal is within 2.5 kHz of the expected frequency.

This measurement is not used for digital signals.

Refer to IS-137, 3.3.1, for more information on measuring analog modulation characteristics.

### Triggering

Triggering is always immediate for this measurement. Trigger Delay and other trigger sources are not used.

### Considerations When Making Manual FM Measurements

When manually controlling the test set from the front panel, all measurements default to using continuous triggering. If you make digital measurements on a DTC using RF Rise or Protocol triggering, and then hand off to an AVC and select an analog measurement, the analog measurement may not trigger and display a result. This is because the digital measurement is still waiting for a burst transmission to trigger it (which it won't get from an analog signal) and therefore the measurements "freeze". To prevent this from happening when making analog measurements, either turn off the digital measurements or set their trigger source to Immediate.

### Distortion State and Distortion Fundamental Frequency Operation

The Distortion Fundamental Frequency value specifies the demodulated audio frequency to use when making a distortion measurement, and must be entered to make a valid measurement. However, specifying the fundamental frequency does not affect the measurement state. The Distortion State must be turned On separately to make the measurement.

### Modulation Frequency State

The modulation frequency measurement is enabled and disabled using the Mod Freq State setting. The modulation frequency measurement is made after any filtering is applied, and can be used to make measurements such as SAT frequency.

## Filter Type

The following filters are available to make measurements on the demodulated FM (baseband) signal.

- None - no filtering is provided (default).
- 100 Hz BW Band Pass Filter (Tunable) - The 100 Hz BW BPF Center Frequency setting is available when this filter is selected, and can be set in the range of 300 Hz to 15 kHz.
- C-Message
- 50 Hz to 15 kHz
- 300 Hz to 15 kHz

## Detector Type

Select the type of detector to use when making FM deviation measurements: RMS, Peak+, Peak-. The Peak+ and Peak- detectors measure the greatest positive or negative frequency excursion in carrier frequency during the sample. The RMS detector measures the root mean squared value. This setting does not affect the distortion measurement.

## De-emphasis State

Select On or Off to enable or disable (respectively) 750  $\mu$ s de-emphasis.

## Expander State

Select On to compensate for signal compression on the mobile's transmitted signal.

## Related Topics

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[“Programming a Frequency Modulation \(FM\) Measurement” on page 83](#)

[“Frequency Modulation \(FM\) Troubleshooting” on page 85](#)

[“Statistical Measurement Results” on page 133](#)

[“Measurement Timeouts” on page 124](#)

[“Triggering of Measurements” on page 145](#)

[“Test Adherence to Standards” on page 109](#)

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## Programming a Frequency Modulation (FM) Measurement

This section provides an example of how to make analog FM deviation and distortion measurements via GPIB.

The following program example assumes that the mobile's antenna output is connected to the RF IN/OUT connector, and the mobile is on an analog voice channel (AVC). For information on configuring the test set to get the mobile on an active call, see [“Establishing an Active Link with the Mobile Station” on page 33](#).

The test set uses the AVC Channel (CALL:SET:AVC) and MS TX Level (CALL:SET:MS:ANALog:TXLevel) settings of the base station emulator for the expected frequency and power level. To manually set the expected frequency and power, see [“Receiver Control” on page 561](#).

The basic procedure to test Frequency Stability is as follows:

1. Enter the expected frequency and power.
2. Define the Frequency Modulation SETup parameters as desired to enable the distortion measurement and set its fundamental frequency, and to define other settings such as measurement timeout and multi-measurements.
3. Use the INITiate:FM command to start the measurement.
4. Use the FETCh? command to obtain the measurement results.

### Programming Example

```
10 !Set the expected frequency and power.
20 OUTPUT 714;"SETup:FM:COUNt 5" !Set multi-measurements to 5.
30 OUTPUT 714;"SETup:FM:DISToRtion:STATe ON" !Enable the distortion measurement.
40 OUTPUT 714;"SETup:FM:DISToRtion:FREQuency 1004 HZ" !Set the distortion measurement
50                                     !Fundamental Frequency (1004 HZ).
60 OUTPUT 714;"SETup:FM:FREQ:STATe ON" !Turn on the modulation frequency measurement.
70 OUTPUT 714;"SETup:FM:FILTEr CMESsage" !Select the C-Message filter.
80 OUTPUT 714;"SETup:FM:DETEctor PPEak" !Select the Peak + detector.
90 OUTPUT 714;"SETup:FM:DEMPhasis:STATe OFF" !Make sure de-emphasis is off.
100 OUTPUT 714;"SETup:FM:EXPandor:STATe OFF" !Make sure the expandor is off.
110 OUTPUT 714;"SETup:FM:CONTinuous OFF" !Set the FM measurement to single trigger mode.
120 OUTPUT 714;"SETup:FM:TIMEout 1 S" !Set a timeout value of 1 second
130                                     !in case the measurement cannot be made.
140 OUTPUT 714;"INITiate:FM" !Start the measurement.
150 OUTPUT 714;"FETCh:FM?" !Query the returned integrity indicator and the
160     !average FM deviation and average FM distortion results.
170 ENTER 714;Integrity,Fm_dev,Fm_dist,Fm_freq !Enter the returned values into variables.
180 IF Integrity=0 THEN !See if the integrity value = 0 (valid measurement).
190 ELSE
200 PRINT "Measurement problem; check for signal level over/under range condition."
210 END IF
220 END
```

## Returned Values

The measurements returned by this program are:

- `Integrity` returns the measurement integrity indicator (see [“Integrity Indicator” on page 121](#)); 0 means a successful measurement with no errors.
- `FM_dev` returns the average FM deviation in kHz. `FM_dist` returns the average FM distortion in percent (%). `FM_freq` returns the average modulation frequency in Hz.

## Related Topics

\*\*\*\*\*

[“Frequency Modulation \(FM\) Measurement Description” on page 81](#)

[“Frequency Modulation \(FM\) Troubleshooting” on page 85](#)

[“INITiate” on page 404](#)

[“SETup:FM” on page 447](#)

[“FETCh:FM” on page 372](#)

[“Comprehensive Program Example” on page 255](#)

[“Receiver Control” on page 561](#)

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# Frequency Modulation (FM) Troubleshooting

## Possible Setup Issues

The Trigger Arm should always be set to Single for GPIB operation (not Continuous).

If digital measurements are active, turn them off or set their trigger source to Immediate. See [“Measurement States” on page 147](#).

The distortion measurement is only returned if it has been enabled (SET:FM:DIST:STAT ON), otherwise the value 9.91E+37 is returned, signifying that a valid measurement was not made.

Distortion measurements require that the Distortion Fundamental Frequency to be specified (SET:FM:DIST:FREQ <value in Hz>).

The modulation frequency measurement is only returned if it has been enabled (SET:FM:FREQ:STAT ON), otherwise the value 9.91E+37 is returned, signifying that a valid measurement was not made.

Both FM distortion and audio distortion measurements are available in the test set. Make sure you are querying the FM Distortion measurement (FETCh:FM:DIST?) in your program and *not* the audio distortion measurement (FETCh:AFAN:DIST?) when making an FM distortion measurement.

Be sure to use the type of detector specified for deviation measurements in the applicable standard. For example, if the measurement specification is for *peak* deviation, be sure to use the Peak+ or Peak- detector instead of the RMS detector. If the signal being measured is noisy, you can use the RMS detector to make a more stable measurement and then multiply the result by 1.414 to arrive at the peak value.

All measurements are performed after any filtering, de-emphasis, and expansion are performed. When measuring SAT deviation and frequency, the Filter Type should normally be set to 100 Hz BW BPF and the 100 Hz BW BPF Center Frequency should be set to the SAT frequency. The C-message filter is often used for measurements made on signals with FM rates in the normal voice frequency range (such as the 1004 Hz tone used for distortion measurements).

This measurement can only be used for analog signals, such as an analog voice channel (AVC). You cannot use this measurement when the mobile is on a digital traffic channel (DTC).

The expected signal frequency (or AVC channel number) and input level must be specified in your program for accurate measurements. This is done either through the base station emulator settings, when the mobile is first put on an AVC, or by manually controlling the test set's measurement receiver. See [“Active Cell Operating Mode” on page 544](#), [“AVC Test Operating Mode” on page 548](#), and [“Receiver Control” on page 561](#) for information on setting the expected input frequency.

To meet performance specifications, the input signal must be in the frequency range of 800 MHz to 960 MHz or 1.70 GHz to 2.0 GHz, and be within 2.5 kHz of the expected input frequency, at a power level (at the RF IN/OUT connector) of -15 dBm to +40 dBm. The specified FM deviation range is 0 Hz to 16 kHz, at a modulation rate of 100 Hz to 15 kHz. FM Distortion is specified over the modulation rate range of 100 Hz to 10 kHz.

The trigger source is always immediate for this measurement. No trigger delay or protocol triggering is used.

## Interpreting Integrity Indicator values

See [“Integrity Indicator” on page 121](#).

If over range (5) is returned; the input power has exceeded the test set’s internal sampler maximum value by at least 6 dB during some part of the sampling or the input power has exceeded the calibrated range of the test set’s power detector for the expected power setting.

If under range (6) is returned; the measured input power is more than 20 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 (-30 dBm). If the expected input power setting is correctly set for the signal level into the test set, an under range condition can still occur if the receiver has not been tuned to the signal’s frequency.

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

# Frequency Stability Measurement Description

## How is a frequency stability measurement made?

The Analog Frequency Stability measurement measures the transmitter frequency and frequency error of analog signals (including AMPS) with a 1 Hz resolution. Frequency Error is derived by comparing the frequency of the measured signal to the expected frequency (as determined by the base station emulator or manual receiver control settings). Measurements can be made with the mobile in test mode or on an active AVC (Analog Voice Channel), and with or without SAT and/or other frequency modulation. The received signal's frequency must be within 200 kHz of the expected frequency to make this measurement.

This measurement is not used for digital signals.

Refer to IS-137, 3.1.1.2, for more information.

## Worst Case Frequency Error

Frequency and Frequency Error measurement results are returned over GPIB in units of Hz. Worst Case Frequency Error, the greatest error measured during the total sample(s), is returned in units of ppm (parts per million). Worst Case Frequency error is only displayed on the test set's display when multi-measurements are used, but is always available via GPIB (regardless of the multi-measurement state).

## Triggering

Triggering is always immediate for this measurement. Trigger Delay and other trigger sources are not used.

## Considerations When Making Manual Frequency Stability Measurements

When manually controlling the test set from the front panel, all measurements default to using continuous triggering. If you make digital measurements on a DTC using RF Rise or Protocol triggering, and then hand off to an AVC and select an analog measurement, the analog measurement may not trigger and display a result. This is because the digital measurement is still waiting for a burst transmission to trigger it (which it won't get from an analog signal) and therefore the measurements "freeze". To prevent this from happening when making analog measurements, either turn off the digital measurements or set their trigger source to Immediate.

## Related Topics

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["Programming a Frequency Stability Measurement" on page 88](#)

["Frequency Stability Troubleshooting" on page 90](#)

["Statistical Measurement Results" on page 133](#)

["Measurement Timeouts" on page 124](#)

["Test Adherence to Standards" on page 109](#)

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## Programming a Frequency Stability Measurement

This section provides an example of how to make analog Frequency Stability measurements via GPIB.

The following program example assumes that the mobile's antenna output is connected to the RF IN/OUT connector, and the mobile is on an analog voice channel (AVC). For information on configuring the test set to get the mobile on an active call, see [“Establishing an Active Link with the Mobile Station” on page 33](#).

The test set uses the AVC Channel (CALL:SET:AVC) and MS TX Level (CALL:SET:MS:ANALog:TXLevel) settings of the base station emulator for the expected frequency and power level. To manually set the expected frequency and power, see [“Receiver Control” on page 561](#).

The basic procedure to test Frequency Stability is as follows:

1. Enter the expected frequency and power.
2. Define the Frequency Stability Setup parameters as desired for measurement timeout and multi-measurements.
3. Use the INITiate:FSTability command to start the measurement.
4. Use the FETCh? command to obtain the measurement results.

### Programming Example

```
10 !Set the expected frequency and power.
20 OUTPUT 714;"SETup:FSTability:CONTinuous OFF" !Set the frequency stability
30                                     !measurement to single trigger mode.
40 OUTPUT 714;"SETup:FSTability:TIMEout 1 S" !Set a timeout value of 1 second
50                                     !in case the measurement cannot be made.
60 OUTPUT 714;"SETup:FSTability:COUNt 5" !Set multi-measurements to 5.
70 OUTPUT 714;"INITiate:FSTability" !Start the measurement.
80 OUTPUT 714;"FETCh:FSTability?" !Query the returned integrity indicator and the
90                                     !Worst Case Frequency Error and average Frequency measurements.
100 ENTER 714;Integrity,Freq_error,Frequency !Enter the returned values into variables.
110 IF Integrity=0 THEN !See if the integrity value = 0 (valid measurement).
120 ELSE
130 PRINT "Measurement problem; check for signal level over/under range condition."
140 END IF
150 END
```

### Returned Values

The measurements returned by this program are:

- `Integrity` returns the measurement integrity indicator (see [“Integrity Indicator” on page 121](#)); 0 means a successful measurement with no errors.
- `Freq_error` returns the worst case frequency error in parts per million (PPM). `Frequency` returns the average frequency.



## Related Topics

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[“Frequency Stability Measurement Description” on page 87](#)

[“Frequency Stability Troubleshooting” on page 90](#)

[“INITiate” on page 404](#)

[“SETup:FSTability” on page 453](#)

[“FETCh:FSTability” on page 378](#)

[“Comprehensive Program Example” on page 255](#)

[“Receiver Control” on page 561](#)

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# Frequency Stability Troubleshooting

## Possible Setup Issues

The Trigger Arm should always be set to Single for GPIB operation (not Continuous).

If digital measurements are active, turn them off or set their trigger source to Immediate. See [“Measurement States” on page 147](#).

This measurement can only be used for analog signals, such as an analog voice channel (AVC). Frequency modulation, such as SAT or other FM signals, can be present. However, you cannot use this measurement when the mobile is on a digital traffic channel (DTC).

The expected signal frequency (or AVC channel number) and input level must be specified in your program for accurate measurements. This is done either through the base station emulator settings, when the mobile is first put on an AVC, or by manually controlling the test set's measurement receiver. See [“Active Cell Operating Mode” on page 544](#), [“AVC Test Operating Mode” on page 548](#), and [“Receiver Control” on page 561](#) for information on setting the expected input frequency.

To meet performance specifications, the signal must be in the frequency range of 800 MHz to 960 MHz or 1.70 GHz to 2.0 GHz, and frequency modulated signals must have a modulation index of no more than 3 and an FM rate of 100 Hz to 15 kHz. No amplitude modulation (AM) may be present. Also, the signal level must be within 3 dB of the expected input level.

The signal's frequency must be within 200 kHz of the expected frequency for the test set to make the frequency stability measurement.

The trigger source is always immediate for this measurement. No trigger delay or protocol triggering is used.

## Interpreting Integrity Indicator values

See [“Integrity Indicator” on page 121](#).

If over range (5) is returned; the input power has exceeded the test set's internal sampler maximum value by at least 6 dB during some part of the sampling or the input power has exceeded the calibrated range of the test set's power detector for the expected power setting.

If under range (6) is returned; the measured input power is more than 20 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 (-30 dBm). If the expected input power setting is correctly set for the signal level into the test set, an under range condition can still occur if the receiver has not been tuned to the signal's frequency.

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

## IQ Tuning Measurement Description

### How is an IQ Tuning Measurement Made?

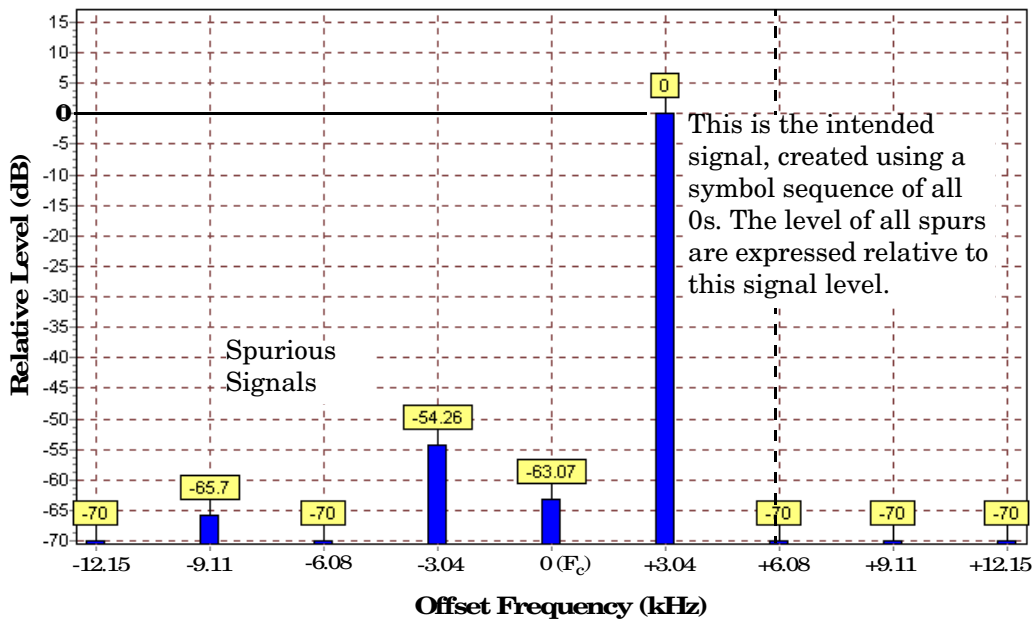
The IQ Tuning measurement looks at spurious signals that may be present because of an unbalanced IQ modulator in the mobile's transmitter. The measurement is normally performed with the mobile station in test mode and sending a repeating sequence of symbols (such as 00,00,00,00,00..., or 10,10,10,10...) into the mobile's Pi/4 DQPSK modulator. The 00 symbol causes the transmitted frequency to go up by 3.0375 kHz, and the 10 pattern causes the frequency to go down by 3.0375 kHz. The mobile can be transmitting either a bursted signal or a continuous wave signal.

I/Q Tuning is not a TIA/EIA specified measurement.

The accuracy of the mobile's I/Q modulator is determined by measuring the level of spurious signals relative to the level of the intended signal (the intended signal is the carrier frequency ( $F_c$ ) +/- 3.0375 kHz). The spurious signals normally measured are the carrier frequency and up to three other user-selectable offset frequencies. The user-selectable frequencies are typically set to  $F_c +/- n*3.0375$  kHz ( $n=1,2,3,...8$ ), but can be set to any value in the range of -16.00 kHz to +16.00 kHz. The returned power values at these frequencies are relative to the power of the intended frequency (in dB). These signals are measured at the RF IN/OUT port. The figure below illustrates a spectrum caused by a symbol sequence of repeating 00s.

The I/Q Tuning measurement also allows you to make an additional relative power measurement in the range of -15.0 MHz to -1.0 MHz and +1.0 MHz to +15.0 MHz relative to the carrier frequency (not shown in Figure 2.)

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



## Types of Signals IQ Tuning can Measure

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

- Normal DTC bursts (without SYNC, SACCH, and CDVCC). The burst must conform to the burst specification in TIA/EIA 136.2, Section 2.1.2.1.2. The frame repetition rate must be no greater than 25 Hz. The burst length must be at least 140 symbols (excluding guard and ramp symbols). Variations on burst modulation, such as higher repetition rates or unusual burst lengths, will produce unreliable results.
- Non-bursted Pi/4 DQPSK modulated signals.
- CW signal (not bursted or modulated)

## IQ 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 of the expected input level.<sup>1</sup>
- Input signal must be within 200 Hz of the expected frequency to meet specified performance.

## Setup Parameters

### IQ Tuning Offset Frequencies

These four settings, IQ Tuning Offset 1 through IQ Tuning Offset 4, define the frequency offsets from the carrier frequency where you want to make spur level measurements. IQ Tuning Offset 1 is typically left at its default value of 0.000 Hz, which measures the relative power at the carrier frequency. IQ Tuning Offsets 2,3, and 4 are typically set to intervals of +/-3.0375 kHz above and below the carrier frequency to measure the relative power at those offsets.

### 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.

---

1. This measurement is designed to operate if the input signal is within +3 dB to -10 dB of the expected input level, but performance is only specified for operating at +/- 3dB of the expected input level.

**Reference Offset Frequency**

This is the frequency offset from the carrier frequency ( $F_c$ ) that is used as the reference for spur level measurements. This value usually corresponds to the frequency change expected when transmitting the repeating symbols.

For example, the default of +3.0375 kHz indicates that the repeating symbols into the mobile’s IQ modulator are expected to cause a frequency change in the carrier of +3.0375 kHz. The test set uses the level measured at the resulting frequency ( $F_c + 3.0375$  kHz) as the reference for all spurious signal level measurements. See Figure 2. on page 91.

**Spur Measurement Frequency**

This is the carrier frequency offset used to make a spur measurement at a frequency that is not spaced an interval of +/- 3.0375 kHz from the carrier (such as 10 MHz).

**Trigger Source**

The trigger source depends on the type of input signal.

**Recommended Trigger Source Settings**

Input Signal Type	Recommended Trigger Source
Normal DTC bursts (without SYNC, SACCH, and CDVCC)	RF Rise <sup>a</sup>
Non bursted Pi/4 DQPSK modulated and CW signals	Immediate <sup>b</sup>

- a. If the input signal is > 10dB below the expected input level, or is below -30 dBm, there may not be enough power to cause an RF Rise trigger.
- b. Using RF Rise triggering will cause the measurement to wait indefinitely, or cause a time-out (if time-outs have been enabled). Always use Immediate triggering for these signal types.

**Related Topics**

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[“Programming an IQ Tuning Measurement” on page 94](#)

[“IQ Tuning Troubleshooting” on page 96](#)

[“Statistical Measurement Results” on page 133](#)

[“Measurement Timeouts” on page 124](#)

[“Triggering of Measurements” on page 145](#)

[“Test Adherence to Standards” on page 109](#)

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## Programming an IQ 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 00s or 01s.
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 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 DTC 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  OUTPUT 714;"SETup:IQTuning:COUNT 5" !Enable multi-measurements to use 5
20      !samples for each returned IQ offset and spur measurement.
30  OUTPUT 714;"SETup:IQTuning:CONTinuous OFF" !Select single trigger mode.
40  OUTPUT 714;"SETup:IQTuning:TRIGger:SOURce RISE" !Select RF Rise trigger. If
50      !you are not measuring a bursted signal, set this to IMMEDIATE instead.
60  OUTPUT 714;"SETup:IQTuning:REFerence:FREQuency 3.0375 KHZ" ! Set the Reference
70      !Offset Frequency to +3.0375 kHz.
80  OUTPUT 714;"SETup:IQTuning:SPUR:STATE ON" !Enable the Spur power measurement.
90  OUTPUT 714;"SETup:IQTuning:SPUR:FREQuency 10 MHz" !Specify the frequency
100      !for the spur power measurement.
110 OUTPUT 714;"SETup:IQTuning:OFFset 0Hz,-3.0375KHZ, 9.113KHZ,-9.113KHZ" !Set the
120 !IQ tuning offset frequencies using a comma-separated list for offsets 1 to 4.
130 OUTPUT 714;"INITiate:IQTuning" !Start IQ offset and spur power measurement.
140 OUTPUT 714;"FETCh:IQTuning?" !Query the IQ Tuning measurement.
150 ENTER 714;Iq_integ,Offset_1,Offset_2,Offset_3,Offset_4 !Enter the returned
160 !measurement integrity indicator value and offset levels measurments into variables.
170 OUTPUT 714;"FETCh:IQTuning:SPUR:POWER?" !Query the spur power measurement.
180 ENTER 714;Spur_power !Enter the Spur Power measurement result into a variable.
190 IF Iq_integ<>0 THEN !Check to verify a valid measurement was made.
200 PRINT "Measurement Error" !Integrity is not zero (0) = measurement error.
210 END IF
220 END
```

## Returned Values

The measurements returned by this program are:

- `Iq_integ` returns the measurement [“Integrity Indicator” on page 121](#) (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  $F_c + 3.0375$  kHz for all 00s or  $F_c - 3.0375$  kHz for all 01s). Note, if the TX I/Q Tuning measurement multi-measurements are set to ON the average of all the individual results at the following offsets are returned:
  - -3.0375 kHz
  - -9.113 kHz
  - 0 Hz (Carrier Frequency)
  - +9.113 kHz

## Related Topics

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[“IQ Tuning Measurement Description” on page 91](#)

[“IQ Tuning Troubleshooting” on page 96](#)

[“SETup:IQTuning” on page 457](#)

[“INITiate” on page 404](#)

[“FETCh:IQTuning” on page 383](#)

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## **IQ Tuning Troubleshooting**

### **Possible Setup Issues**

If no measurements are returned after using the INITiate and FETCh (or READ) commands, and the measurement times out (if a time-out has been set), the measurement is probably not being triggered. This happens if the mobile's signal is not bursted but the trigger source is set to RF Rise. Change the trigger to IMMEDIATE or change the mobile's output to be a bursted signal.

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 or the Reference Offset Frequency is incorrect.

- The carrier frequency is normally derived from the current DTC Channel number, but can also be set using manual receiver control and specifying the Measurement Frequency. See [“Receiver Control” on page 561](#) for information on automatic and manual receiver control.
- The Reference Offset Frequency determines the frequency used as the reference for all of the IQ Tuning power measurements. If the incorrect reference offset frequency is used, all power measurements will be incorrect. See [“Reference Offset Frequency” on page 93](#).

The expected input level must be specified to make accurate measurements. The expected input level is normally derived from the MS TX Level setting, but can also be set using manual receiver control and specifying the level. See [“Expected Power” on page 563](#) for information on automatic and manual receiver control.

Invalid measurements may be also be caused by modulation data other than all 01 or all 00 symbols, for example, it may be that a synch word is being transmitted.

### **Interpreting Integrity Indicator Values**

See [“Integrity Indicator” on page 121](#).



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## Loopback Bit Error Ratio Measurement Description

### How is a Loopback Bit Error Ratio (LBER) measurement made?

Loopback BER sends digital data on the forward DTC to a mobile (in loopback mode) that echoes the data back to the test set on the reverse DTC. The test set compares the data received on the reverse DTC to the data sent on the forward DTC. The measurement result is the ratio of the number of bit errors in the returned signal to the number of bits sent, expressed as a percentage.

This measurement can only be made on a mobile station in digital loopback mode on a digital traffic channel (DTC) transmitting full-length DTC bursts and synchronized to the test set's base station emulator in DTC Test operating mode. See [“DTC Test Operating Mode” on page 557](#).

By varying the cell power level into the mobile station, the sensitivity of the mobile's receiver can be determined. Refer to IS-137, section 2.3.2.1, Receiver Signal Level Range Capability (static testing portion) for more information on this test.

The number of bits to test is selectable by the user, in the range of 1,000 to 999,000 bits. The actual number of bits tested is a multiple of 260, the number of bits in a complete burst. If the specified number of bits to count is reached before the end of burst, the count is continued until the number of bits tested reaches the next multiple of 260. For example, if you specify the number of bits to test of 2400, the test set will actually test 2600 bits (since it is an even multiple of 260), and will return '2600' when queried.

The greater the number of bits to test, the longer the measurement takes to complete. Measurement progress is displayed as the number of bits counted over the number of bits to test (such as 10140/30000). Both the number of bits to test and the number of bit errors can be queried. Be sure to set a measurement time-out value large enough for the number of bits to test so the measurement doesn't time-out before all of the bits are checked.

The trigger source is not selectable. Multi-measurements are not available for this measurement.

### Related Topics

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[“Programming a Loopback Bit Error Ratio \(BER\) Measurement” on page 98](#)

[“Loopback Bit Error Ratio \(BER\) Troubleshooting” on page 100](#)

[“Measurement Timeouts” on page 124](#)

[“Test Adherence to Standards” on page 109](#)

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## Programming a Loopback Bit Error Ratio (BER) Measurement

This section provides an example of how to make Loopback BER measurements via GPIB.

The following program example assumes that the mobile's antenna output is connected to the RF IN/OUT connector, and the mobile is on a Digital Traffic Channel (DTC) in loopback mode and synchronized to the test set. When correctly configured, the mobile's DTC Channel number and output power level match the test set's DTC Channel and MS TX Level settings for DTC test mode.

For information on configuring the test set to get the mobile on an DTC in test mode, see [“DTC Test Operating Mode” on page 557](#).

The basic procedure to test Loopback BER is as follows:

1. Put the mobile in digital loopback mode, synchronizing it to the test set in DTC Test mode.
2. Configure the Loopback BER Setup parameters using the SETup subsystem.
3. Start the Loopback BER measurement using the INITiate subsystem.
4. Use the FETCh? command to obtain the measurement results. The measurement integrity value, number of bits to test, bit error ratio, and the number of bit errors are all available results. The following program example queries the measurement integrity value and bit error ratio result.

### Programming Example

```
10 !Select DTC Test Operating Mode and put the mobile on a DTC in digital loopback mode.
20 OUTPUT 714;"SETup:LBError:COUNT 2600" !Set number of bits to test to 2600.
30 OUTPUT 714;"SETup:LBError:CONTinuous OFF" !Select single trigger mode for
40                                     !the loopback BER measurement.
50 OUTPUT 714;"SETup:LBError:TIMEout 5 S" !Turn on measurement timeout
60                                     !and set a value of 5 seconds in case the measurement cannot be made.
70 OUTPUT 714;"INITiate:LBError" !Start the measurement.
80 OUTPUT 714;"FETCh:LBError:INTegrity?;RATio?" !Query the integrity indicator
90                                     !and bit error ratio.
100 ENTER 714;Integrity,Ber_ratio !Enter the returned integrity and bit error
110                                     !ratio results into variables.
120 IF Integrity=0 THEN !Measurement results are valid.
130 ELSE
140 PRINT "Measurement problem; the mobile must be in TDMA loopback test mode, and"
150 PRINT "the test set must be in DTC Test Operating Mode, to make this measurement."
160 END IF
170 END
```

### Returned Values

The results returned by this program are:

- **Integrity** returns the measurement integrity indicator (see [“Integrity Indicator” on page 121](#)); 0 means a successful measurement with no errors.
- **Ber\_Ratio** is the bit error ratio, expressed as a percent.

**Related Topics**

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[“Loopback Bit Error Ratio Measurement Description” on page 97](#)

[“Loopback Bit Error Ratio \(BER\) Troubleshooting” on page 100](#)

[“INITiate” on page 404](#)

[“FETCh:LBError” on page 386](#)

[“SETup:LBError” on page 464](#)

[“Comprehensive Program Example” on page 255](#)

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## Loopback Bit Error Ratio (BER) Troubleshooting

### Possible Setup Issues

During remote operation of the Loopback BER measurement, you should configure the Trigger Arm to Single. See [“SETup:LBError” on page 464](#). If single triggering is used during manual operation, press the START SINGLE key to trigger each measurement.

The measurement results are affected by the Amplitude Offset value, especially when testing at very low signal levels (such as -110 dBm). See [“Description” on page 599](#).

The Loopback BER measurement can only be made when the mobile is in digital loopback mode and is transmitting on a DTC that is synchronized with the test set in DTC Test operating mode. If this measurement is initiated with the test set in any other operating mode, the returned Bit Error Ratio result is 9.91+E37 (Not A Number), and the integrity indicator is 11 (Sync Not Found). Because the DTC Test operating mode has no provision for overhead signaling to put the mobile on a DTC, getting the mobile into loopback test mode and synchronizing it to the test set is the user’s responsibility.

The expected signal amplitude and channel number (or frequency) must be specified for accurate measurements. See [“DTC Test Operating Mode” on page 557](#), and [“Receiver Control” on page 561](#) for information on setting the expected input frequency and power level.

### Interpreting Integrity Indicator values

See [“Integrity Indicator” on page 121](#).

If over range (5) is returned; the input power has exceeded the test set’s internal sampler maximum value by at least 3 dB during some part of the sampling or the input power has exceeded the calibrated range of the test set’s power detector for the expected power setting.

If under range (6) is returned; the input power 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 (-30 dBm at the RF IN/OUT connector).

If Sync Not Found (11) is returned; the test set cannot synchronize to the mobile. This occurs if the test set is set to any operating mode other than DTC Test, if the mobile is not transmitting, or if the mobile is transmitting on a DTC but has not been synchronized to the test set.

## MAHO BER/RSSI Measurement Description

### How is a Mobile Assisted HandOff (MAHO) BER/RSSI measurement made?

Mobile Assisted Handoff (MAHO) bit error ratio (BER) is the number of error bits received by the mobile compared to the number of correct bits, expressed as a percentage. It is calculated by the mobile by monitoring the correctness of the data into its channel decoder on the current forward digital traffic channel (DTC).

MAHO BER is reported back to the base station (on the reverse DTC) and the mobile switching center to help determine when a handoff to another cell site should happen. In this case the forward DTC is generated by the test set during an active call, and the MAHO BER measurement is reported to the test set on its reverse DTC.

Using the DTC Induced Err function, the test set creates the forward DTC with a user-specified percentage of bit errors to test the mobile's ability to correctly measure the BER.

The received signal strength indicator (RSSI) is a measurement of the received DTC signal strength at the mobile. Like the MAHO BER measurement, it is reported back to the base station and mobile switching center to help determine when a handoff to another cell site should happen.

The RSSI for neighboring cell channels can also be measured by specifying the neighboring cell band and channel number. This helps the MSC determine which cell, band, and channel number to hand the mobile off to when the MAHO BER and RSSI values indicate that a handoff is needed.

Because MAHO BER and RSSI values use signaling over the Slow Associated Control Channel (SACCH) to report back to the test set, these measurements can only be made on a DTC while using the Active Cell operating mode.

### Querying Last and New Measurements

When the test set first sends a command to the mobile to make a MAHO measurement, the mobile requires a minimum of 1.28 seconds to respond. This is due solely to the requirements of the AMPS/136 protocol in the mobile requiring that the measurement to be made over 40 frames (1 second) plus the 12 timeslots needed to transmit the values to the test set. Once a measurement has been made and is reported back to the test set, the measurement value in the test set remains the same until a new measurement is made.

If you change the level into the mobile to affect the MAHO values, but do not allow the mobile the full time needed to make the new measurement and report the new results before querying the measurement, the returned measurement will be inaccurate. This is because the previous measurement remains in the test set and is immediately returned until a new measurement is made, or because a new measurement started but some of the frames were measured at the old level and some of the frames were measured at the new level.

To help prevent measurement errors, two types of queries are provided to make sure you are querying the correct measurement.

- `CALL:MS:REPorted:MAHO:<BERR | RSSI>[:LAST]?` - returns the last BER or RSSI measurement made. The measurement result is returned immediately. Use this syntax when you know the mobile has had time to report a valid new measurement before querying the result.
- `CALL:MS:REPorted:MAHO:<BERR | RSSI>:NEW?` - clears the past measurement value and waits for another measurement to be made. The measurement value is not returned until a completely new measurement is made (requiring at least 1.28 seconds). Use this syntax when you change signal conditions into the mobile and immediately query the results.

To make sure the values returned by the `NEW?` syntax reflect fully settled measurements from the mobile, you should discard the first queried results and query the results again for the final values.

### MAHO BER Reported Values

The mobile does not report an exact bit error ratio measurement (such as 1.54%) back to the test set. Instead, the value reported back to the base station indicates which of eight measurement intervals the measurement value falls into. This value is returned via GPIB as a corresponding interval number (such as BERI5 for interval number 5). The table below describes the mobile reported BER intervals and the test set's returned values. Refer to IS-137, section 2.3.2.5, Mobile Assisted Handoff/Mobile Assisted Channel Allocation Bit Error Rate for additional information.

Mobile Returned BER Interval (%)	GPIB Returned Value (string)
less than 0.01	BERI0
0.01 to less than 0.1	BERI1
0.1 to less than 0.5	BERI2
0.5 to less than 1.0	BERI3
1.0 to less than 2.0	BERI4
2.0 to less than 4.0	BERI5
4.0 to less than 8.0	BERI6
greater than 8.0	BERI7

### Related Topics

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[“Programming a MAHO BER/RSSI Measurement” on page 103](#)

[“MAHO BER/RSSI Troubleshooting” on page 105](#)

[“Test Adherence to Standards” on page 109](#)

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## Programming a MAHO BER/RSSI Measurement

This section provides an example of how to make Mobile Assisted HandOff (MAHO) Bit Error Ratio (BER) and Received Signal Strength Indicator (RSSI) measurements.

The following program assumes the mobile's antenna port is connected to the test set's RF IN/OUT connector, and the mobile is on a Digital Traffic Channel (DTC) with the test set in Active Cell operating mode. For information on getting the mobile on a DTC, see ["Establishing an Active Link with the Mobile Station" on page 33](#).

The basic procedure to test MAHO BER is as follows:

1. Get the mobile on a DTC in Active Cell operating mode.
2. Enable MAHO measurements.
3. Specify the percentage of induced errors on the DTC.
4. Set up the neighbor list for making neighbor RSSI measurements.
5. Query the BER and RSSI results. If you have just changed the signal level into the mobile before querying the results, you should query the results twice; discarding the first result and re-querying the results to make sure the returned measurements are stable. (See the program example below.)

### Programming Example

```

10 !Get the mobile on a DTC in Active Cell operating mode.
20 OUTPUT 714;"CALL:MS:REPorted:MAHO:STATe ON" !Enable MAHO reporting.
30 OUTPUT 714;"CALL:DTC:IBERror 7" !Enable DTC Induced Errors and
40         !set the value to create an induced BER of 7%.
50 OUTPUT 714;"CALL:POWer -60 DBM" !Set the power into the mobile to -60 dBm.
60 OUTPUT 714;"CALL:MS:REPorted:MAHO:NEIGHbor:COUNt 6" !Enable neighbor
70         !RSSI measurements for six neighbor cell channels.
80 OUTPUT 714;"CALL:MS:REPorted:MAHO:NEIGHbor:BAND 1,1,1,1,1,1" !Specify
90         !the Cellular band for each of the neighbor cell measurements.
100 OUTPUT 714;"CALL:MS:REPorted:MAHO:NEIGHbor:CHANnel 298,299,301,302,331,300"
110         !Specify the neighbor cell channel numbers for making the
120         !neighbor RSSI measurements.
130 OUTPUT 714;"CALL:MS:REPorted:MAHO:BERRor:NEW?" !Start a new BER
140         !and RSSI measurement and query the BER result.
150 ENTER 714;Discard !Throw away the first BER (and RSSI) measurements.
160 OUTPUT 714;"CALL:MS:REPorted:MAHO:BERRor:NEW?" !Start the second BER and
170         !RSSI measurements to make sure the mobile returns settled values.
180 ENTER 714;Maho_ber$ !Enter the new returned BER value into a variable.
190 OUTPUT 714;"CALL:MS:REPorted:MAHO:RSSI?" !Query the RSSI result.
200 ENTER 714;Maho_rssi !Enter the returned RSSI value into a variable.
210 OPTION BASE 1 !Set the index for the following array to one (instead of zero).
220 DIM Neighbors(18) !Create an array to contain neighbor RSSI results (18 values).
230 OUTPUT 714;"CALL:MS:REPorted:MAHO:NEIGHbor:LIST:ALL:NEW?" !Start and
240         !query a new set of neighbor RSSI measurements.
250 ENTER 714;Neighbors(*) !Enter all neighbor RSSI results into the variable.
260 PRINT "Reported MAHO interval is ";Maho_ber$
270 PRINT "Cell #1 Band ";Neighbors(1) !Returned 1=Cellular, 2=PCS
  
```

```
280 PRINT "Cell #1 Channel ";Neighbors(7)
290 PRINT "Cell #1 RSSI ";Neighbors(13)
300 END
```

## Returned Values

Maho\_ber\$ is the returned string value representing the BER interval. In this case, the program deliberately set the induced error rate to 7%, so the returned value should be BERI6 (because it is between 4% and 8%). See [“MAHO BER Reported Values” on page 102](#) for more information.

Maho\_RSSI is the numeric value for the RSSI measurement. Neighbors is an 18 element numeric array for storing the returned neighbor band, channel number, and RSSI values.

In the example program, six neighbor channels are enabled by specifying the number of neighbor cells to measure (6), specifying the band (1=Cellular, 2=PCS) for each neighbor, and then specifying the channel number for each neighbor. The PRINT "Cell #1..." commands illustrate how to access the returned band, channel number, and RSSI values for neighbor cell 1 in the array.

## Related Topics

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[“MAHO BER/RSSI Measurement Description” on page 101](#)

[“MAHO BER/RSSI Troubleshooting” on page 105](#)

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## MAHO BER/RSSI Troubleshooting

### Possible Setup Issues

MAHO BER and RSSI measurements must be made with the mobile on a Digital Traffic Channel (DTC) using the test set's Active Cell operating mode. Measurements cannot be made with the mobile on a DTC in DTC Test operating mode.

The measurement results are affected by the Amplitude Offset value. See [“Measurement Related Configuration” on page 599](#).

If the MAHO BER value is greater than expected, make sure the DTC Induced Err function is set correctly. If induced bit errors are not desired, set the value to Off using the CALL:DTC:IBERror:STATe OFF syntax.

### Measurement Timing Issues

Due to the AMPS/136 protocol processes in the mobile, it takes a minimum of 1.28 seconds for the mobile to make MAHO measurements after receiving a request from the test set. Additional time is needed by the mobile to forward the results on the reverse DTC back to the test set.

If you query the MAHO values using the CALL:MS:MAHO:<BERR | RSSI>[:LAST] syntax before the mobile has had time to respond to the test set's MAHO request, one of the following results occur:

- The value “UNKN” is returned for the BER measurement and 9.91E+37 is returned for the RSSI measurement. This occurs when no MAHO measurements have received by the test set.
- The previous MAHO measurement is returned. This is because the test set hasn't received the new measurement values from the mobile.

Therefore, when MAHO reporting is first enabled, and any time the signal into the mobile is changed to alter the reported MAHO values, your program must either use the CALL:MS:REPorted:MAHO:<BERR | RSSI>:NEW syntax to retrieve new measurement values, or wait for the mobile to respond with the correct MAHO values before querying the measurement values.

If you use the CALL:MS:REPorted:MAHO:<BERR | RSSI>:NEW syntax, you should discard the first returned value and re-query the measurement to ensure that the mobile's report values reflect the new signal conditions. See [“Querying Last and New Measurements” on page 101](#).

### Interpreting Integrity Indicator values

See [“Integrity Indicator” on page 121](#).

---

## SINAD Measurement Description

### How is a SINAD measurement made?

SINAD is a receiver audio quality measurement for mobiles on an analog voice channel (AVC). It is the ratio of Signal+Noise+Distortion divided by Noise+Distortion, expressed in dB. SINAD is measured using the test set's Audio Analyzer. SINAD can be measured in the range of 100 Hz to 10 kHz. For information on using the Audio Analyzer, see [“Audio Analyzer Measurement Description” on page 57](#).

The SINAD measurement is used to determine receiver RF sensitivity. SINAD is usually measured either of two ways:

- Reduce the Cell Power from the test set until 12 dB SINAD is displayed (re-triggering for each measurement), or
- Set the Cell Power from the test set to a specified low level and verify a  $\geq 12$  dB SINAD reading.

See IS-137A, section 2.3.1.1, for more information.

### Difference in Agilent 8960 Series 10 and 8920B Test Set SINAD Measurements

If you have previously used the Agilent 8920B RF Communications Test Set to measure SINAD, you may notice that the Agilent 8960 Series 10 test set's SINAD value may be higher by up to 0.8 dB when measuring 12 dB SINAD. This is due to the more precise digital notch filter used by the 8960, causing a more accurate noise measurement to be made. The 8920B uses an analog filter that does not have as tight a filter notch as the 8960.

### Considerations When Making Manual SINAD Measurements

When manually controlling the test set from the front panel, all measurements default to using continuous triggering. If you make digital measurements on a DTC using RF Rise or Protocol triggering, and then hand off to an AVC and select an analog measurement, the analog measurement may not trigger and display a result. This is because the digital measurement is still waiting for a burst transmission to trigger it (which it won't get from an analog signal) and therefore the measurements “freeze”. To prevent this from happening when making analog measurements, either turn off the digital measurements or set their trigger source to Immediate.

### Related Topics

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[“Programming a SINAD Measurement” on page 107](#)

[“AFANalyzer Troubleshooting” on page 61](#)

[“Audio Analyzer Measurement Description” on page 57](#)

[“Test Adherence to Standards” on page 109](#)

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## Programming a SINAD Measurement

This section provides an example of how to make SINAD measurement via GPIB. It is patterned after TIA/EIA IS-137, Analog RF Sensitivity (section 2.3.1.1).

SINAD and Distortion measurements are affected by the same STATE and INITiate commands, so both measurements are enabled and triggered at the same time. However, measurement results are queried separately. See [“Audio Analyzer Measurement Description” on page 57](#).

The following procedure assumes that the mobile’s audio output is connected to the AUDIO IN connectors and the mobile is on an analog voice channel (AVC) that is being modulated with a 1004 Hz tone at  $\pm 8$  kHz peak deviation. It is also assumed that the Cell Power from the test set is set to a minimum usable level (typically about -116 dBm).

1. Configure audio analyzer measurement parameters using the SETup subsystem.
2. Start the audio analyzer measurement using the INITiate subsystem.
3. Use the FETCh? subsystem to obtain audio analyzer measurement results.

### Programming Example

```
10 OUTPUT 714;"SETup:AFANalyzer:CONTinuous OFF" !Set the audio analyzer
20                                     !measurements to single trigger mode.
30 OUTPUT 714;"SETup:AFANalyzer:PEAK:VOLTage 3V" !Set the Expected Amplitude level for
40                                     !audio input voltage in Vpeak.
50 OUTPUT 714;"SETup:AFANalyzer:SDISortion:STATE ON" !Turn on the SINAD and
60                                     !distortion measurements.
70 OUTPUT 714;"SETup:AFANalyzer:SDISortion:FREQuency 1004 HZ" !Specify the audio
80                                     !frequency to use for the measurements.
90 OUTPUT 714;"SETup:AFANalyzer:FILTer CMESsage" !Select the c-message filter.
100 OUTPUT 714;"SETup:AFANalyzer:DEMPHasis:STATE OFF" !Turn off de-emphasis.
110 OUTPUT 714;"SETup:AFANalyzer:EXPandor:STATE OFF" !Turn off the expandor.
120 OUTPUT 714;"SETup:AFANalyzer:TIMEout 3S" !Set a timeout value of 3 seconds
130                                     !in case the measurement cannot be made.
140 OUTPUT 714;"INITiate:AFANalyzer" !Start the AF Analyzer measurement.
150 OUTPUT 714;"FETCh:AFANalyzer:INTEgrity?" !Query the integrity indicator to
160                                     !verify that a reliable measurement was made.
170 ENTER 714;Integrity !Enter the returned value into a variable for comparison
180                                     !with possible integrity indicator values (not shown here).
190 IF Integrity=0 THEN !Only fetch measurement result if integrity indicator is 0.
200 OUTPUT 714;"FETCh:AFANalyzer:SINAD?" !Fetch the SINAD result.
210 ENTER 714;Sinad !Enter the returned value into a variable.
220 END IF
230 END
```

## Returned Values

The results returned by this program are:

- `Integrity` returns the integrity indicator (0 means a successful measurement with no errors). See [“Integrity Indicator” on page 121](#).
- `SINAD` returns the SINAD value in dB.

## Related Topics

\*\*\*\*\*

[“Audio Analyzer Measurement Description” on page 57](#)

[“AFANalyzer Troubleshooting” on page 61](#)

[“INITiate” on page 404](#)

[“SETup:AFANalyzer” on page 428](#)

[“FETCh:AFANalyzer” on page 355](#)

[“Comprehensive Program Example” on page 255](#)

\*\*\*\*\*

## Test Adherence to Standards

The following information describes the implementation of the measurements in the E1961A Mobile Test Application and their compliance with established standards.

### Audio Frequency (AF Analyzer)

The Audio Frequency measurement in the AF Analyzer provides an accurate general purpose frequency measurement for audio signals at the test set's AUDIO IN connectors.

### Audio Level (AF Analyzer)

The AC Level measurement in the AF Analyzer is suitable for making measurements such as RX Hum and Noise in IS-137A section 2.2.2.4 and TX FM Hum and Noise in IS-137A section 3.3.1.6.

### Analog Transmit Power

Analog Transmit Power measures the mean power of a continuous (not bursted) signal of constant envelope. CW or AMPS signals can be measured with or without modulation. Refer to IS-137A section 3.2.1.1, Analog RF Power Output.

### Audio Distortion (AF Analyzer)

The test set makes two measurements to determine total harmonic distortion. First, the test set measures the total audio signal level into the Audio Analyzer. Next, a precise notch filter is then used to remove the signal at the specified frequency. The remaining signal level indicates the level of unwanted signals (distortion). Distortion is expressed as a percentage of the total audio signal.

The distortion measurement can be used to perform the Audio Harmonic Distortion test. In this test, two audio signals are used: a 1004 Hz tone and the 6000 Hz SAT. The 1004 Hz tone is notched out to make the measurement. See IS-137A section 2.2.2.5 for more information.

### Digital Transmit Power

Digital Transmit Power measures the mean power of a TDMA mobile burst at the test set's RF IN/OUT connector. Power is measured on at least 140 symbols in the burst between symbols 6 and 162. The measurement is designed to operate on a bursted signal using a normal time slot with a valid sync word. This measurement conforms to IS-137A section 3.2.1.2.2, Digital RF Power, Method of Measurement.

### Digital Modulation Accuracy

Digital Modulation Accuracy measures the RMS error vector magnitude for 1 burst (EVM1) and for ten bursts (EVM10), and the origin offset, as specified in IS-137A section 3.3.2.1.2, Digital Modulation Accuracy, Method of Measurement. Also measured is digital frequency error as specified in IS-137A section 3.1.2.2.2, Digital Frequency Stability, Method of Measurement.

Also measured, but not required in the standards, are the RMS phase error and RMS magnitude error.

## Digital Adjacent Channel Power

Digital Adjacent Channel Power simultaneously measures the RF power at 30 kHz (adjacent), 60 kHz (alternate), and 90 kHz (second alternate) frequency offsets above and below the selected channel. Definitions and limits for these offsets are defined in IS-137 section 3.4.1.2.1.3, Adjacent and Alternate Channel Power due to Modulation, Minimum Standard. Results are reported in dBc, relative to the mean output power.

The Digital Adjacent Channel Power measurement as implemented in this instrument does not strictly conform to IS-137 section 3.4.1.2.1, Adjacent and Alternate Channel Power due to Modulation, or section 3.4.1.2.2, Out of Band Power Arising from Switching Transients. The IS-137 standard specifies the measurement of out-of-band *average* power due to modulation only, *excluding* the effects of switching transients or *peak* out-of-band power including the effects of switching transients. This instrument measures the out-of-band average power due to modulation *and* switching transients. This method is the same used in the 8920B TDMA systems, and has proven an effective means of measuring transmitter adjacent channel power performance.

## FM Deviation and FM Distortion

FM deviation and distortion can be made on analog signals where the carrier is within 2.5 kHz of the expected frequency. Filtering and other signal processing is selectable to perform the Analog Modulation Requirements measurement as specified in IS-137A section 3.3.1.1.2, SAT deviation in section 3.3.1.4, Signaling Tone deviation in section 3.3.1.5, and Modulation Deviation Limiting in section 3.3.1.2.3.

## Frequency Stability

Frequency Stability measures the absolute frequency and frequency error of an analog RF signal. The signal may be modulated by SAT and/or additional FM. Refer to IS-137A section 3.1.1.2, Analog Frequency Stability, for more information on making this measurement. Measurement resolution is 1.0 Hz, meeting the requirements in IS-137A section 6.6.1.1, Analog General Equipment, Radio frequency.

## IQ Tuning

This measurement is not specified in the TIA/EIA 136 or IS-137 standards, but is useful when adjusting or verifying the balance of the mobile transmitter's IQ modulator.

## MAHO BER and RSSI

Mobile Assisted Handoff Bit Error Ratio and Received Signal Strength Indicator measurements are made in compliance with IS-137A section 2.3.2.5, Mobile Assisted Handoff/Mobile Assisted Channel Allocation Bit Error Rate.

## Loopback Bit Error Ratio

Loopback Bit Error Ratio compares the data sent on a forward digital channel to the returned digital data from a mobile in digital loopback mode. This measurement meets the requirements for IS-137A, section 2.3.2.1, Receiver Signal Level Range Capability (static testing portion).

## **SINAD (AF Analyzer)**

SINAD is the ratio of Signal+Noise+Distortion divided by Noise+Distortion, expressed in dB. It is used when testing receiver performance. The SINAD measurement in the test set is suitable for making the Analog RF Sensitivity measurement in IS-137A section 2.3.1.1.2.





# 3 General Programming



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## Programming Handoffs

### Description

The TIA/EIA 136 standard specifies that mobiles shall be able to use both analog control channels (ACC) and digital control channels (DCCH) to provide call processing, and analog voice channels (AVC) and digital traffic channels (DTC) for conversation. Once on an AVC or DTC, the mobile must be able to change to another channel without dropping the call. This is known as a handoff, and typically occurs when the signal level at the mobile is reduced to the point where signal quality may cause the call to be dropped, or where the voice quality is unacceptable. Handoffs can be made between two analog voice channels, between analog and digital channels, between two digital channels, and between cellular (800 MHz) and PCS band (1900 MHz) digital channels. Handoffs from an AVC to a PCS-band DTC are not supported by the standard, and cannot be performed.

### How the Test Set Performs a Handoff

To perform a handoff, the mobile must first be camped on a control channel (generated by the test set) and then brought up on an AVC or a DTC in Active Cell operating mode. This involves specifying parameters for the control channel and the DTC or AVC you want the mobile to go to and originating the call. See [“Establishing an Active Link with the Mobile Station” on page 33](#).

After the mobile is up on a call (AVC or DTC), you can re-configure the AVC or DTC setup parameters for the channel to hand off to. Issuing the handoff command sends an overhead message to the mobile on the current AVC or DTC, telling it to change to the new AVC or DTC (or DTC band).

Unless Receiver Control is set to manual, the test set automatically sets its RF generator and receivers to tune to the new AVC or DTC. Unless you have a specific need to manually control the RF generator or receivers, you should leave all Receiver Control settings to auto when using Active Cell operating mode.

### Program Example

The following program example assumes the mobile is already on a DTC:

```
10 OUTPUT 714;"CALL:SETup:DTC:BAND PCS;CHANnel 789" !Configure a new DTC in
!the PCS band on channel 789.

20 OUTPUT 714;"CALL:HANDoff" !Perform the handoff.
```

### Power Level Changes for the Current AVC or DTC

As mobiles encounter signal attenuation during use, the base station commands the mobile to raise or lower its power level to prevent signal degradation or inter-cell interference. The test set does this by sending an overhead message to the mobile on the current AVC or DTC when you issue the appropriate command.

The commands for issuing a power change command are CALL:MS:ANALog:TXLevel and CALL:MS:DIGital:TXLevel. Both commands immediately send the message to the mobile to change power level.

### Operating Considerations

The commands to cause an immediate mobile power change (shown above) are NOT the same commands used

**Programming Handoffs**

to set up the AVC or DTC MS TX Level before performing a handoff or originating a call. The CALL:SETup:MS:ANALog:TXLevel and CALL:SETup:MS:DIGital:TXLevel commands, and other mobile station parameters, require the handoff command to be sent after they are issued to send the power change order to the mobile. See [“Configuring Mobile Station Operating Parameters” on page 560](#).

**Related Topics**

\*\*\*\*\*

- [“Configuring the Control Channel \(CCH\)” on page 552](#)
- [“Configuring the Traffic Channel \(TCH\)” on page 565](#)
- [“Configuring Mobile Station Operating Parameters” on page 560](#)
- [“CALL:HANDoff” on page 300](#)
- [“CALL:MS:ANALog:TXLevel” on page 304](#)
- [“CALL:MS:DIGital:TXLevel” on page 305](#)
- [“Step 7: Perform a Handoff” on page 193](#)

\*\*\*\*\*

## Dealing With Semicolon Separated Response Data Lists

### Description

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 Basic programming environment the above ENTER statement will fail with an 'Insufficient data for ENTER' error. Some programming languages, Basic for example, cannot use the semicolon character as a data item terminator for string variables. In this example Basic will attempt to enter data into Imsi\$ until it sees a LF (line feed) data item terminator. The test set does not send the LF until all the data has been sent. Consequently when 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)
```

## Dealing With Semicolon Separated Response Data Lists

```
!  
!  
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_power
```

## Concurrent Measurements

### Description

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.

### Operating Considerations

The test set's block diagram 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.

### Concurrent Measurements For The E1961A Test Application

This table shows the concurrency considerations for the E1961A AMPS/136 Mobile Test Application .

**Table 2.**

Measurement	IQ Tuning	Audio Analyzer	FM Deviation (FDEV)	Frequency Stability (FST)	Adjacent Chan Power (ACP)	Loopback BER (LBER)	Modulation Accuracy (MACC)	Analog TX Power
Digital TX Power (DTXP)	Partial	Partial	Partial	Partial	Partial	Yes	Partial	Partial
Analog TX Power (ATXP)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Modulation Accuracy (MACC)	Partial	Partial	Partial	Partial	Partial	Yes		
Loopback BER (LBER)	Yes	Yes	Yes	Yes	Yes			
Adjacent Channel Power (ACP)	Partial	Partial	Partial	Partial				
Frequency Stability (FST)	Partial	Partial	Partial					
FM Deviation (FDEV)	Partial	Partial						
Audio Analyzer	Partial							

**Concurrent Measurements**

Table Key:

YES - The pair of measurements can be initiated simultaneously and the measurements will be performed concurrently, resulting in decreased test times.

Partial - The pair of measurements can be initiated simultaneously, but the measurements will be performed sequentially, resulting in no decrease in test times over performing the tests sequentially.

**Related Topics**

\*\*\*\*\*

[“Measurement Event Synchronization” on page 128](#)

[“Block Diagram” on page 539](#)

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## 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

## Integrity Indicator

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

```

## Related Topics

\*\*\*\*\*

["Error Messages" on page 611](#)

\*\*\*\*\*

## 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, its multiple measurement count value, and so forth. Because of this, 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 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.

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.

### Timeout Default Values

**Table 3. List of Timeouts and Default Values**

Measurement Function	Default Timeout Time	Default Timeout State	Integrity Indicator Value
Adjacent Channel Power (ACP)	10 seconds	OFF	2
Analog Frequency Stability (FST)	10 seconds	OFF	2
Analog Transmit Power (ATXP)	10 seconds	OFF	2
Digital Transmit Power (DTXP)	10 seconds	OFF	2
Digital Modulation Accuracy (MACC)	10 seconds	OFF	2
Dynamic Power (DPOW)	10 seconds	OFF	2
Frequency Modulation (FM)	10 seconds	OFF	2
IQ Tuning (IQT)	10 seconds	OFF	2
Loopback Bit Error Rate (LBER)	10 seconds	OFF	2
Call Control Status Change Arm	10 seconds	OFF	Not included

### Program Example

With the mobile transmitting on an ANALOG voice channel (AVC), the following program will force a timeout to occur when an attempting to make a DIGITAL transmit power measurement (since the test set will not see the burst rise needed to trigger the digital measurement). The integrity indicator should return a 2 (the

measurement timeout indicator).

```
10 OUTPUT 714;"SETup:DTXPower:TIMEout 5S" !Set a timeout value of 5 seconds.
20 OUTPUT 714;"SETup:DTXPower:TRIGger:SOURce RISE" !Select rise triggering.
30 OUTPUT 714;"INITiate:DTXPower" !Start the measurement.
40 OUTPUT 714;"FETCh:DTXPower?" !Query the returned integrity indicator and the
50                                     !Average digital transmit power measurement.
60 ENTER 714;Integrity,Dtxpower !Enter the returned values into variables.
70 IF Integrity=2 THEN !Integrity value of 2 means digital TX power timed out.
80 PRINT "Measurement timed out."
90 ELSE
100 PRINT "Measurement successful; Digital TX Power result was ";Dtxpower
110 END IF
120 END
```

In this example, if the digital TX power measurement takes longer than 5 seconds to complete (since the trigger never happens), 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 121](#)

["SETup Subsystem" on page 422](#)

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## 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:ATXPOWER:ICOUNT?" !Returns the approximate number of
                                     !multi-measurement cycles completed during a
                                     !multi-measurement count cycle
```

### Related Topics

\*\*\*\*\*

["Statistical Measurement Results" on page 133](#)

\*\*\*\*\*

---

## Measurement Event Synchronization

### Description

Measurement event synchronization saves time by controlling 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 do something well after it could have). Because some measurements can run concurrently, 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 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 406](#) for more details about this query.

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

- "ACP" - The adjacent channel power measurement results are available.
- "AFAN" - The audio analyzer measurement results (SINAD, Distortion, AF Level) are available.
- "ATXP" - The analog transmit power measurement results are available
- "DPOW" - The dynamic power measurement results are available.
- "DTXP" - The digital transmit power measurement results are available
- "FM" - The frequency modulation measurement results are available.
- "FST" - The analog frequency stability measurement results are available.
- "IQT" - The IQ Tuning measurement results are available.
- "LBER" - The loopback bit error measurement results are available.
- "MACC" - The digital modulation accuracy 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 407](#). 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 407](#). This would indicate that all measurements results are available or none have been initiated.



## Programming Example

The following example assumes that the mobile is transmitting on a digital traffic channel and no measurements other than digital TX power (DTXP) and digital modulation accuracy (MACC) are being triggered. See [“Triggering Process Description” on page 146](#).

```

10 OUTPUT 714;"SETup:DTXPower:CONTinuous OFF" !Sets digital TX power
20                                     !trigger mode to single.
30 OUTPUT 714;"SETUP:MACCuracy:CONTinuous OFF" !Sets digital modulation
40                                     !accuracy trigger mode to single.
50 OUTPUT 714;"INITiate:DTXPower;MACCuracy" !Begin digital TX power and
60                                     !modulation accuracy measurements.
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 "DTXP" !Characters must be upper case.
150 OUTPUT 714;"FETCh:DTXPower:POWer:AVERAge?" !If this case is selected,
160                                     !average digital TX Power (no integrity indicator) is FETChed.
170 ENTER 714;Dtxpower_meas
180 PRINT "DTX_Power is ";Dtxpower_meas
190 CASE "MACC" !Characters must be uppercase.
200 OUTPUT 714;"FETCh:MACC:EVm1:AVERAge?" !If this case is selected,
210                                     !the average EVm1 modulation accuracy measurement is FETChed.
220 ENTER 714;Evm1_meas
230 PRINT "Average EVm1 is ";Evm1_meas
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

---

**NOTE** Status subsystem features are not fully implemented in this early release.

---

The STATUS:OPERation:NMRReady 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 Condition Register Bit Assignment” on page 481](#) 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 bit for the measurement desired
- STATUS:OPERation bit (512 for NMRReady). See [“Status Subsystem Overview” on page 134](#).
- Service Request Enabling (\*SRE 128 for NMRReady). See [“Status Subsystem Overview” on page 134](#).

The [“STATUS:OPERation:NMRReady Condition Register Bit Assignment” on page 481](#) status register provides status reporting on the following measurement completions:

- Analog TX Power
- Digital TX Power
- Adjacent Channel Power
- Loopback BER
- Frequency Stability
- Frequency Modulation
- MAHO Bit Error
- AF Analyzer (SINAD, Distortion, AC Level)

---

**NOTE** The following program example uses the E1960A GSM Mobile Test Application Bit Error Rate measurement for the example. Refer to [“STATUS:OPERation:NMRReady Condition Register Bit Assignment” on page 481](#) for bit assignments for other Test Applications.

---

#### Example 4. 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:PTR 256" !Enable positive transition
20                                     !filter on fast BER bit.
30 OUTPUT 714;"STATUS:OPERATION:NMRREADY:ENABLE 256" !Enable the fast BER Bit to
40                                     !generate a summary message.
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 (CONTinuous:OFF) trigger mode.

## Related Topics

\*\*\*\*\*

[“INITiate Command Functions” on page 402](#)

[“What Happens When a Measurement is INITiated?” on page 402](#)

[“Concurrent Measurements” on page 119](#)

\*\*\*\*\*

---

## 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:ATXPOWER:COUNT 10" !Enters an Analog TX Power count
                                           !value of 10, and turns the Analog TX Power
                                           !multi-measurement state on.
```

### Related Topics

\*\*\*\*\*

["Measurement Progress Report" on page 127](#)

\*\*\*\*\*

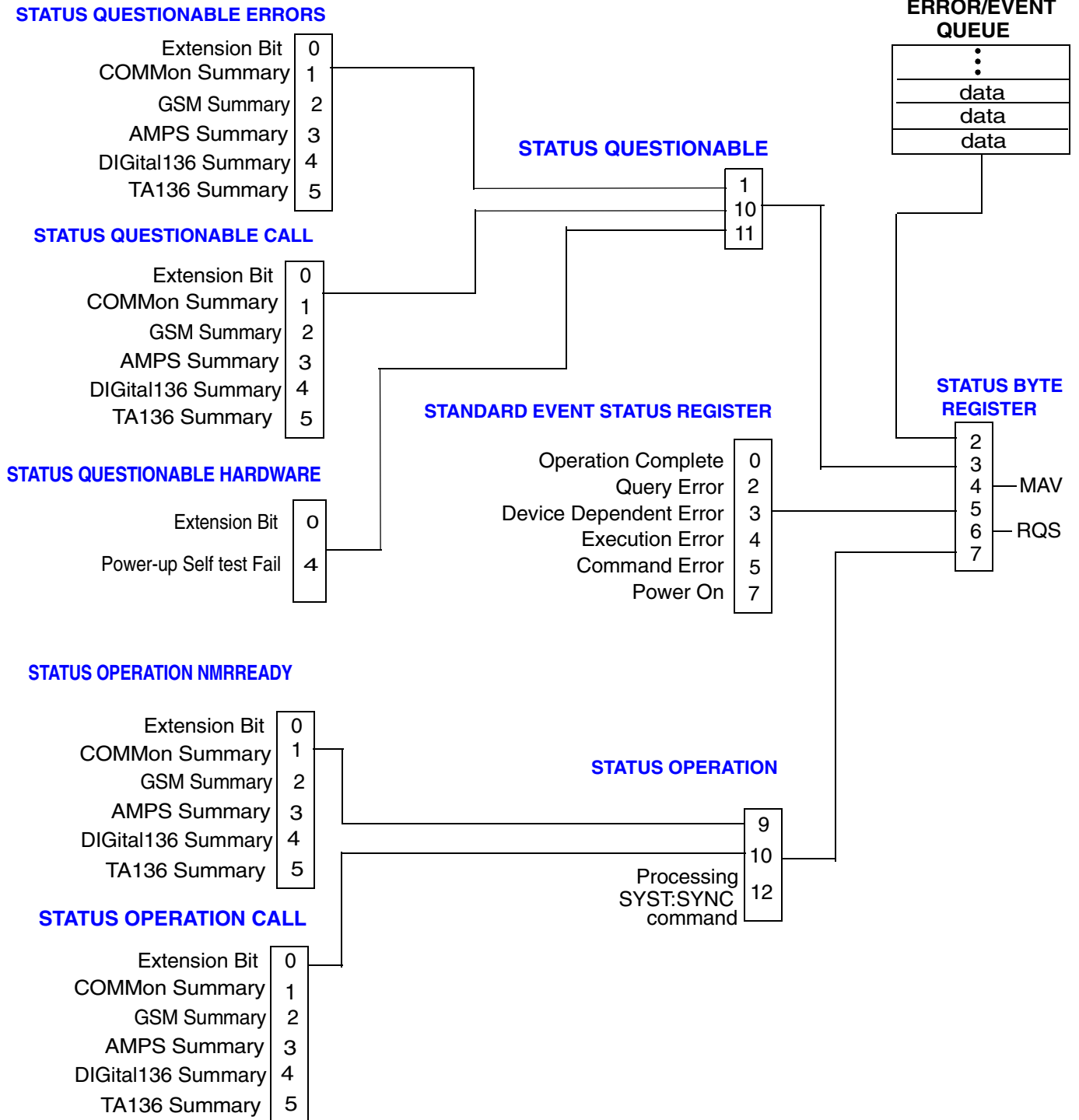
---

## **Status Subsystem Overview**

The following pages present an overview of the entire status subsystem, including test applications which may or may not be loaded in your test set.

## Description

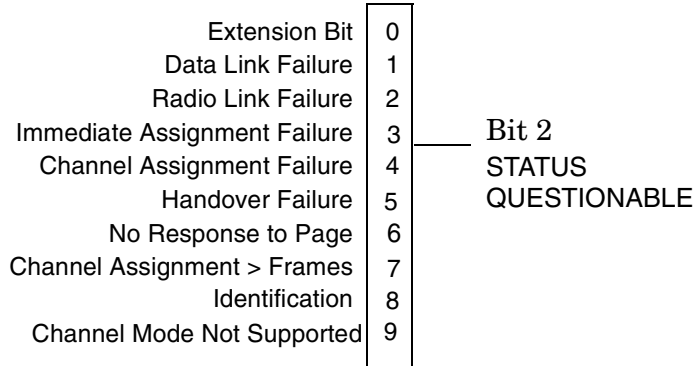
### Overview of STATUS Reporting Structure



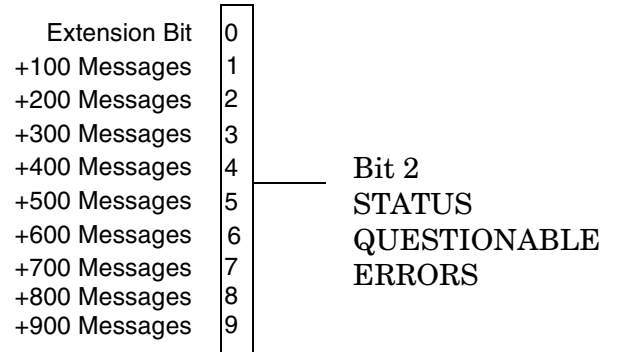
**Status Subsystem Overview**

**Status Reporting Structure For The GSM Test Application**

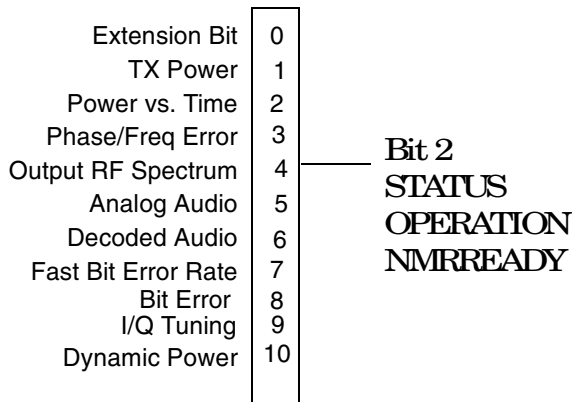
**STATUS QUESTIONABLE CALL GSM**



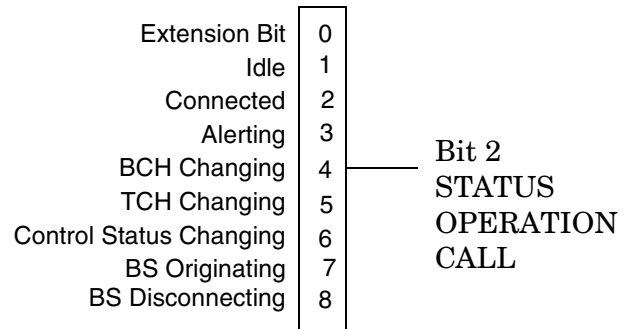
**STATUS QUESTIONABLE ERRORS GSM**



**STATUS OPERATION NMRREADY GSM**



**STATUS OPERATION CALL GSM**





## Status Reporting Structure For The DIGital136 Registers

### STATUS QUESTIONABLE ERRORS DIGITAL136

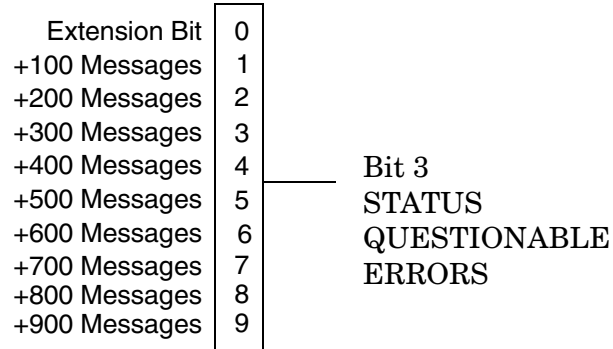
Extension Bit	0	
+100 Messages	1	
+200 Messages	2	
+300 Messages	3	
+400 Messages	4	Bit 4 STATUS QUESTIONABLE ERRORS
+500 Messages	5	
+600 Messages	6	
+700 Messages	7	
+800 Messages	8	
+900 Messages	9	

### STATUS OPERATION NMRREADY DIGITAL136

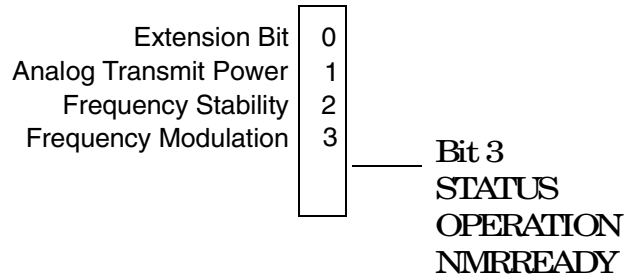
Extension Bit	0	
Digital Transmit Power	1	
Modulation Accuracy	2	
Adjacent Channel Power	3	
Loopback BER	4	Bit 4 STATUS OPERATION NMRREADY
Digital IQ Adjust	5	
Digital Dynamic Power	6	

## Status Reporting Structure For The AMPS Registers

### STATUS QUESTIONABLE ERRORS

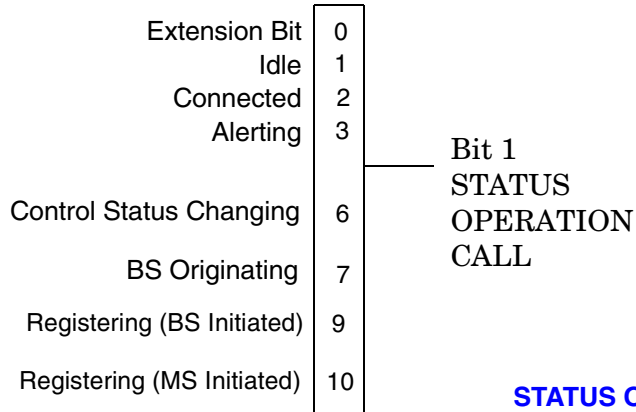


### STATUS OPERATION NMRREADY AMPS

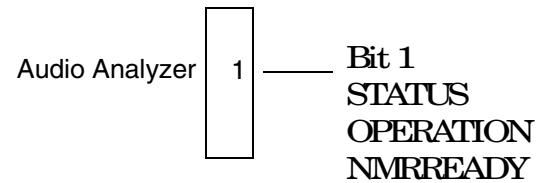


## Status Reporting Structures For The COMMON Registers

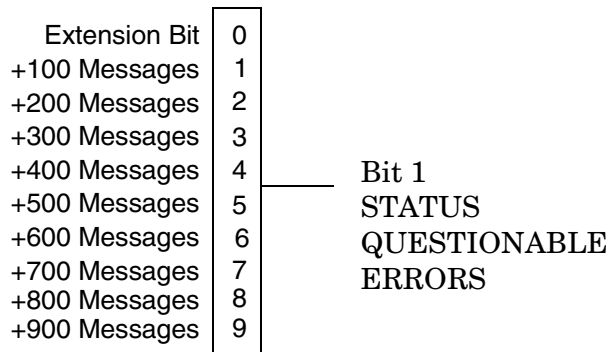
### STATUS OPERATION CALL COMMON



### STATUS OPERATION NMRREADY COMMON



### STATUS QUESTIONABLE ERRORS COMMON



## Status Reporting Structures For The TA136 Registers

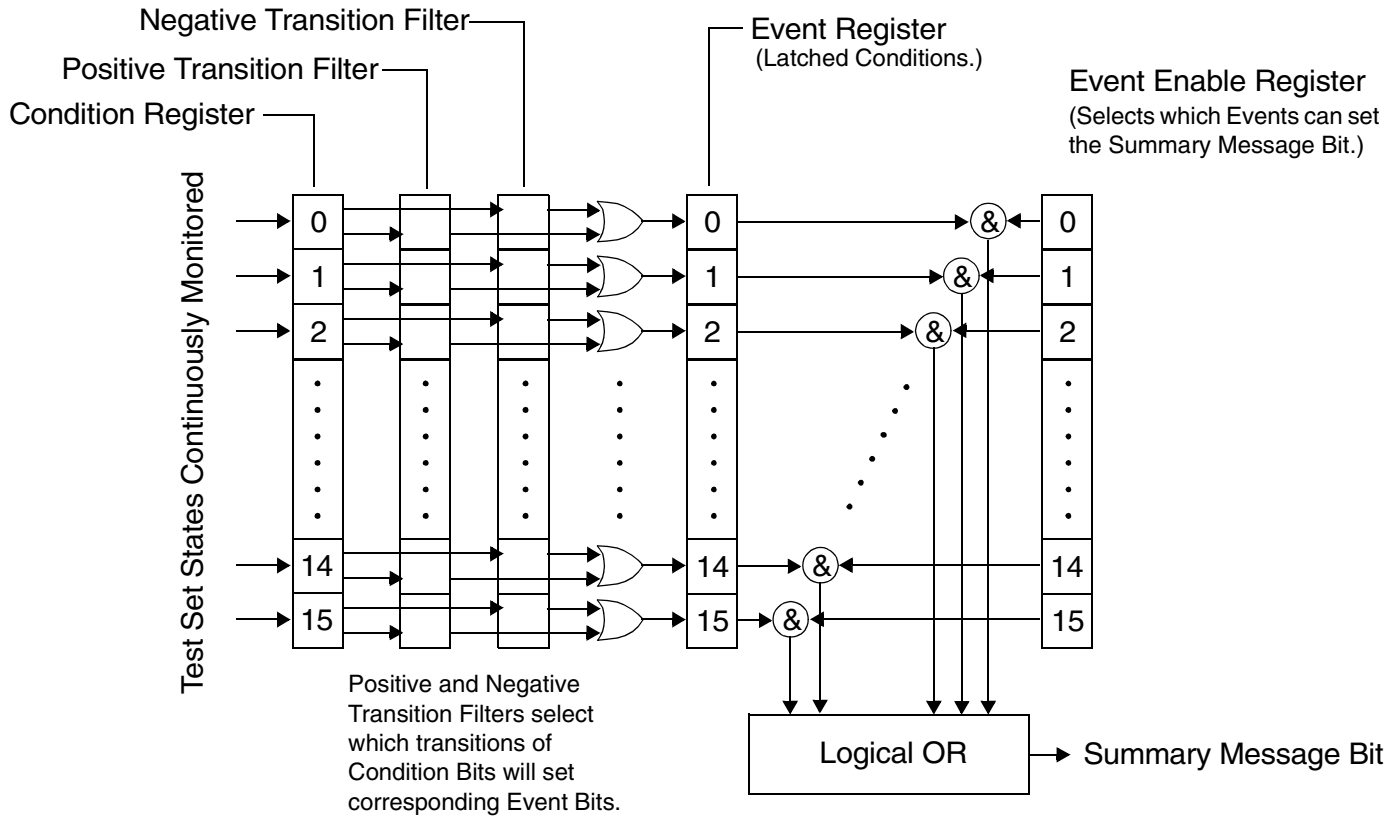
### STATUS QUESTIONABLE ERRORS TA136

Extension Bit	0	
+100 Messages	1	
+200 Messages	2	
+300 Messages	3	
+400 Messages	4	
+500 Messages	5	Bit 5 STATUS QUESTIONABLE ERRORS
+600 Messages	6	
+700 Messages	7	
+800 Messages	8	
+900 Messages	9	

## 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.

**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

**Status Subsystem Overview**

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. 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 16 bits long and may contain unused bits. All unused bits return a zero value when read.

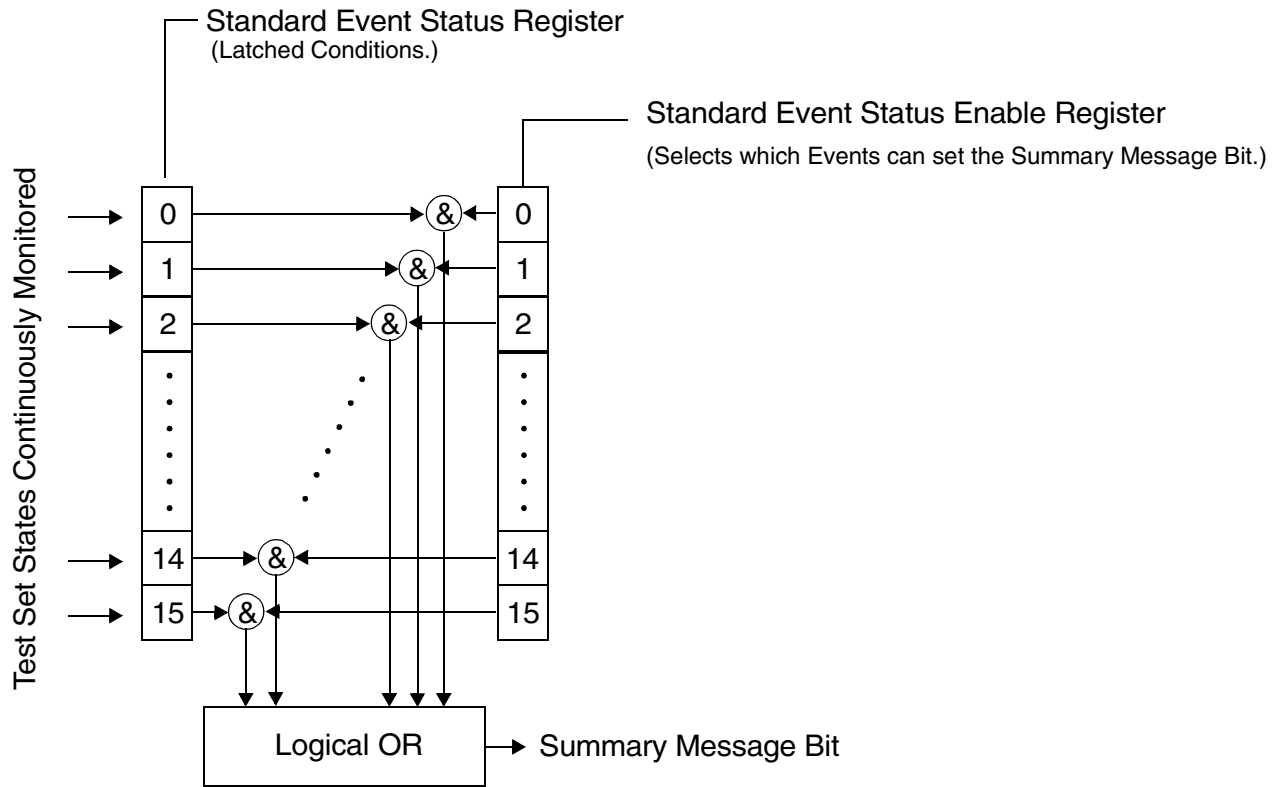
**Event Enable Register** The Event Enable Register defines which bits in the Event Register will be used to generate the Summary Message. Each bit in the Enable Register has a corresponding bit in the Event Register. The test set logically ANDs corresponding bits in the Event and Enable registers and 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 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, logic 1, if the register contains some information and an enabled event in the Event Register is set TRUE.

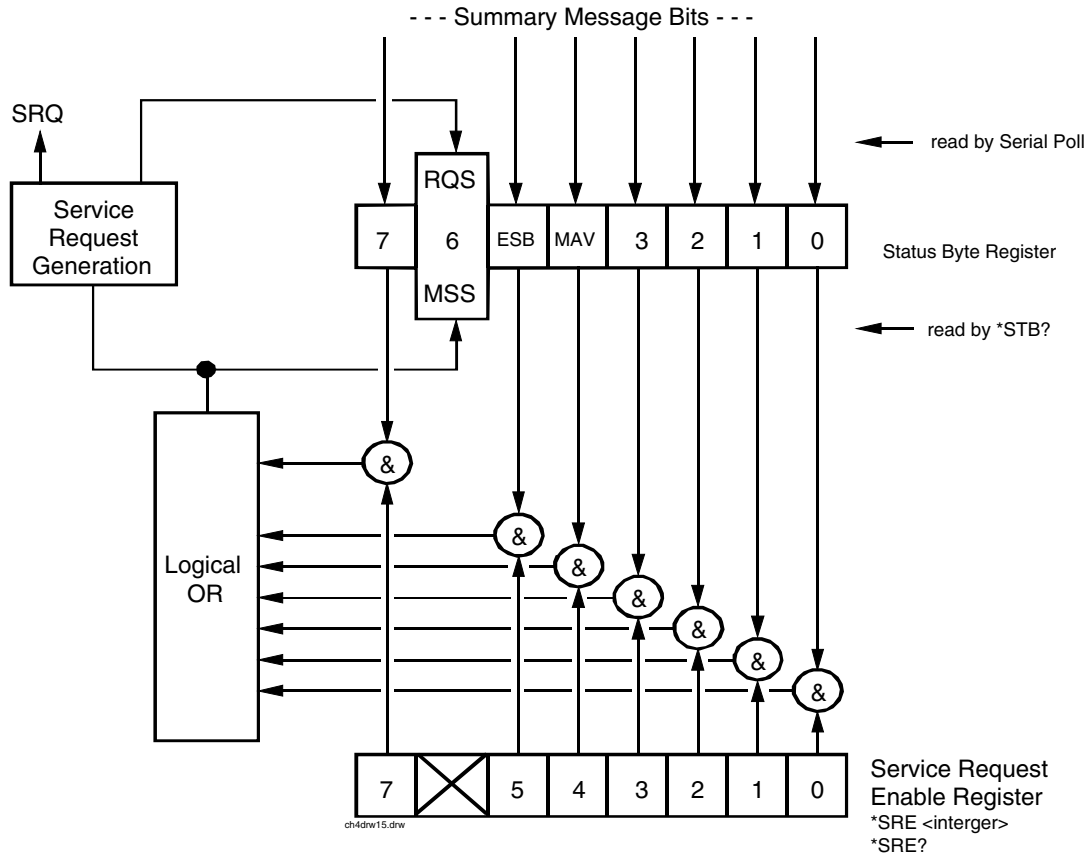
The Summary Message is FALSE, logic 0, if the queue is empty and no enabled events are TRUE. Registers can be cleared by reading all the information from the queue. Registers can also be cleared using the \*CLS (clear status) command.

### Standard Event Status Register Model



Status Subsystem Overview

Service Request Enabling Register Model



Related Topics

\*\*\*\*\*

[“STATUS Subsystem” on page 471](#)

\*\*\*\*\*



## 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 4. 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 [“AVC Test Operating Mode” on page 548](#), [“DTC Test Operating Mode” on page 557](#), or [“Active Cell Operating Mode” on page 544](#).

## Triggering of Measurements

### GPIB Example

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

### Triggering Process Description

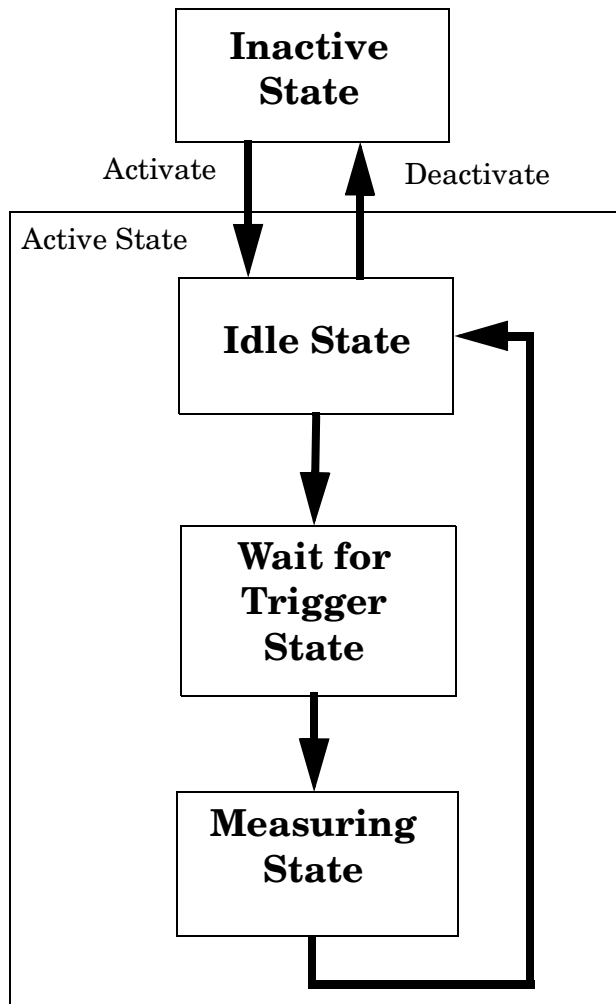
The triggering process controls the present and future states of the test set during the measurement cycle. Triggers are set up using the SETup commands and can be set up when a measurement is in the inactive state. A measurement is activated (selected) with an INITiate command. If a measurement is initiated 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 3. on page 147 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).

### GPIB Examples

```
OUTPUT 714;"INITIATE:DTWPower:OFF" !Turns off a Digital Transmit Power measurement.  
OUTPUT 714;"INITIATE:DTXPower" !Turns on a Digital Transmit Power measurement.
```

**Figure 3. The Test Set's Measurement States**



### Measurement States

The following examples describe states of the test set under various conditions. Refer to Figure 3. on page 147.

#### Example 5. 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 6. 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” on page 404](#).

## Triggering of Measurements

### Example 7. Measuring and Idle States (Trigger Arm Single)

If the trigger arm is set to single, and the trigger source is available, 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 Source Description” on page 145](#) and [“Trigger Arm \(Single or Continuous\) Description” on page 148](#))

### Example 8. Measuring State (Trigger Arm Continuous)

If the trigger arm is set to continuous, and the trigger source is available, 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 Source Description” on page 145](#) and [“Trigger Arm \(Single or Continuous\) Description” on page 148](#)).

### 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 start a measurement if trigger arm is set to continuous because it will continue to cycle in the measuring state.

**Table 5. 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

### GPIB Example

```
OUTPUT 714;"SETUP:MACCuracy:CONTINUOUS OFF" !Set Digital Modulation Accuracy measurement to single trigger mode.
```

## 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.

## GPIB Example

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

## Triggering Considerations When Making Manual Measurements

When manually controlling the test set from the front panel, all measurements default to using continuous triggering. If you make digital measurements on a DTC using RF Rise or Protocol triggering, and then hand off to an AVC and select an analog measurement, the analog measurement may not trigger and display a result. This is because the digital measurement is still waiting for a burst transmission to trigger it (which it won't get from an analog signal) and therefore the measurements "freeze". To prevent this from happening when making analog measurements, either turn off the digital measurements or set their trigger source to Immediate.

## Related Topics

\*\*\*\*\*

["Integrity Indicator" on page 121](#)

["Measurement Event Synchronization" on page 128](#)

["SETup Subsystem" on page 422](#)

\*\*\*\*\*

# Triggering of Measurements

# **4 Programming the Agilent Technologies 8960 Series 10 for TIA/EIA-136 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 E1961A AMPS/136 mobile test application installed.

### Purpose of This Programming Guide

The test capabilities of the test set 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 136 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 136 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 153](#).

Typically in a manufacturing environment, steps 1, 2, 3, and 4 are done once each time a production run is started, steps 5 and 8 are done once for each mobile station tested during the production run, and steps 6 and 7 are done iteratively for each mobile station tested during the production run. The number of iterations for steps 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 forth).

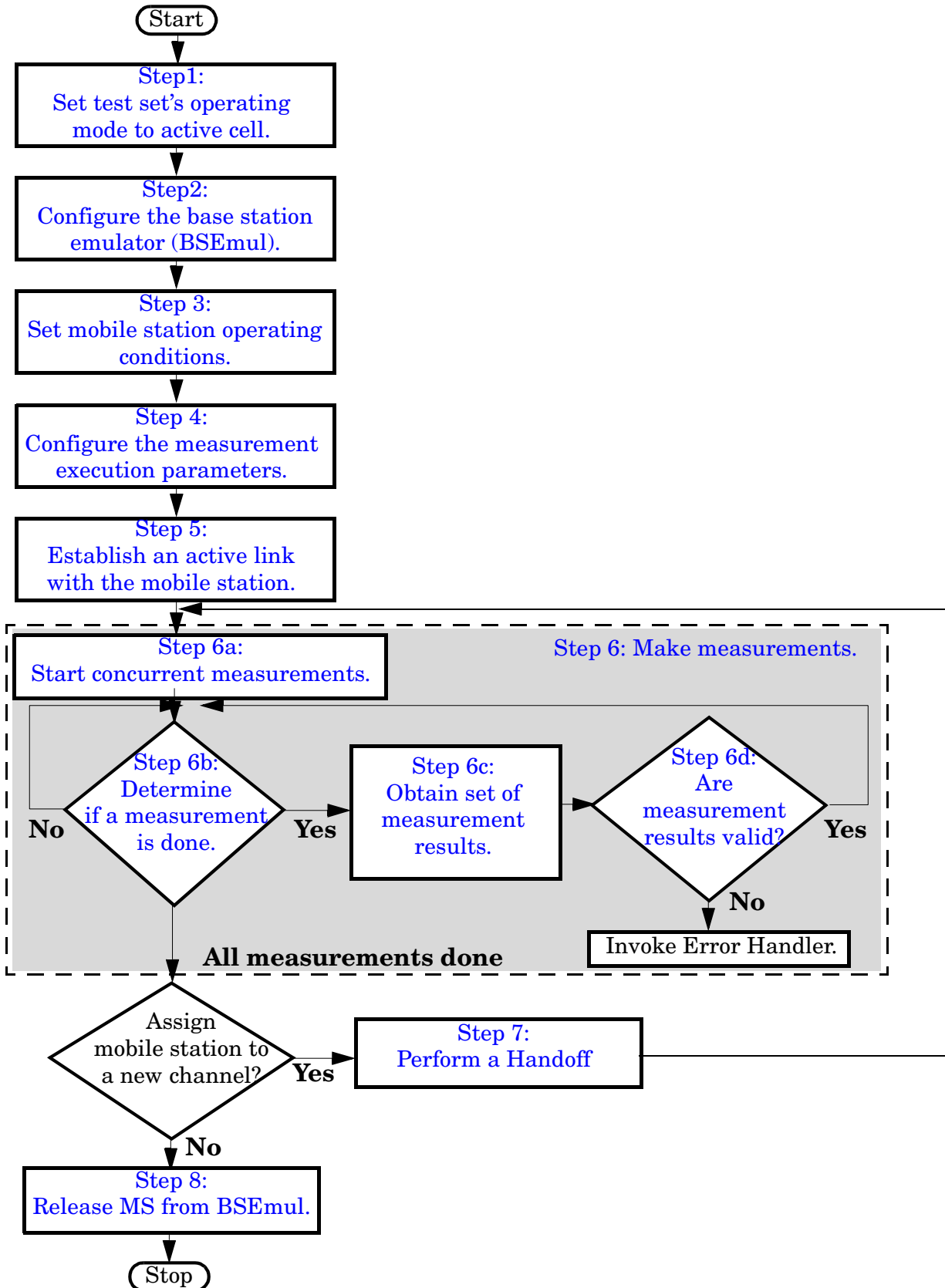
### How to Use This Programming Guide

This Programming Guide is divided into 9 sections. Sections 1 through 8 (step 1 through 8) should be read in sequence. Each section 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 205](#) 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.



Figure 1. Typical Flow of Tasks Performed by Control Program



## About the Programming Examples Presented in This Programming Guide

### Programming Language:

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

### 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:

```
RFANalyzer:CONTrol:MEASurement:FREQuency:AUTO?
```

#### Example 2. Shortened Form:

```
RFAN:CONT:MEAS:FREQ:AUTO?
```

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]:POWer[:SAMPlitude] -80dBm
```

#### Example 4. Command Syntax without Default Nodes:

```
CALL:POW -80dBm
```

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.

### Complex Commands

Complex commands are used to configure the state and assign values to parameters simultaneously. Complex commands can be used to save programming steps.

#### Example 5. Configuring a Parameter State

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

turns the state of the parameter on.

#### Example 6. Configuring a Parameter Value

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

assigns a value to the parameter.

**Example 7. Single Complex Command to Configure a Parameter**

```
OUTPUT Test_set;"SET:DTXP:TIM:STIM 10 S"
```

would set the parameter state to ON and set the value of the parameter to 10 seconds. Note that in this example the optional command mnemonic :STIME has been included to clarify that this complex command was used to set both the state and the value.

**Example 8. Shortened Complex Command**

```
OUTPUT Test_set;"SET:DTXP:TIM 10 S"
```

would also set the state to ON and set the value to 10 seconds. Note that in this example, the optional command mnemonic :STIME has been left off to shorten the complex command. This is the format that will be used throughout this programming guide.

**Introduction**

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

### Background

The test set contains a TIA/EIA-136 base station emulator. The base station emulator's primary purpose is to provide the call processing necessary for parametric measurements on the RF and audio signals of a 136 mobile station.

An important characteristic of the test set's base station emulator is its operating mode. The operating mode sets the way in which the base station emulator interacts with the mobile station. The base station emulator has four operating modes; CW mode, DTC test mode, AVC test mode, and active cell mode.

Active cell mode is used when emulating a normal TIA/EIA-136 cell.

This Programming Guide focuses on programming the test set's base station emulator in active cell operating mode.

### Overview of Active Cell Operating Mode

Active cell is the default operating mode of the test set's base station emulator and is used when emulating a normal TIA/EIA-136 cell (that is, active signaling between the mobile station and the base station emulator).

**Active Cell Features** The basic features provided by the base station emulator when the operating mode is set to active cell are:

- Generation of a DCCH (Digital Control Channel).
- Generation of an ACC (Analog Control Channel).
- Generation of a DTC (Digital Traffic Channel).
- Generation of an AVC (Analog Voice Channel).
- Call setup, both mobile station and base station emulator originated.
- Changing DTC and AVC parameters during a call using over-the-air signaling.
- Base station emulator initiated and mobile station initiated call release.
- A user specified bit error ratio can be inserted into the data sent to the mobile station while on a digital traffic channel.
- All measurements supported in the test application are available.
- The base station emulator automatically controls the test set's 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 9. Command Syntax

```
CALL:OPERating:MODE <CALL|DTCtest|AVCTest|CW>
```

#### Example 10. Programming Example

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

```
!*****  
! Step 1: Set Test Set Operating Mode To Active Cell  
!*****  
!  
OUTPUT 714;"CALL:OPER:MODE CALL"
```

## Step 2: Configure the Base Station Emulator

### Background

In active cell operating mode the base station emulator, using the test set's modulated source, generates a forward channel (base station emulator to mobile station direction) digital control channel (DCCH) or analog control channel (ACC) which represents a cell. The mobile station can camp to the control channel signal, just as it would camp to a cell on a real network. The base station emulator can then page the mobile station on the control channel and listen to the response of the mobile station on the reverse channel (mobile station to base station emulator direction), using the test set's demodulating receiver. Calls can then be set up with the establishment of a digital traffic channel (DTC) or an analog voice channel (AVC) in both the forward and reverse directions. Measurements can be made, using the base station emulator's measuring receiver, under essentially identical conditions to those which the mobile station would experience on a real network.

The base station emulator can emulate a cell in any one of the following TIA/EIA-136 frequency bands and modes:

- Cellular Analog (800 MHz)
- Cellular Digital (800 MHz)
- PCS Digital (1900 MHz)

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

In a manufacturing environment it may be desirable to explicitly configure all parameters to ensure that the settings have not been corrupted by someone setting a parameter's value through the test set's front panel. This will also allow the mobile to camp to the base station emulator more quickly.

### Configuring the Control Channel Parameters

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

#### Control Channel Settable Parameters

Parameter	Command Syntax	Footnote
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>]	1
System Identification	CALL[:CELL]:SID <numeric value>	
Mobile Country Code	CALL[:CELL]:MCCode <numeric value>	
System Operator Code	CALL[:CELL]:SOCCode <numeric value>	
Control Channel Type	CALL:CCHannel:TYPE <DCCH   ACC>	

**Step 2: Configure the Base Station Emulator****Control Channel Settable Parameters**

Parameter	Command Syntax	Footnote
Analog Control Channel Number	CALL:ACC[:CHANnel][:SElected] <numeric value> OR CALL:ACC[:CHANnel]:CELLular <numeric value>	2
DCCH Band	CALL:DCCH:BAND <CELLular   PCS>	3
DCCH Digital Verification Color Code	CALL:DCCH:DVCCode <numeric value>	
DCCH Burst Size	CALL:DCCH:BURSt[:SIZE] <NORMal   SHORtened>	
Digital Control Channel Number	CALL:DCCH[:CHANnel][:SElected] <numeric value> OR CALL:DCCH[:CHANnel]:<CELLular   PCS> <numeric value>	4

**Table Footnotes**

- 1 Complex command to set the cell power amplitude value and to turn the cell power state to ON in one command.
- 2 The selected band for analog is fixed to cellular.
- 3 The DCCH band setting becomes the selected band (see Note 4).
- 4 Sets the DCCH channel for the DCCH band selected with the DCCH Band command (see Note 3).

**Example 11. Programming Example:**

```
OUTPUT Test_set;"CALL:POW -50 DBM"
OUTPUT Test_set;"CALL:DCCH:BAND CELL"
OUTPUT Test_set;"CALL:DCCH 320"
```

**Configuring the Traffic Channel Type**

You can specify the current traffic channel type to be either a digital traffic channel or an analog traffic channel using the following command:

```
CALL:TCHannel:TYPE <DTC | AVC>
```



## Configuring the Digital Traffic Channel Parameters

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

### Digital Traffic Channel Settable Parameters

Parameter	Command Syntax	Footnotes
Digital Traffic Channel Band	CALL:SETup:DTC:BAND <CELLular   PCS>	1
Digital Traffic Channel Number	CALL:SETup:DTC[:CHANnel][:SElected] <numeric value> OR CALL:SETup:DTC[:CHANnel]:<CELLular   PCS> <numeric value>	2
Digital Traffic Channel Burst Size	CALL:DTC:BURSt[:SIZE] <NORMal   SHORtened>	3
Digital Traffic Channel Vocoder Type	CALL:SETup:DTC:VOCoder[:TYPE] <VSELp   ACELp>	
Digital Traffic Channel Timeslot	CALL:SETup:DTC:TSLot <numeric value>	
Digital Verification Color Code	CALL:SETup:DTC:DVCCCode <numeric value>	
Digital Traffic Channel Induced Bit Error Rate	CALL:DTC:IBERror:RATio <numeric value>	4
Digital Traffic Channel Induced Bit Error Rate State	CALL:DTC:IBERror:STATe <ON   1   OFF   0>	4
Digital Traffic Channel Induced Bit Error Rate and State	CALL:DTC:IBERror[:SRATio] <numeric value>	4,5

### Table Footnotes

- 1 The DTC band setting becomes the selected band (see Note 2).
- 2 Sets the DTC channel for the DTC band selected with the DTC Band command (see Note 1).
- 3 This parameter is not available during an ACC to DTC origination. Refer to the user documentation for more details.
- 4 This parameter is available in Active Cell operating mode when generating a DTC, or in DTC Test operating mode.
- 5 Complex command to set the DTC induced bit error rate and to turn the DTC induced bit error rate to ON in one command

**Step 2: Configure the Base Station Emulator****Configuring the Analog Voice Channel Parameters**

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

**Analog Voice Channel Settable Parameters**

Parameter	Command Syntax	Footnotes
Analog Voice Channel Number	CALL:SETup:AVC[:CHANnel][:SELEcted] <numeric value> OR CALL:SETup:AVC[:CHANnel]:CELLular <numeric value>	1
SAT Frequency	CALL:SETup:AVC:SATone[:CCODE] <SAT1   SAT2   SAT3>	2
Internal FM Source State and Deviation	CALL:FM:INTernal[:SDEViation] <numeric value>[<suffix>]	2,3
Internal FM Source State	CALL:FM:INTernal:STATe <ON   1   OFF   0>	
Internal FM Source Deviation	CALL:FM:INTernal:DEViation <numeric value>[<suffix>]	2
Internal FM Source Frequency	CALL:FM:INTernal:FREQUency <numeric value>[<suffix>]	
External FM Input State	CALL:FM:EXTernal:STATe <ON   1   OFF   0>	2,4

**Table Footnotes**

- 1 The selected (:SELEcted) band is Cellular, the only available band for an AVC.
- 2 Make sure that the sum of the 3 FM sources (Internal FM, External FM, and SAT) does not exceed 20kHz deviation.
- 3 Complex command to set the internal FM source deviation and to turn the internal FM source state to ON in one command.
- 4 The FM deviation is fixed at 20kHz/volt with a 1 volt maximum input voltage.

## Programming Example

The following programming example illustrates how you might setup the traffic channel parameters at the beginning of your program. First, in line 40, you would specify on which traffic channel type the call is first brought up on. In this case, it will be a digital traffic channel. This command is used again later when you want to handoff to an analog voice channel (See “Performing a Group 2 Handoff” on page 194.) Then, in lines 60 thru 90, you specify the parameters for the digital traffic channel. These include setting the band to cellular, the channel to 42, the timeslots used to 2 and 5, the vocoder to ACELP, and the induced bit error rate to 2 percent.

Finally, in lines 120 thru 140, you setup the parameters for an analog voice channel to be used later in the program.

```
10      ! Configure the traffic channel parameters
20      !
30      ! Specify the channel type
40      OUTPUT Test_set;"CALL:TCH:TYPE DTC"
50      ! Configure the DTC
60      OUTPUT Test_set;"CALL:SET:DTC:BAND CELL"
70      OUTPUT Test_set;"CALL:SET:DTC 42"
80      OUTPUT Test_set;"CALL:SET:DTC:TSL 2;VOC ACEL"
90      OUTPUT Test_set;"CALL:DTC:IBER 2"
100     ! Specify the AVC parameters to be used
110     ! when the channel type becomes AVC.
120     OUTPUT Test_set;"CALL:SET:AVC:SAT SAT1"
130     OUTPUT Test_set;"CALL:SET:AVC:CHAN 354"
140     OUTPUT Test_set;"CALL:FM:INT:STAT OFF;DEV 8KHZ;FREQ 1004HZ"
```



## Step 3: Set the Mobile Station's Operating Conditions

### Background

The mobile station's transmit level is specified by the test set in a command sent to the mobile station. In this way, the test set emulates the functionality of a 136 base station, which sends transmit level change commands to a mobile. The test set also uses the MS TX Level parameter to determine the power it should expect from the mobile station when making measurements on the mobile station's transmitter.

The test set has two options for setting the mobile station transmit level. When a call is originated or a handoff is made to another band or channel type, the test set will send the mobile a default MS TX Level of 2. This level can be specified before any signalling occurs between the test set and the mobile station by using the CALL:SET:MS commands.

The MS TX Level can also be sent to the mobile independent of the call/handoff setup parameters. The test set immediately sends a message to the mobile station to change its power level when it receives the immediate MS TX Level command. These commands are valid only when a link is established with the mobile station.

### Overview

The mobile station's operating conditions are set up before a call origination or handoff using the CALL processing subsystem commands shown in the following table.

**Settable Mobile Station Operating Conditions**

Parameter	Command Syntax	Table Footnotes
Analog Transmit Level	CALL:SETup:MS:ANALog:TXLevel[:SElected] <numeric value> OR CALL:SETup:MS:ANALog:TXLevel:CELLular <numeric value>	1
Digital Transmit Level	CALL:SETup:MS:DIGital:TXLevel[:SElected] <numeric value> OR CALL:SETup:MS:DIGital:TXLevel:<CELLular   PCS> <numeric value>	2

### Table Footnotes

- 1 The selected band is fixed to cellular for analog.
- 2 The DTC band setting becomes the selected band.

### Example 12. Programming Example:

```
!*****
! Step 3: Set the Mobile Station's Operating Conditions
!*****
!
OUTPUT Test_set;"CALL:SET:MS:DIG:TXL:CELL 3"
```

The MS TX Level of the mobile can be changed immediately when an active link is established between the

**Step 3: Set the Mobile Station's Operating Conditions**

mobile station and the test set using the following commands.

**Settable Mobile Station Operating Conditions**

Parameter	Command Syntax
Analog Transmit Level	CALL:MS:ANALog:TXLevel[:IMMEDIATE]
Digital Transmit Level	CALL:MS:DIGital:TXLevel[:IMMEDIATE]

**Example 13. Programming Example:**

OUTPUT Test\_set;"CALL:MS:DIG:TXL 3"

---

## Step 4: 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:

- Statistical Measurement Results (used by most measurements)

- Multi-Measurement Count State
  - Multi-Measurement Count Number

- Measurement Timeouts (used by all measurements)

- Measurement Timeout
  - Measurement Timeout State

- Measurement Triggering (used by most measurements)

- Trigger Arm (used by all measurements)
  - Trigger Source (not applicable to analog measurements)
  - Trigger Delay (not applicable to analog measurements)

---

**NOTE** Not all measurements use all the execution parameters shown above. Additionally, some measurements have parameters that are specific to the measurement. Each measurement has its own set of parameters that are unique to it and have no effect on the execution of other measurements. Refer to the GPIB syntax listing for a detailed list of execution parameters for individual measurements.

---

**Step 4: Configure the Measurement Execution Parameters****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 Technologies E1961A 136/AMPS mobile test application and their associated <meas-mnemonic> used in the SETup command syntax.

**Measurement Mnemonics Used In The SETup Subsystem**

Measurement	<meas-mnemonic>
Adjacent Channel Power	ACPower
Analog Transmit Power	ATXPower
Audio Analyzer	AFANalyzer
Digital Transmit Power	DTXPower
Dynamic Transmit Power	DPOwer
Frequency Modulation	FM
Frequency Stability	FSTability
IQ Tuning	IQTuning
Modulation Accuracy	MACCuracy

**Configuring Statistical Measurement Results Parameters****Statistical Measurement Results Parameters**

Parameter	Command Syntax
Measurement Count Number and State	SETup:<meas-mnemonic>:COUNT[:SNUMber] <numeric value>
Measurement Count State	SETup:<meas-mnemonic>:COUNT:STATE <ON 1 OFF 0>
Measurement Count Number	SETup:<meas-mnemonic>:COUNT:NUMBer <numeric value>

**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 14. Programming Example:**

```
OUTPUT Test_set;"SET:DTXP:COUN 10"
```

would set the multi-measurement count state to ON and set the number of averages to 10 for the digital transmit power measurement.



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

**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.

## Configuring Measurement Triggering Parameters

### Measurement Triggering Parameters

Parameter	Command Syntax
Trigger Arm	SETup:<meas-mnemonic>:CONTInuous <ON 1 OFF 0>
Trigger Source	SETup:<meas-mnemonic>:TRIGger:SOURce <AUTO IMMediate PROToCol RISE>
Trigger Delay	SETup:<meas-mnemonic>:TRIGger:DELay <numeric value> [<suffix>]

**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).

---

**NOTE** The recommended trigger arm setting for all measurements when programming the test set is single (CONTInuous OFF).

---

### Example 15. Programming Example:

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

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

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

---

**NOTE** The recommended trigger source setting for all measurements when programming the test set is AUTO.

---

### Example 16. Programming Example:

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

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

---

**NOTE** Trigger Source is always IMMediate for analog measurements and cannot be changed by the user.

---

**Step 4: Configure the Measurement Execution Parameters****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 17. Programming Example:**

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

would set the trigger delay to 10  $\mu$ s for the digital transmit power measurement.

---

**NOTE** Trigger Delay is not applicable to analog measurements.

---

**Configuring Measurement Timeout Parameters****Measurement Timeout Parameters**

Parameters	Command Syntax
Measurement Timeout Time and State	SETup:<meas-mnemonic>:TIMEout[:STIME] <numeric value>[<suffix>]
Measurement Timeout State	SETup:<meas-mnemonic>:TIMEout:STATe <ON 1 OFF 0>
Measurement Timeout Time	SETup:<meas-mnemonic>:TIMEout:TIME <numeric value>[<suffix>]

**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 18. Programming Example:**

```
OUTPUT Test_set; "SET:DTXP:TIM 10"
```

would set the measurement timeout state to ON and set the measurement timeout time to 10 seconds for the digital transmit power measurement.

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

**Example 19. Programming Example:**

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

would enable measurement timeouts for the modulation accuracy 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 20. Programming Example:

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

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

### Example 21. Programming Example

```
!*****  
! Step 4: Configure Measurement Execution Parameters  
!*****  
!  
! Configure Modulation Accuracy Measurement:  
!  
OUTPUT Test_set;"SET:MACC:COUN 5"           ! Example of using a complex  
                                           ! command to set multi-meas  
                                           ! state and count at same time.  
OUTPUT Test_set;"SET:MACC:TRIG:SOUR AUTO" ! Set trig source to Auto.  
OUTPUT Test_set;"SET:MACC:CONT OFF"       ! Set trig mode to single.  
OUTPUT Test_set;"SET:MACC:TIM 15"        ! Set timeout time to 15 sec.  
! Turn the EVM10 State ON  
OUTPUT Test_set;"SET:MACC:EVM10:STAT ON"  
!  
! Configure Digital TX Power Measurement:  
!  
OUTPUT Test_set;"SET:DTXP:COUN 5"  
OUTPUT Test_set;"SET:DTXP:TRIG:SOUR AUTO"  
OUTPUT Test_set;"SET:DTXP:CONT OFF"  
OUTPUT Test_set;"SET:DTXP:TIM 5"  
!  
! Configure Frequency Stability Measurement:  
!  
OUTPUT Test_set;"SET:FST:COUN 3"  
OUTPUT Test_set;"SET:FST:CONT OFF"  
OUTPUT Test_set;"SET:FST:TIM 10"  
!  
! Configure Analog TX Power Measurement:  
!  
OUTPUT Test_set;"SET:ATXP:COUN 5"  
OUTPUT Test_set;"SET:ATXP:TRIG:SOUR AUTO"  
OUTPUT Test_set;"SET:ATXP:CONT OFF"  
OUTPUT Test_set;"SET:ATXP:TIM 15"  
!
```

**Step 4: Configure the Measurement Execution Parameters**

---

## Step 5: Establish an Active Link with Mobile Station

### Background

#### Why is Call Connect/Release Synchronization Important?

When the control program requires that an active link be established/terminated between the mobile station and the test set, it must also be able to obtain knowledge about the status of that link. The control program issues the commands necessary to initiate the call connect/release process, either to the test set (for a base station originated/terminated call) or to the mobile station (for an mobile station originated/terminated call). The control program must then be able to determine when the call has successfully connected/released so that the control program can proceed. The control program must also be able to determine if the call has not been successfully connected/released so that the control program can take appropriate action.

#### Call States

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

- Idle
- Set Up Request\*
- Alerting\*
- Releasing\*
- Handoff\*
- Registering\*
- Paging\*
- Connected

The states marked by a \* are referred to as transitory states because the amount of time which the call can spend in any of these states is limited by TIA/EIA-136 protocol. Therefore, the call is not allowed to stay in a transitory state forever.

---

**NOTE** If repeat paging or repeat registration are on, it is possible for the call process to stay in one of the transitory states beyond the time specified by the TIA/EIA-136 timers.

---

#### CALL:STATus[:STATe]? Query

The CALL:STATus[:STATe]? query immediately returns the state of the call at the time the query is received.

##### Responses returned from the CALL:STAT:STAT? query

Response	Meaning
IDLE	The call is in the Idle state
SREQ	The call is in the Set Up Request transitory state.
ALER	The call is in the Alerting transitory state.
REL	The call is in the Releasing transitory state.

**Step 5: Establish an Active Link with Mobile Station****Responses returned from the CALL:STAT:STAT? query**

Response	Meaning
HAND	The call is in the Handoff transitory state.
REG	The call is in the Registering transitory state.
PAG	The call is in the Paging transitory state.
CONN	The call is in the Connected state.

**Using the CALL:STATus[:STATe]? query for Call Connect/Release Synchronization**

The most common technique used by control programs to determine if a call connect/release 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/release 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. It may also completely miss transient states so it is far less dependable and robust.
- 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.

**Call Connect/Release Synchronization Commands provided by the Test Set**

The test set implements a set of commands designed specifically for call connect/release 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/Release Synchronization Commands**

Synchronization Command	Command Syntax
Call Connected State Query	CALL:CONNected[:STATe]?
Call State Change Detector Arm	CALL:CONNected:ARM[:IMMediate]
Call State Change Detector Time-out	CALL:CONNected:TIMEout

**Call Connected State Query Command** The CALL:CONNected[:STATe]? query allows the control program to determine if a call is in the Connected state or in the Idle state. There is a built in provision to automatically wait if the call is in one of the transitory states.

**Responses Returned by the CALL:CONN:STAT? query**

Response	Meaning
1	The call is in the Connected state.
0	The call is in the Idle state.

This query allows the user to quickly determine if the call is connected or not and eliminates the need for rapid polling and the problems associated with that method.

---

**NOTE** If repeat paging or repeat registration are on, a call origination process could 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, the query could hang “forever”.

---

**Call Connected Arm Command** The test set has a call-state-change detector which can be used to temporarily hold off the response to a call-connected-state query until the call origination/release process has reached the correct state. The call-connected-state query only hangs if the call is in a transitory state. Otherwise, it immediately returns a 1 or 0. Therefore, if an origination process is started and the query is satisfied before the call state has transitioned from Idle to one of the transitory states, the query response would be zero indicating that the call had failed. The call-state-change-detector can be used to hold off the query’s response until the appropriate state change has occurred.

The CALL:CONNected:ARM[:IMMEDIATE] command is used to ‘arm’ this call-state-change-detector.

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/release process has started since the call state must have moved from either Idle or Connected to one of the transitory states

AND

- the connect/release 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 disarmed. The command is:

```
CALL:CONNected:ARM:STATE?
```

**Call Connected Time-out Command** 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. The CALL:CONNected:TIMEout command is used to set the time-out value for the call-state-change-detector time-out timer.

**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

## Step 5: Establish an Active Link with Mobile Station

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 TIA/EIA-136 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 TIA/EIA-136 defined protocol timers limit the amount of time that can be spent in any transitory state.

## Overview

Establishing an active link with the mobile station when the test set is in active cell operating mode can be accomplished by making a:

- Base station originated call
- Mobile station originated call

## Process for Making a Base Station Originated Call

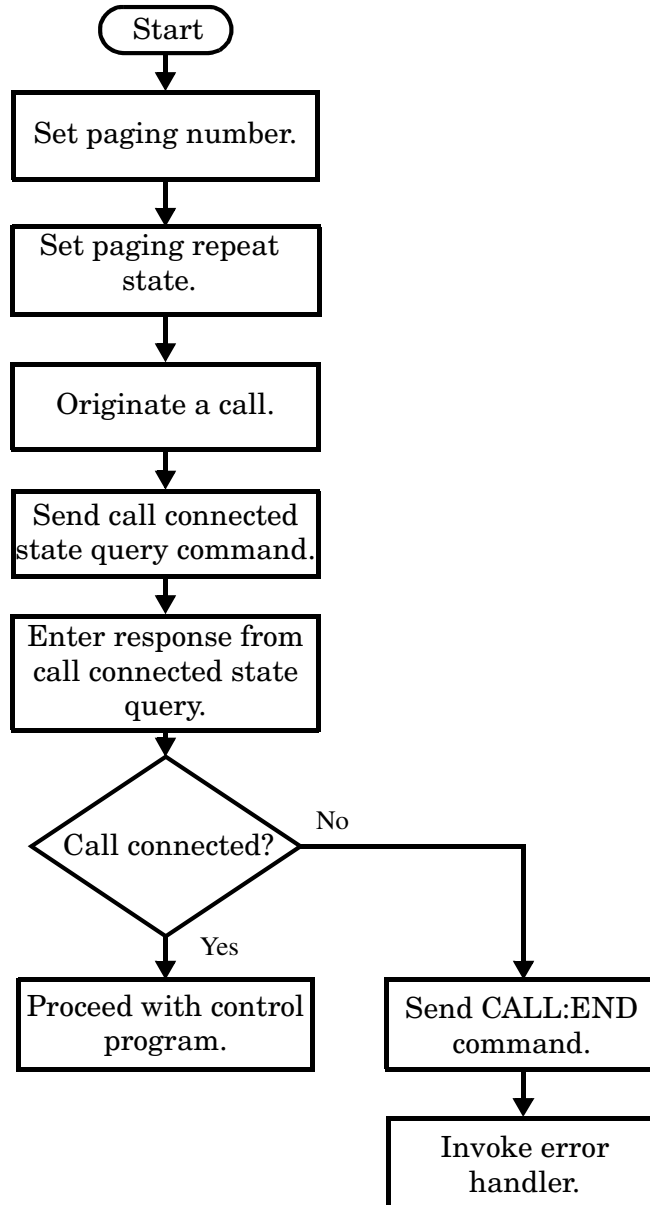
The recommended process for making a base station originated call is shown in [“Figure 1. Process for Making a Base Station Originated Call” on page 177](#).

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).



Figure 1. Process for Making a Base Station Originated Call



**Example 9. Programming Example:**

```

!*****
! Step 5: Establish an Active Link with Mobile Station
!*****
!
OUTPUT Test_set;"CALL:PAG:PNUM `0000574016`" ! Set paging number
OUTPUT Test_set;"CALL:PAG:REP ON" ! Set paging repeat state
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
  
```

## Step 5: Establish an Active Link with Mobile Station

```
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 1. Command Syntax:

```
CALL:ORIGinate
```

#### Example 2. Programming Example:

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

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

**Setting the Paging Number** The paging number is set using the PAGing:PNUMber command.

#### Example 3. Command Syntax:

```
CALL:PAGing:PNUMber <string>
```

#### Example 4. Programming Example:

```
OUTPUT Test_set;"CALL:PAG:PNUM `0000574016`"
```

would set the paging number to 0000574016.

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

#### Example 5. Command Syntax:

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

#### Example 6. Programming Example:

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

would turn off paging repeat.

## Process for Making a Mobile Station Originated Call

The recommended process for making a mobile station originated call is shown in [“Figure 2. Process For Making A Mobile Station Originated Call” on page 179.](#)

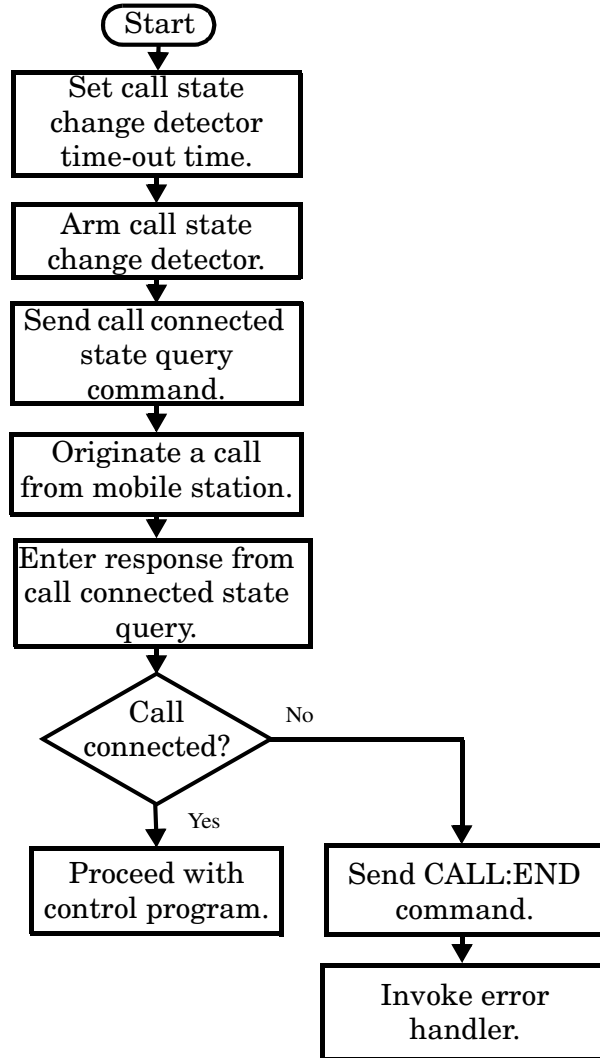
There is no facility in the test set to initiate a call connect from the mobile station. This must be accomplished manually or through a test bus built into the mobile station.

If the call origination process fails it is necessary to preset 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.

**Figure 2. Process For Making A Mobile Station Originated Call**



**Step 5: Establish an Active Link with Mobile Station**

**Example 7. Programming Example:**

```
OUTPUT Test_set;"CALL:CONN:TIM 10"           ! Set timeout time to 10 seconds
OUTPUT Test_set;"CALL:CONN:ARM"              ! Arm the change detector
DISP "Initiate a call from the mobile"
OUTPUT Test_set;"CALL:CONN:STAT?"           ! Initiate a call connect state query
ENTER Test_set;Call_connected                ! Program will hang here until
                                              ! origination passes or fails

IF NOT Call_connected THEN
    OUTPUT Test_set;"CALL:END"
    ! <put error handler here>
END IF
! Call is connected. Proceed with the control program.
```

---

## 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 required to implement measurement concurrency.

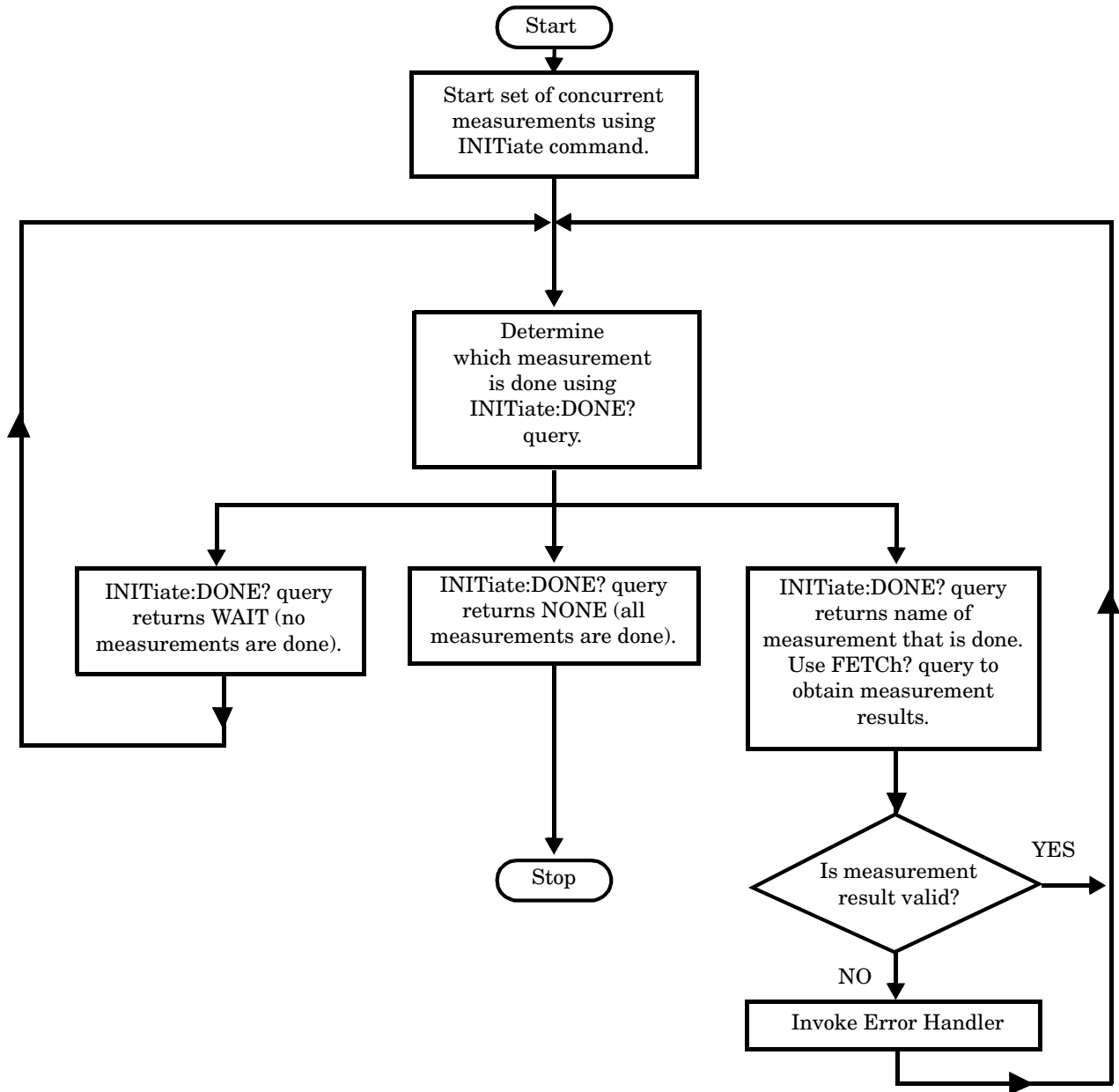
[“Step 6: Figure 1. Process for Making Concurrent Measurements” on page 182](#) shows the recommended process for making concurrent measurements using the test set’s command set.

### Making Sequential Measurements

Step 6 explains how to initiate measurements concurrently and what process to use when fetching results. These can be applied to sequential measurements. It is unnecessary to use the commands in Step 6b when performing sequential measurements.

Step 6: Make Measurements

Step 6: Figure 1. Process for Making Concurrent Measurements



**Example 8. Programming Example:**

The following program segment illustrates making a digital transmit power measurement and a modulation accuracy measurement concurrently using the recommended process shown in “[Step 6: Figure 1. Process for Making Concurrent Measurements](#)” on page 182.

```

!*****
!Step 6:  Make Measurements
!*****
!
!Step 6a:  Start Set of Concurrent Measurements
!
OUTPUT Test_set;"INIT:DTXP;MACC"
!
!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 "DTXP"
        OUTPUT Test_set;"FETC:DTXP?"
        ENTER Test_set;Integrity,Avg_dig_pow
!
!Step 6d:  Validate Measurmement Results
!
        IF Integrity=0 THEN
            PRINT "AVERAGE DIGITAL POWER = ";Avg_dig_pow
        ELSE
            GOSUB Meas_fail ! The subroutine "Meas_fail"
                           ! is the error handler.
        END IF
!
    CASE "MACC"
        OUTPUT Test_set;"FETC:MACC:INT?;EVM10:AVER?"
        ENTER Test_set;Integrity,Avg_evm10
        IF Integrity=0 THEN
            PRINT "AVERAGE EVM 10 = ";Avg_evm10
        ELSE
            GOSUB Meas_fail
        END IF
!
    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** You can compensate for fixture or cable loss by using the RF IN/OUT port's amplitude offset parameters. Twenty different offsets can be set up for twenty different frequencies. To set the frequencies use the command:

```
SYSTem:CORRection:SFRequency (comma separated numeric values)<suffix>
```

Similarly, to then set the offsets for these frequencies, use the following command syntax:

```
SYSTem:CORRection:SGAin (comma separated numeric values)<suffix>
```

Refer to the reference documentation for details about how to use these commands properly.



---

## Step 6a: Start Set Of Concurrent Measurements

### Starting Measurements

Each measurement in a test application can be started using the INITiate command. The syntax of the INITiate command is as follows:

#### Example 1. Command Syntax:

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

The following table shows the measurements available in the Agilent Technologies E1961A AMPS/136 mobile test application and their associated <meas-mnemonic> used in the INITiate command syntax.

**Measurement Mnemonics Used In The INITiate Subsystem**

Measurement	<meas-mnemonic>
Adjacent Channel Power	ACPower
Analog Transmit Power	ATXPower
Audio Analyzer	AFANalyzer
Digital Transmit Power	DTXPower
Dynamic Transmit Power	DPOWer
Frequency Modulation	FM
Frequency Stability	FSTability
IQ Tuning	IQTuning
Modulation Accuracy	MACCuracy

---

**NOTE** The Dynamic Transmit Power measurement closes all other active measurements when it is activated, therefore it should not be used concurrently with other measurements. Refer to the user documentation for more information.

---

#### Example 9. Programming Example:

```
OUTPUT Test_set;"INIT:DTXP"
```

would start the digital transmitter power measurement.

#### Using Compound Commands to Start Concurrent Measurements

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

```
OUTPUT Test_set;"INIT:DTXP;MACC"
```

would start the digital transmit power measurement and the modulation accuracy measurement. These measurements would then run concurrently.

**Step 6a: Start Set Of Concurrent Measurements**

## Step 6b: Determine if a Measurement Is Done

### Background

After a set of concurrent measurements has been started, it is desirable that the control program be able to determine when individual measurement results are available. This enables the control program to request results for a completed measurement without having to wait for other measurements to finish.

---

**NOTE** Step 6b applies only to measurements that have been initiated concurrently. When measurements have been initiated one at a time (sequential measurements) it is unnecessary to use the INITiate:DONE? query command. Step 6b can be skipped for sequential measurements.

---

### 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 table on the following page.

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 assumes the control program immediately fetches a measurement's results once it is reported as being done.

#### Responses Returned from INITiate:DONE? Query

Response	Meaning
ACP	The adjacent channel power measurement is done.
ATXP	The analog transmit power measurement is done.
AFAN	The audio analyzer measurement is done.
DPOW	The dynamic transmit power measurement is done.
DTXP	The digital transmit power measurement is done.
FM	The frequency modulation measurement is done.
FST	The frequency stability measurement is done.
IQT	The IQ Tuning measurement is done.
MACC	The modulation accuracy 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 10. Command Syntax:**

INITiate: DONE?

## 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 digital transmit power measurement with statistical measurement results 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 digital 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 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 E1961A AMPS/136 mobile

**Step 6c: Obtain a Set of Measurement Results**

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>
Adjacent Channel Power	ACPower
Analog Transmit Power	ATXPower
Audio Analyzer	AFANalyzer
Digital Transmit Power	DTXPower
Dynamic Transmit Power	DPOWer
Frequency Modulation	FM
Frequency Stability	FSTability
IQ Tuning	IQTuning
Modulation Accuracy	MACCuracy

**Example 1. Command Syntax:**

```
FETCh:<meas-mnemonic>:<result format>?
```

**Example 2. Programming Example:**

```
OUTPUT Test_set;"FETC:DTXP:POW:MIN?"
```

would return the minimum value from the set of samples taken during the digital transmit power measurement (when statistical measurement results are turned on and number of samples taken >1). The returned value can be assigned to a variable using the following HP Basic command:

```
ENTER Test_set;Min_dig_pow
```

---

## Step 6d: Validate Measurement Results

### Background

Validating measurement results is extremely important. The test set will return a result if it is capable of making a measurement, even if this result is obtained under adverse conditions.

### Overview

The integrity indicator is a measurement result and therefore is queried using the FETCh subsystem. A value of 0 indicates that the measurement is valid. A value other than 0 indicates that an error occurred during the measurement process.

#### Integrity Indicators

Value Returned	Description (Message also appears on Test Set)
0	Normal
1	No Result Available
2	Measurement Timeout
3	Hardware Not Installed
4	Hardware Error
5	Over Range
6	Under Range
7	Burst Short
8	Trigger Early or Fall Early
9	Trigger Late or Rise Late
10	Signal Too Noisy
11	Sync Not Found
12	Oven Out of Range
13	Unidentified Error

**Step 6d: Validate Measurement Results**

**Example 11. Programming Example**

```
OUTPUT Test_set;"FETC:DTXP?"
ENTER Test_set;Integrity,Avg_dig_pow
IF Integrity=0 THEN
    PRINT "AVG DIG POW= ";Avg_dig_pow
ELSE
    PRINT "DTXP Measurement Error"
    PRINT "DTXP Measurement Integrity is ";Integrity
END IF
```



---

## Step 7: Perform a Handoff

### Background

A handoff is defined as assigning the mobile station to a new channel. The test set is capable of performing several types of handoffs. For simplicity, they are grouped below.

- Group 1:
  - AVC to AVC
  - Cellular(800MHz) DTC to Cellular(800MHz) DTC
  - PCS(1900 MHz) DTC to PCS(1900 MHz) DTC
- Group 2: Mode to Mode
  - AVC to Cellular(800MHz) DTC
  - Cellular(800 MHz) DTC to AVC
- Group 3: Band to Band
  - Cellular(800 MHz) DTC to PCS(1900 MHz) DTC
  - PCS(1900 MHz) DTC to Cellular(800 MHz) DTC
- PCS(1900 MHz) DTC to AVC

---

**NOTE** A handoff from an analog voice channel in the cellular band to a digital traffic channel in the PCS(1900 MHz) band is not currently supported by the TIA/EIA-136 standard.

---

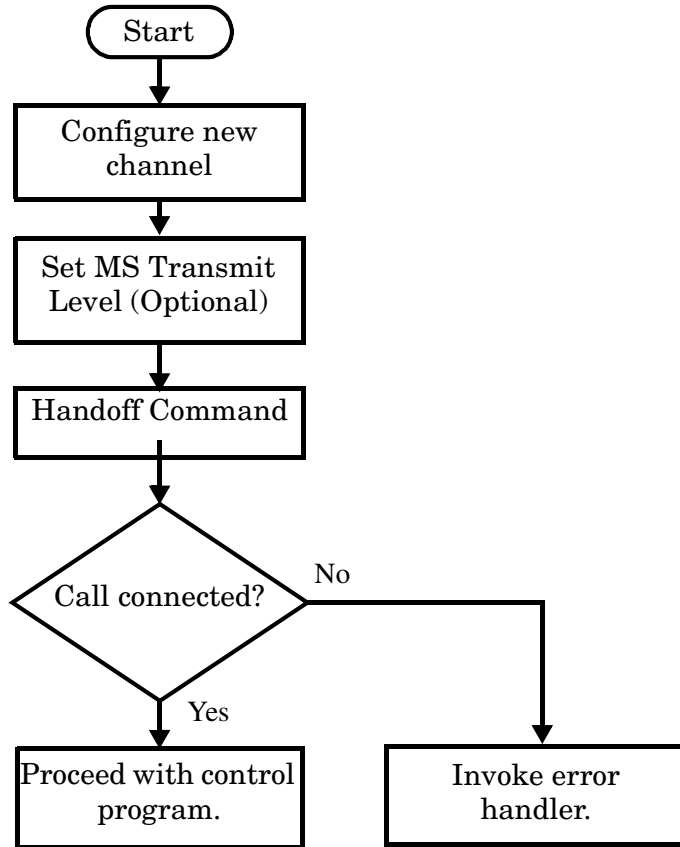
### Overview

Handoffs are accomplished by using the following three steps:

1. Use base station emulator configuration commands from “[Step 2: Configure the Base Station Emulator](#)” to set up a new traffic or voice channel.
2. Use mobile station configuration commands from “[Step 3: Set the Mobile Station’s Operating Conditions](#)” to set mobile station transmit levels. (Optional)
3. Issue the CALL:HANDoff[:IMMediate] command.

### Performing a Group 1 Handoff

The recommended process for performing the handoffs in Group 1 is shown in the following figure.

**Step 7: Perform a Handoff****Step 7: Figure 1. Process for Performing a Group 1 Handoff****Example 12. Programming Example: Cellular DTC to Cellular DTC**

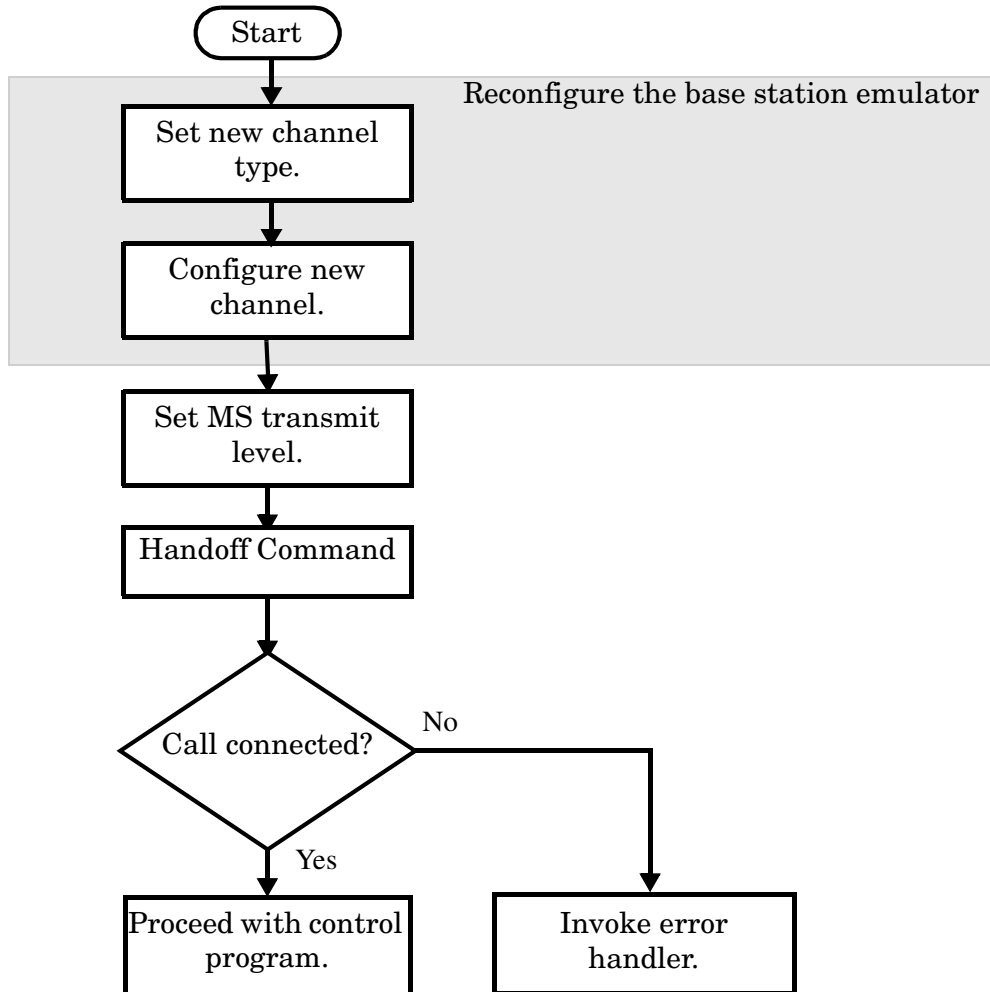
```

! Existing conditions: Mobile station is connected to the test set on
!   DTC 300 of the cellular band.
! It is not necessary to respecify the band as cellular
!
! Step 1: Configure the new traffic channel
OUTPUT Test_set;"CALL:SET:DTC 556"
! Step 2: Configure the MS TX Level (optional)
OUTPUT Test_set;"CALL:SET:MS:DIG:TXL 4"
! Step 3: Issue the handoff immediate command
OUTPUT Test_set;"CALL:HAND"
! Step 4: Check the status of the call connection to be
!   sure the handoff completed successfully.
OUTPUT Test_set;"CALL:STAT:STAT?"
ENTER Test_set;Call_state$
IF Call_state$<>"CONN" THEN
! Invoke the error handler
END IF
! Handoff was successful. Proceed with control program.
  
```

**Performing a Group 2 Handoff**

The recommended process for performing the handoffs found in Group 2 is shown in the following figure.

## Step 7: Figure 2. Process for Performing a Group 2 Handoff



**Step 7: Perform a Handoff****Example 13. Programming Example: Cellular DTC to AVC**

```

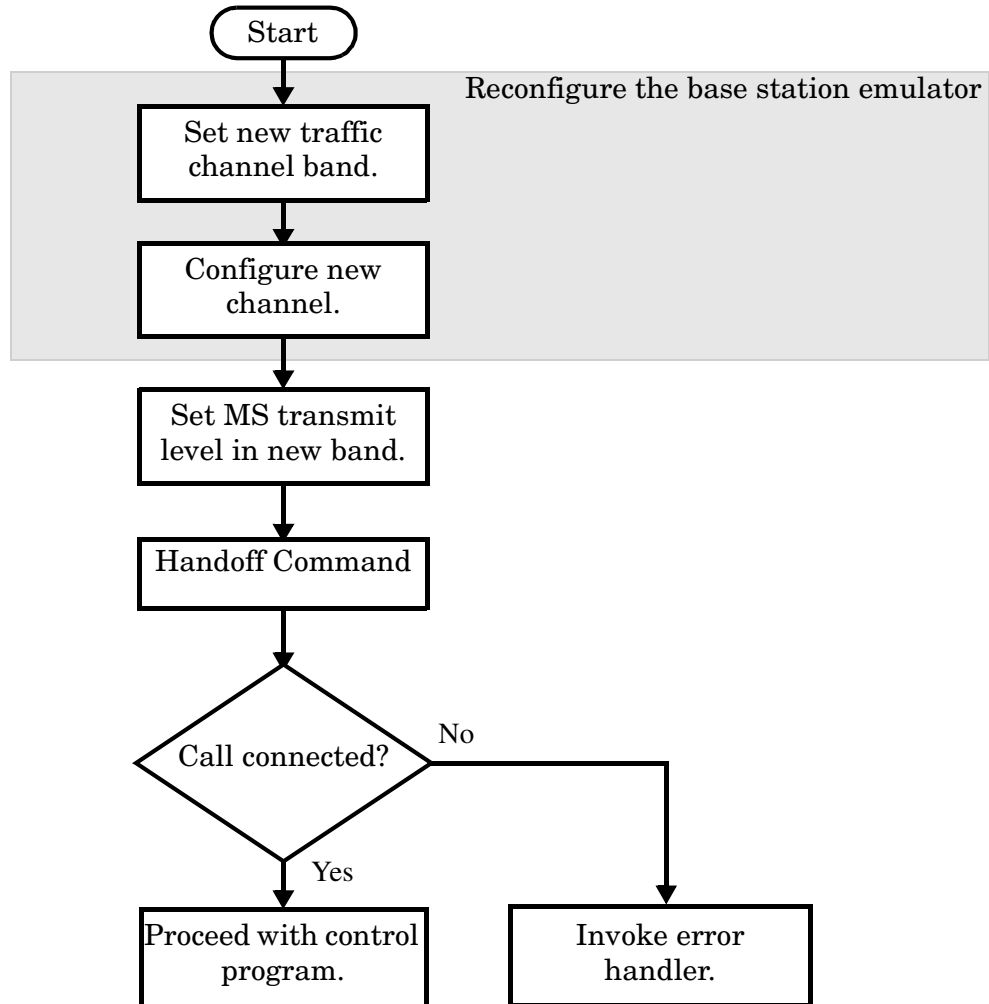
! Existing conditions: Mobile station is connected to the test set on
!   DTC 300 of the cellular band.
!
! Step 1a: Configure Channel Type to AVC
OUTPUT Test_set;"CALL:TCH:TYPE AVC"
!
! Step 1b: Configure the new channel
! It is not necessary to respecify the band as cellular
!
OUTPUT Test_set;"CALL:SET:AVC 42"
!
! Step 2: Set new MS TX Level
OUTPUT Test_set;"CALL:SET:MS:ANAL:TXL 3"
!
! Step 3: Issue the handoff immediate command
OUTPUT Test_set;"CALL:HAND"
! Step 4: Check the status of the call connection to be
!   sure the handoff completed successfully.
OUTPUT Test_set;"CALL:STAT:STAT?"
ENTER Test_set;Call_state$
IF Call_state$<>"CONN" THEN
! Invoke the error handler
END IF
! Handoff was successful. Proceed with control program.

```

**Performing a Group 3 Handoff**

The recommended process for performing the handoffs found in Group 3 is shown in the following figure.

## Step 7: Figure 3. Process for Performing a Group 3 Handoff



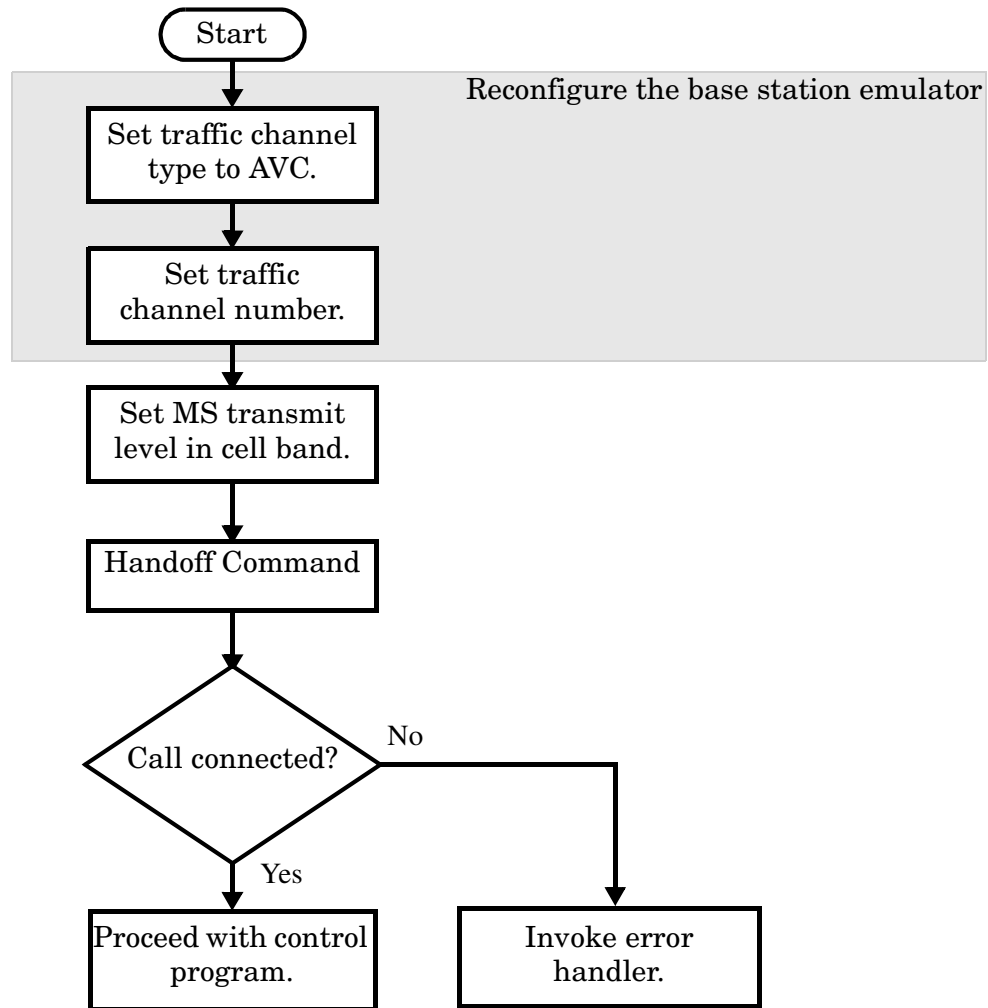
**Step 7: Perform a Handoff**

**Example 14. Programming Example: PCS DTC to Cellular DTC**

```
! Existing conditions: Mobile station is connected to the test set
!   on DTC 1026 of the PCS band.
!
! Step 1a: Set the DTC band to cellular
OUTPUT Test_set;"CALL:SET:DTC:BAND CELL"
! Step 1b: Configure the new channel
OUTPUT Test_set;"CALL:SET:DTC 556"
!
! Step 2: Set the new MS TX level
OUTPUT Test_set;"CALL:SET:MS:DIG:TXL 3"
!
! Step 3: Issue the handoff immediate command
OUTPUT Test_set;"CALL:HAND"
!
! Step 4: Check the status of the call connection to be
!   sure the handoff completed successfully.
OUTPUT Test_set;"CALL:STAT:STAT?"
ENTER Test_set;Call_state$
IF Call_state$<>"CONN" THEN
! Invoke the error handler
END IF
! Handoff was successful. Proceed with control program.
```

## Performing a PCS DTC to AVC Handoff

Step 7: Figure 4. Process for Performing a PCS DTC to AVC Handoff



**Step 7: Perform a Handoff**

**Example 15. Programming Example: PCS DTC to AVC**

```
! Existing conditions: Mobile station is connected to the test set on
!   DTC 1026 of the PCS band.
!
! Step 1a: Change the traffic channel type to AVC
OUTPUT Test_set;"CALL:TCH:TYPE AVC"
! Step 1b: Configure the new channel
OUTPUT Test_set;"CALL:SET:AVC:CELL 42"
!
! Step 2: Set a new MS TX Level
OUTPUT Test_set;"CALL:SET:MS:ANAL:TXL 3"
!
! Step 3: Issue the handoff immediate command
OUTPUT Test_set;"CALL:HAND"
!
! Step 4: Check the status of the call connection to be
!   sure the handoff completed successfully.
OUTPUT Test_set;"CALL:STAT:STAT?"
ENTER Test_set;Call_state$
IF Call_state$<>"CONN" THEN
PRINT "HANDOFF FAILED"
! Invoke the error handler
END IF
! Handoff was successful. Proceed with the control program.
```



---

## Step 8: Release the Mobile Station from the Base Station Emulator

### Background

See “[Step 5: Establish an Active Link with Mobile Station](#)” on page 173 for a discussion of call connect/disconnect synchronization.

### Overview

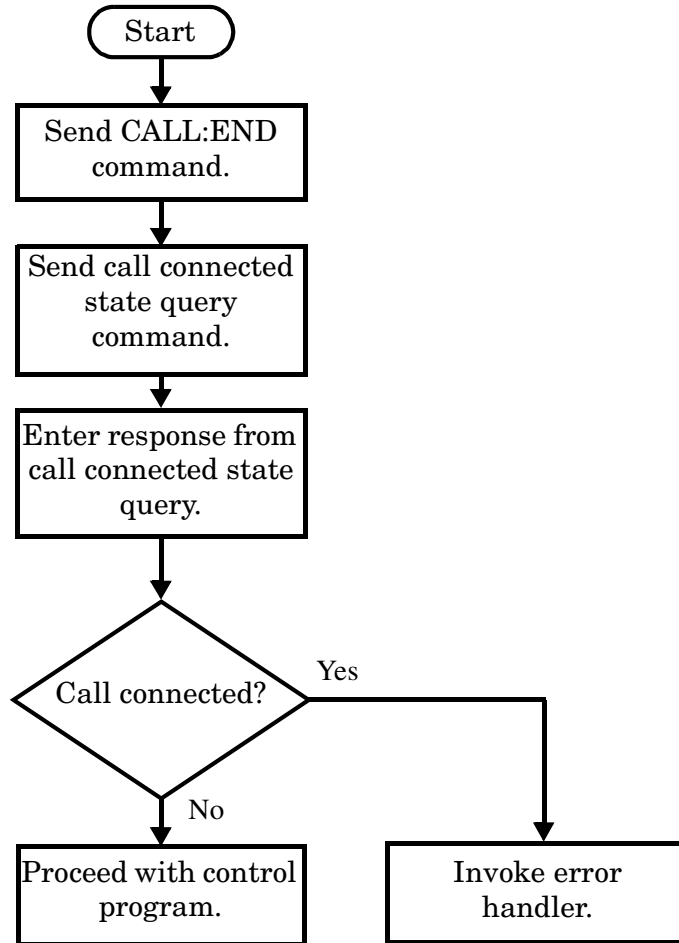
Terminating an active call with the mobile station when the test set is in active cell operating mode can be accomplished in one of two ways:

- 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: Release the Mobile Station from the Base Station Emulator****Step 8: Figure 1. Process for Terminating an Active Call from the Base Station Emulator****Example 10. Programming Example:**

```

!*****
! Step 8: Disconnect Mobile Station from Base Station Emulator
!*****
!
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
  
```

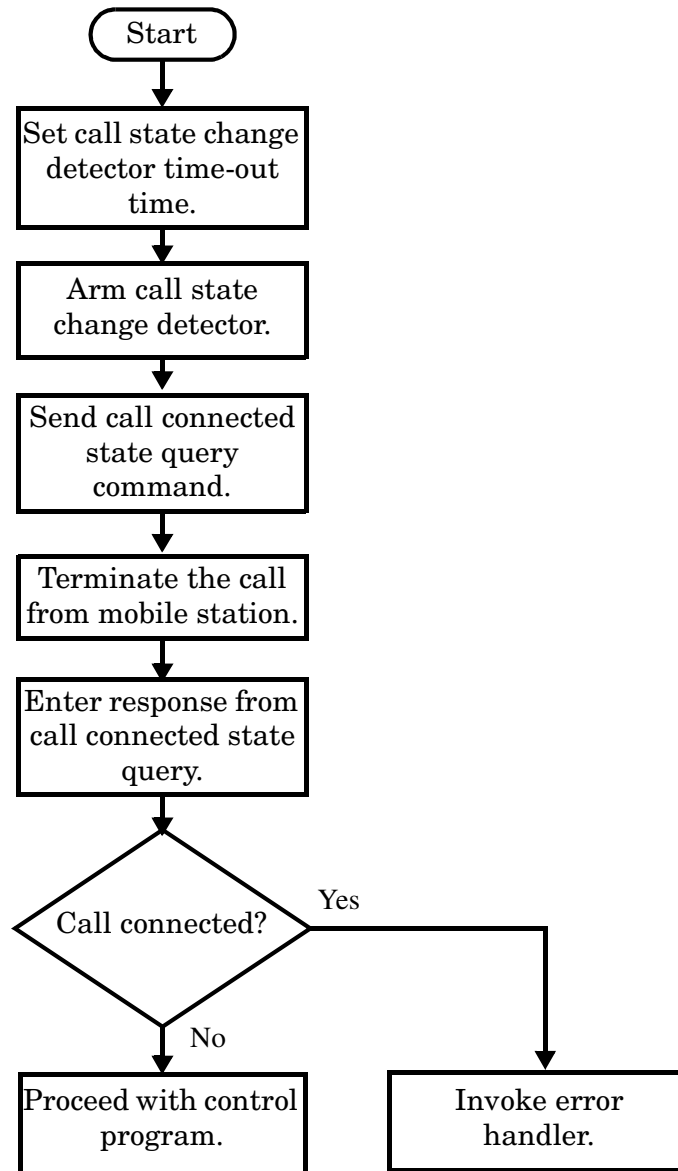
**Terminating an Active Call from the Mobile Station**

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**



**Step 8: Release the Mobile Station from the Base Station Emulator**

**Example 11. 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.

DISP "Terminate the call from the mobile station."
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
```

---

## Comprehensive Program Example

This section presents two example programs for making measurements using the test set in active cell mode. The first program follows the task flow presented at the beginning of this programming guide and illustrates how each step presented throughout the guide fits together into a single program. The second program is an example of more efficient programming techniques.

### Example Program 1

```
10      !*****
20      !   Program:  COMP_EX.TXT                               October 9,2000
30      !   Purpose: Comprehensive Example of programming measurements on
40      !               the Agilent Technologies 8960 using Active Cell
50      !               operating mode.
60      !               This example is written in HP BASIC.
70      !*****
80      !
90      !   Configure the HP BASIC environment.
100     !   These actions are unrelated to configuring or performing tests
110     !       with the Agilent Technologies 8960.
120     !
130     OPTION BASE 1
140     Test_set=714!   Test set's GPIB address
150     PRINTER IS CRT
160     CLEAR SCREEN
170     !
180     !   Reset the test set to start from a known state.
190     !   It is not always necessary to do a full preset in a
200     !   manufacturing environment, but is useful in a programming
210     !   example.
220     !
230     OUTPUT Test_set;"*RST"
240     !
250     !   Set a GPIB timeout. This is for program development purposes
260     !   only. Programming mistakes may cause the GPIB bus to hang and
270     !   not allow HP BASIC to be reset.
280     !
290     ON TIMEOUT 7,30 GOTO Timeout_routine
300     !
310     !   Turn on the GPIB debugger. This is for program development
320     !   purposes only and should be removed once the program is
330     !   completed.
340     OUTPUT Test_set;"SYST:COMM:GPIB:DEB ON"
350     !*****
360     !Step 1: Set the test set's Operating Mode to Active Cell
370     !*****
380     !
390     OUTPUT Test_set;"CALL:OPER:MODE CALL"
400     !
```

**Comprehensive Program Example**

```

410 !*****
420 !Step 2: Configure the base station emulator (BSEmul)
430 !*****
440 !
450 ! The default traffic channel type is DTC,
460 ! so we will not specify it here.
470 !
480 ! Configure the Digital Traffic Channel parameters
490 OUTPUT Test_set;"CALL:SET:DTC:BAND CELL"! Set DTC Band to Cell.
500 OUTPUT Test_set;"CALL:SET:DTC 1000" ! Set DTC to 1000.
510 !
520 ! Configure the Analog Voice Channel parameters
530 OUTPUT Test_set;"CALL:SET:AVC 1000"
540 OUTPUT Test_set;"CALL:SET:AVC:SAT SAT1"
550 !*****
560 !Step 3: Set the Mobile Station's Operating Conditions
570 !*****
580 OUTPUT Test_set;"CALL:SET:MS:DIG:TXL 4"
590 !
600 !*****
610 !Step 4: Configure measurement execution parameters
620 !*****
630 !
640 ! Set trigger to single for all measurements
650 OUTPUT Test_set;"SET:CONT:OFF"
660 !
670 ! Configure Digital Measurements
680 OUTPUT Test_set;"SET:DTXP:COUN 2;TIM 5"
690 OUTPUT Test_set;"SET:MACC:EVM10 ON;COUN 1;TIM 10"
700 OUTPUT Test_set;"SET:ACP:COUN 3;TIM 5"
710 !
720 ! Configure Analog Measurements
730 OUTPUT Test_set;"SET:ATXP:COUN 2;TIM 5"
740 !
750 !*****
760 !Step 5: Establish an active link with the MS
770 !*****
780 !
790 ! This example will use an BS originated call. The phone must
800 ! be camped to the BSEmul before a call can be originated. The
810 ! following code will use repeat paging to originate the call.
820 ! The test set will repeatedly page the mobile until it has
830 ! successfully camped and accepts the page.
840 !
850 OUTPUT Test_set;"CALL:PAG:PNUM '0002007344'" ! The paging number
860 OUTPUT Test_set;"CALL:PAG:REP ON" ! Repeat paging is turned on
870 OUTPUT Test_set;"CALL:ORIG" ! The test set begins paging
880 ! the mobile station.
890 !
900 OUTPUT Test_set;"CALL:CONN:STAT?" ! Hanging query
910 ENTER Test_set;Call_connected ! Program will hang here until
920 ! origination process completes.
930 ! If successful, returns 1.

```

```

940             ! If call does not connect,
950             ! returns 0.
960 IF NOT Call_connected THEN
970   OUTPUT Test_set;"CALL:END"
980   PRINT "Call was not able to connect.  Program terminated."
990   STOP
1000 END IF
1010 !
1020 !*****
1030 !Step 6:  Make Measurements
1040 !*****
1050 CLEAR SCREEN
1060 PRINT "800 MHz DTC Measurement Results:  "
1070 PRINT "*****CH 1000*****"
1080 !
1090 !Step 6a:  Start Set of Concurrent Measurements
1100 !
1110 OUTPUT Test_set;"INIT:DTXP;MACC"
1120 !
1130 !Step 6b:  Determine if a Measurement is Done
1140 !
1150 LOOP
1160 OUTPUT Test_set;"INIT:DONE?"
1170 ENTER Test_set;Meas_done$
1180 !
1190 !Step 6c:  Obtain Measurement Results
1200 !
1210 SELECT Meas_done$
1220 !
1230 CASE "DTXP"
1240   OUTPUT Test_set;"FETC:DTXP?"
1250   ENTER Test_set;Integrity,Avg_dig_pow
1260 !
1270 !Step 6d:  Validate Measurmement Results
1280 !
1290   IF Integrity=0 THEN
1300     PRINT
1310     PRINT "AVERAGE DIGITAL POWER = ";Avg_dig_pow
1320   ELSE
1330     GOSUB Meas_fail  !  The subroutine "Meas_fail"
1340                     !  is the error handler.
1350   END IF
1360 !
1370 CASE "MACC"
1380   OUTPUT Test_set;"FETC:MACC:INT?;EVM10:AVER?"
1390   ENTER Test_set;Integrity,Avg_evm10
1400   OUTPUT Test_set;"FETC:MACC:EVM?"
1410   ENTER Test_set;Max_evm
1420   IF Integrity=0 THEN
1430     PRINT
1440     PRINT "AVERAGE EVM 10 = ";Avg_evm10
1450     PRINT "MAXIMUM EVM      = ";Max_evm
1460   ELSE

```

## Comprehensive Program Example

```

1470         GOSUB Meas_fail
1480     END IF
1490 !
1500 END SELECT
1510 EXIT IF Meas_done$="NONE"
1520 END LOOP ! If 'WAIT' is returned from the 'INIT:DONE?' query, it
1530         ! will fall through the loop.
1540 !
1550 !*****
1560 !Step 7: Perform a Group 1 Handoff
1570 !*****
1580 !
1590 ! Handoff to another DTC in the 800 MHz band
1600 !
1610 ! Set up the handoff.
1620 OUTPUT Test_set;"CALL:SET:DTC 300"
1630 OUTPUT Test_set;"CALL:SET:MS:DIG:TXL 2"
1640 !
1650 ! Initiate the handoff.
1660 OUTPUT Test_set;"CALL:HAND"
1670 !
1680 ! Verify that the handoff completed successfully
1690 OUTPUT Test_set;"CALL:STAT:STAT?"
1700 ENTER Test_set;Call_state$
1710 IF Call_state$<>"CONN" THEN
1720     PRINT "HANDOFF FAILED"
1730     STOP
1740 END IF
1750 !
1760 !*****
1770 !Step 6 (REPEATED): Make Measurements on the New Channel
1780 !*****
1790 PRINT
1800 PRINT "*****CH 300*****"
1810 OUTPUT Test_set;"INIT:DTXP;MACC;ACP"
1820 LOOP
1830 OUTPUT Test_set;"INIT:DONE?"
1840 ENTER Test_set;Meas_done$
1850 SELECT Meas_done$
1860 !
1870 CASE "DTXP"
1880     OUTPUT Test_set;"FETC:DTXP?"
1890     ENTER Test_set;Integrity,Avg_dig_pow
1900     IF Integrity=0 THEN
1910         PRINT
1920         PRINT "AVERAGE DIGITAL POWER = ";Avg_dig_pow
1930     ELSE
1940         GOSUB Meas_fail ! The subroutine "Meas_fail"
1950                 ! is the error handler.
1960     END IF
1970 !
1980 CASE "MACC"
1990     OUTPUT Test_set;"FETC:MACC:INT?;EVM10:AVER?"

```



```

2000     ENTER Test_set;Integrity,Avg_evm10
2010     OUTPUT Test_set;"FETC:MACC:EVM?"
2020     ENTER Test_set;Max_evm
2030     IF Integrity=0 THEN
2040         PRINT
2050         PRINT "AVERAGE EVM 10 = ";Avg_evm10
2060         PRINT "MAXIMUM EVM      = ";Max_evm
2070     ELSE
2080         GOSUB Meas_fail
2090     END IF
2100     !
2110     CASE "ACP"
2120         OUTPUT Test_set;"FETC:ACP?"
2130         ENTER Test_set;Integrity,L_adj,U_adj,L1_alt,U1_alt,L2_alt,U2_alt
2140         IF Integrity=0 THEN
2150             PRINT
2160             PRINT "AVERAGE LOWER ADJACENT POWER =";L_adj
2170             PRINT "AVERAGE UPPER ADJACENT POWER =";U_adj
2180             PRINT "AVERAGE LOWER 1ST ALTERNATE POWER =";L1_alt
2190             PRINT "AVERAGE UPPER 1ST ALTERNATE POWER =";U1_alt
2200             PRINT "AVERAGE LOWER 2ND ALTERNATE POWER =";L2_alt
2210             PRINT "AVERAGE UPPER 2ND ALTERNATE POWER =";U2_alt
2220             PRINT
2230         ELSE
2240             GOSUB Meas_fail
2250         END IF
2260     !
2270     END SELECT
2280     EXIT IF Meas_done$="NONE"
2290     END LOOP
2300     !
2310     !*****
2320     !Step 7: Perform a Group 2 Handoff
2330     !*****
2340     !
2350     OUTPUT Test_set;"CALL:TCH:TYPE AVC"
2360     OUTPUT Test_set;"CALL:HAND"
2370     OUTPUT Test_set;"CALL:STAT:STAT?"
2380     ENTER Test_set;Call_state$
2390     IF Call_state$<>"CONN" THEN
2400         PRINT "HANDOFF FAILED"
2410         STOP
2420     END IF
2430     !
2440     !*****
2450     !Step 6 (REPEATED):  Make Analog Measurements
2460     !*****
2470     !
2480     PRINT "800 MHz AVC Measurement Results:  "
2490     PRINT "*****CH 1000*****"
2500     !
2510     OUTPUT Test_set;"INIT:ATXP"
2520     OUTPUT Test_set;"FETC:ATXP?"

```

**Comprehensive Program Example**

```

2530 ENTER Test_set;Integrity,Avg_anal_pow
2540 IF Integrity=0 THEN
2550     PRINT
2560     PRINT "AVERAGE ANALOG TRANSMIT POWER = ";Avg_anal_pow
2570 ELSE
2580     GOSUB Meas_fail
2590 END IF
2600 !
2610 !*****
2620 !Step 8: Disconnect the mobile from the BSEmul
2630 !*****
2640 !
2650 OUTPUT Test_set;"CALL:END"
2660 ! Verify that the call released correctly
2670 OUTPUT Test_set;"CALL:CONN:STAT?"
2680 ENTER Test_set;Call_conn
2690 IF Call_conn THEN
2700     PRINT "UNABLE TO DISCONNECT PROPERLY"
2710     STOP
2720 END IF
2730 PRINT
2740 PRINT "TESTING COMPLETED SUCCESSFULLY"
2750 STOP
2760 Meas_fail:    ! Subroutine to handle measurement errors
2770     PRINT
2780     PRINT "Measurement error: "&Meas_done$
2790     PRINT "Integrity Indicator = ";Integrity
2800     RETURN
2810 Timeout_routine: !
2820 PRINT "GPIB TIMEOUT HAS OCCURRED."
2830 END ! End of program

```

**Example Program 2**

```

10     !*****
20     ! Comprehensive Example Program
30     ! 8960 AMPS/136 Call Mode
40     !
50     ! This is a program to demonstrate the use of Momentum
60     ! with E1961A AMPS/136 TA testing a dual-mode TDMA phone.
70     ! The program makes Digital Cellular, Digital PCS, and Analog
80     ! measurements while on a call.
90     !*****
100    !
110    COM /Address/ INTEGER Testset
120    Testset=714
130    ON TIMEOUT 7,20 GOSUB Timeout
140    Rf_level=-75
150    Maho_level=-110
160    Sinad_level=-116
170    CLEAR SCREEN
180    !
190    !*****

```

```
200 ! Configure Testset Parameters
210 !*****
220 !
230 OUTPUT Testset;"*RST"
240 OUTPUT Testset;"SYST:COMM:GPIB:DEB:STAT ON"
250 ! Remove afer development is finished.
260 !
270 !*****
280 ! Configure Base Station Emulator Parameters
290 !*****
300 !
310 OUTPUT Testset;"CALL:CELL:OPER:MODE CALL"
320 OUTPUT Testset;"CALL:POW ";Rf_level
330 OUTPUT Testset;"CALL:CCH:TYPE DCCH"
340 OUTPUT Testset;"CALL:DCCH:BAND CELL"
350 OUTPUT Testset;"CALL:DCCH 1013"
360 OUTPUT Testset;"CALL:SET:AVC 387"
370 OUTPUT Testset;"CALL:SET:DTC:BAND CELL"
380 OUTPUT Testset;"CALL:SET:DTC:CHAN:CELL 542"
390 OUTPUT Testset;"CALL:SET:DTC:CHAN:PCS 1000"
400 OUTPUT Testset;"CALL:TCH:TYPE DTC"
410 OUTPUT Testset;"CALL:CONN:TIM 15"
420 OUTPUT Testset;"CALL:SET:MS:ANAL:TXL 2"
430 OUTPUT Testset;"CALL:SET:MS:DIG:TXL:CELL 2"
440 OUTPUT Testset;"CALL:SET:MS:DIG:TXL:PCS 2"
450 OUTPUT Testset;"CALL:FM:INT:STATE OFF;DEV 8KHZ;FREQ 1004HZ"
460 !
470 !*****
480 ! Configure Measurement Parameters
490 !*****
500 !
510 OUTPUT Testset;"SET:CONT:OFF"
520 OUTPUT Testset;"SET:DTXP:TIM 3"
530 OUTPUT Testset;"SET:MACC:TIM 3"
540 OUTPUT Testset;"SET:ACP:TIM 3"
550 OUTPUT Testset;"SET:FST:TIM 3"
560 OUTPUT Testset;"SET:ATXP:TIM 3"
570 OUTPUT Testset;"SET:AFAN:TIM 3"
580 OUTPUT Testset;"SET:FM:TIM 3"
590 OUTPUT Testset;"SET:MACC:EVM10:STAT OFF"
600 OUTPUT Testset;"SET:AFAN:PEAK:VOLT 1"
610 OUTPUT Testset;"SET:AFAN:SDIS:STAT ON"
620 OUTPUT Testset;"SET:AFAN:FILT CMES"
630 OUTPUT Testset;"SET:AFAN:SDIS:STATE ON;FREQ 1004"
640 OUTPUT Testset;"SET:FM:DIST:STATE ON;FREQ 6000"
650 OUTPUT Testset;"SET:FM:DETECTOR:TYPE PPEAK"
660 OUTPUT Testset;"SET:FM:FILT:TBP 6000"
670 OUTPUT Testset;"SET:FM:FILT TBP"
680 !
690 !*****
700 ! Establish Call with Mobile
710 !*****
720 !
```

## Comprehensive Program Example

```

730 PRINT "Turn the phone on now."
740 PRINT "When the phone camps on DCCH 1013, press F2 to continue."
750 PAUSE
760 CLEAR SCREEN
770 PRINT "Originate a call on the Mobile now."
780 OUTPUT Testset;"CALL:CONN:ARM" !Arm Call-State-Change Detector
790 OUTPUT Testset;"CALL:CONN?" !Query State
800 ENTER Testset;Callstate
810 IF NOT Callstate THEN
820     Orig_failed
830 END IF
840 !
850 CLEAR SCREEN
860 PRINT "Cellular Results: "
870 Time=TIMEDATE
880 !
890 !*****
900 ! Make Measurements (Digital Cellular and PCS)
910 !*****
920 !
930 FOR I=1 TO 2
940     OUTPUT Testset;"CALL:POW ";Maho_level
950     OUTPUT Testset;"CALL:MS:REP:MAHO ON"
960     !
970     OUTPUT Testset;"INIT:DTXP;MACC;ACP"
980     REPEAT
990         OUTPUT Testset;"INIT:DONE?"
1000        ENTER Testset;Measdone$
1010        SELECT Measdone$
1020        CASE "DTXP"
1030            OUTPUT Testset;"FETC:DTXP?"
1040            ENTER Testset;Integrity,Power
1050            IF Integrity<>0 THEN CALL Bad_measurement(Integrity,Measdone$)
1060            Print_results(Measdone$,Power)
1070        CASE "MACC"
1080            OUTPUT Testset;"FETC:MACC?"
1090            ENTER Testset;Integrity,Evm,Ferr,Ooff,Perr,Mag
1100            IF Integrity<>0 THEN CALL Bad_measurement(Integrity,Measdone$)
1110            Print_results(Measdone$,Evm,Ferr,Ooff,Perr,Mag)
1120        CASE "ACP"
1130            OUTPUT Testset;"FETC:ACP?"
1140            ENTER Testset;Integrity,Adj1,Adjh,Alt1l,Alt1h,Alt2l,Alt2h
1150            IF Integrity<>0 THEN CALL Bad_measurement(Integrity,Measdone$)
1160            Print_results(Measdone$,Adj1,Adjh,Alt1l,Alt1h,Alt2l,Alt2h)
1170        END SELECT
1180    UNTIL Measdone$="NONE"
1190    !
1200    OUTPUT Testset;"CALL:MS:REP:MAHO:BERR:NEW?" !Get NEXT MAHO Report
1210    ENTER Testset;Ber$
1220    OUTPUT Testset;"CALL:MS:REP:MAHO:RSSI?"
1230    ENTER Testset;Rssi
1240    Print_maho(Ber$,Rssi,Maho_level)
1250    OUTPUT Testset;"CALL:MS:REP:MAHO OFF"

```

```
1260     OUTPUT Testset;"CALL:POW ";Rf_level
1270     !
1280     !*****
1290     ! Make Test Set Changes (Change to PCS, then Analog)
1300     !*****
1310     !
1320     IF I=1 THEN ! Just did Digital 800, get ready for Digital 1900
1330         OUTPUT Testset;"CALL:SET:DTC:BAND PCS"
1340         PRINT ""
1350         PRINT "PCS Results:"
1360     ELSE      ! Done doing Digital 1900, get ready for Analog
1370         OUTPUT Testset;"CALL:TCH:TYPE AVC"
1380         PRINT ""
1390         PRINT "Analog Results:"
1400     END IF
1410     !
1420     !*****
1430     ! Perform handoff to new channel
1440     !*****
1450     !
1460     OUTPUT Testset;"CALL:HAND"
1470     OUTPUT Testset;"CALL:STAT:STAT?"
1480     ENTER Testset;Connected$
1490     IF Connected$<>"CONN" THEN
1500         Dropped_call
1510     END IF
1520 NEXT I
1530     !
1540     !*****
1550     ! Make Measurements (Analog)
1560     !*****
1570     !
1580     OUTPUT Testset;"CALL:FM:INT:STATE ON"
1590     OUTPUT Testset;"CALL:POW ";Sinad_level
1600     OUTPUT Testset;"INIT:ATXP;FST;AFAN;FM"
1610     REPEAT
1620         OUTPUT Testset;"INIT:DONE?"
1630         ENTER Testset;Measdone$
1640         SELECT Measdone$
1650         CASE "ATXP"
1660             OUTPUT Testset;"FETC:ATXP?"
1670             ENTER Testset;Integrity,Power
1680             IF Integrity<>0 THEN CALL Bad_measurement (Integrity,Measdone$)
1690             Print_results (Measdone$,Power)
1700         CASE "FST"
1710             OUTPUT Testset;"FETC:FST?"
1720             ENTER Testset;Integrity,Ferr,Freq
1730             IF Integrity<>0 THEN CALL Bad_measurement (Integrity,Measdone$)
1740             Print_results (Measdone$,Ferr,Freq)
1750         CASE "AFAN"
1760             OUTPUT Testset;"FETC:AFAN?"
1770             ENTER Testset;Integrity,Level,Sinad,Dist
1780             IF Integrity<>0 THEN CALL Bad_measurement (Integrity,Measdone$)
```

## Comprehensive Program Example

```

1790     Print_results (Measdone$, Level, Dist, Sinad)
1800     CASE "FM"
1810         OUTPUT Testset; "FETC:FM?"
1820         ENTER Testset; Integrity, Dev, Dist
1830         IF Integrity<>0 THEN CALL Bad_measurement (Integrity, Measdone$)
1840         Print_results (Measdone$, Dev, Dist)
1850     END SELECT
1860 UNTIL Measdone$="NONE"
1870 !
1880 !*****
1890 ! Finish Testing, Release Call
1900 !*****
1910 !
1920 PRINT ""
1930 PRINT "Testing Complete."
1940 Testtime=PROUND (TIMEDATE-Time, -2)
1950 PRINT ""
1960 PRINT "Test time was "; Testtime; " seconds."
1970 OUTPUT Testset; "CALL:POW "; Rf_level
1980 OUTPUT Testset; "CALL:END"
1990 OUTPUT Testset; "CALL:CONN:STAT?"
2000 ENTER Testset; Callstate
2010 IF Callstate=1 THEN
2020     PRINT "Make sure the phone has released the call."
2030     OUTPUT Testset; "SYST:PRES3"
2040 END IF
2050 STOP
2060 Timeout: !Comes here only when program times out
2070 PRINT "Program time out."
2080 END
2090 !
2100 !*****
2110 ! Subroutine Section
2120 !*****
2130 !
2140 SUB Print_results (Meas_name$, Res1, OPTIONAL Res2, Res3, Res4, Res5, Res6)
2150     SELECT Meas_name$
2160     CASE "DTXP"
2170         PRINT USING "5X, ""Ave Digital Power: """, 5X, M2D.2D, "" dBm"""; Res1
2180     CASE "MACC"
2190         PRINT USING "5X, ""Max EVM1: """, 14X, M2D.2D, "" %"""; Res1
2200         PRINT USING "5X, ""Worst Freq Error: """, 5X, M3D.2D, "" Hz"""; Res2
2210         PRINT USING "5X, ""Max Mag. Error: """, 8X, M2D.2D, "" %"""; Res5
2220         PRINT USING "5X, ""Max Origin Offset: """, 5X, M2D.2D, "" dB"""; Res3
2230         PRINT USING "5X, ""Max Phase Error: """, 7X, M2D.2D, "" Deg"""; Res4
2240     CASE "ACP"
2250         PRINT USING "5X, ""ACP Adj Lo: """, 12X, M2D.2D, "" dBc"""; Res1
2260         PRINT USING "5X, ""ACP Adj Hi: """, 12X, M2D.2D, "" dBc"""; Res2
2270         PRINT USING "5X, ""ACP Alt1 Lo: """, 11X, M2D.2D, "" dBc"""; Res3
2280         PRINT USING "5X, ""ACP Alt1 Hi: """, 11X, M2D.2D, "" dBc"""; Res4
2290         PRINT USING "5X, ""ACP Alt2 Lo: """, 11X, M2D.2D, "" dBc"""; Res5
2300         PRINT USING "5X, ""ACP Alt2 Hi: """, 11X, M2D.2D, "" dBc"""; Res6
2310     CASE "ATXP"

```

```

2320     PRINT USING "5X, ""Ave Analog Power:"", 6X, M2D.2D, "" dBm""; Res1
2330     CASE "FST"
2340         PRINT USING "5X, ""Worst Freq Error:"", 5X, M3D.2D, "" ppm""; Res1
2350         PRINT USING "5X, ""Average Freq:"", 6X, M3D.2DESZ, "" Hz""; Res2
2360     CASE "FM"
2370         PRINT USING "5X, ""SAT Deviation:"", 9X, M5D, "" Hz""; Res1
2380         PRINT USING "5X, ""Distortion:"", 11X, M3D.2D, "" %""; Res2
2390     CASE "AFAN"
2400         PRINT USING "5X, ""Audio Level:"", 11X, M3D.2D, "" V""; Res1
2410         PRINT USING "5X, ""Audio Distortion:"", 6X, M3D.2D, "" %""; Res2
2420         PRINT USING "5X, ""SINAD:"", 16X, M3D.2D, "" dB""; Res3
2430     END SELECT
2440 SUBEND
2450 SUB Bad_measurement(Integrity, Meas_name$)
2460     PRINT "      Measurement warning: "; Meas_name$
2470     PRINT "      Integrity ="; Integrity
2480 SUBEND
2490 SUB Dropped_call
2500     PRINT " "
2510     PRINT "Call was dropped. Program aborted."
2520     STOP
2530 SUBEND
2540 SUB Print_maho(Ber$, Rssi, Maho_level)
2550     SELECT Ber$
2560     CASE "BERI0"
2570         PRINT "      MAHO BER at "; Maho_level; " dBm is: <0.01"
2580     CASE "BERI1"
2590         PRINT "      MAHO BER at "; Maho_level; " dBm is: 0.01 < 0.1"
2600     CASE "BERI2"
2610         PRINT "      MAHO BER at "; Maho_level; " dBm is: 0.1 < 0.5"
2620     CASE "BERI3"
2630         PRINT "      MAHO BER at "; Maho_level; " dBm is: 0.5 < 1.0"
2640     CASE "BERI4"
2650         PRINT "      MAHO BER at "; Maho_level; " dBm is: 1.0 < 2.0"
2660     CASE "BERI5"
2670         PRINT "      MAHO BER at "; Maho_level; " dBm is: 2.0 < 4.0"
2680     CASE "BERI6"
2690         PRINT "      MAHO BER at "; Maho_level; " dBm is: 4.0 < 8.0"
2700     CASE "BERI7"
2710         PRINT "      MAHO BER at "; Maho_level; " dBm is: > 8.0"
2720     CASE ELSE
2730         PRINT "      MAHO Results not available."
2740     SUBEXIT
2750     END SELECT
2760     PRINT "      MAHO RSSI at "; Maho_level; " dBm is: "; Rssi
2770 SUBEND
2780 SUB Orig_failed
2790     PRINT "Origination failed. Check conditions and run again."
2800     STOP
2810 SUBEND

```





---

# **Programming the Agilent Technologies 8960 Series 10 for TIA/EIA-136 Mobile Testing in Test 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 E1961A AMPS/136 mobile test application installed.

### Purpose of This Programming Guide

The test capabilities of the test set 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 136 mobile station with the test set operating in test mode.

### About the Programming Examples Presented in This Programming Guide

#### Programming Language:

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

#### 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 12. Command Syntax:

```
RFANalyzer:CONTrol:MEASurement:FREQuency:AUTO?
```

##### Example 13. Shortened Form:

```
RFAN:CONT:MEAS:FREQ:AUTO?
```

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

##### Example 14. Command Syntax:

```
CALL[:CELL]:POWer[:SAMPlitude] -80dBm
```

##### Example 15. Command Syntax without Default Nodes:

```
CALL:POW -80dBm
```

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.

## Complex Commands

Complex commands are used to configure the state and assign values to parameters simultaneously. Complex commands can be used to save programming steps.

### Example 16. Configuring a Parameter State

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

turns the state of the parameter on.

### Example 17. Configuring a Parameter Value

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

assigns a value to the parameter.

### Example 18. Single Complex Command to Configure a Parameter

```
OUTPUT Test_set;"SET:DTXP:TIM:STIM 10 S"
```

would set the parameter state to ON and set the value of the parameter to 10 seconds. Note that in this example the optional command mnemonic :STIME has been included to clarify that this complex command was used to set both the state and the value.

### Example 19. Shortened Complex Command

```
OUTPUT Test_set;"SET:DTXP:TIM 10 S"
```

would also set the state to ON and set the value to 10 seconds. Note that in this example, the optional command mnemonic :STIME has been left off to shorten the complex command. This is the format that will be used throughout this programming guide.

## 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 136 mobile station in test mode in a manufacturing environment. The set of tasks is shown in [“Figure 1. Typical Flow of Tasks Performed by Control Program” on page 221](#).

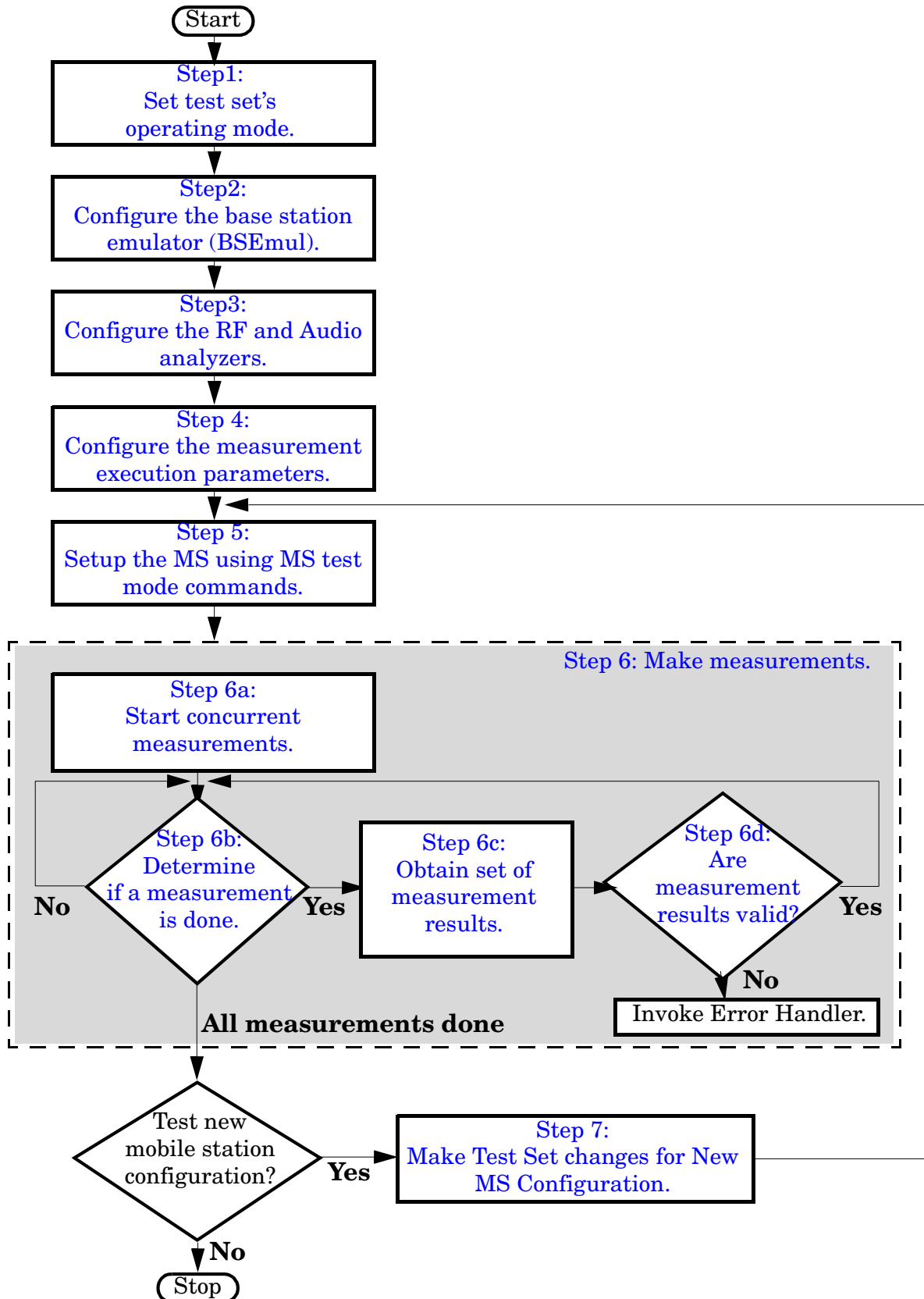
Typically in a manufacturing environment, step 4 is done once each time a production run is started and steps 5, 6, and 7 are done iteratively for each mobile tested during a production run. The number of iterations for steps 5, 6, and 7 is dependent upon how many mobile station operating conditions are being tested (that is, number of channels, number of power levels, and so fourth). Steps 1, 2, and 3 may or may not be repeated during any iteration of step 7.

## How to Use This Programming Guide

This Programming Guide is divided into 8 sections. Sections 1 through 7 (step 1 through 7) 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 255](#) which uses all of the topics discussed in sections 1 through 7 together in one program to give the programmer a sense of how to tie everything together.

Figure 1. Typical Flow of Tasks Performed by Control Program





## Step 1: Set the Test Set's Operating Mode

### Background

The test set contains a TIA/EIA-136 base station emulator. The base station emulator's primary purpose is to provide the call processing necessary for parametric measurements on the RF and audio signals of a 136 mobile station.

An important characteristic of the test set's base station emulator is its operating mode. The operating mode sets the way in which the base station emulator interacts with the mobile station. The base station emulator has four operating modes; CW mode, DTC test mode, AVC test mode, and active cell mode.

When the mobile station is operating in test mode, the test set should also be operated in DTC Test Mode, AVC Test Mode or CW Mode. The test being performed, the setup of the mobile, and the testing environment will determine which one should be used. While operating in a test mode, the base station emulator provides necessary forward channel stimulus and makes reverse channel measurements. It does not provide over-the-air signaling.

This Programming Guide focuses on programming the test set's base station emulator in DTC test mode, AVC test mode and CW mode.

### Overview of Test Mode Operating Modes

In the two test mode operating modes, the test set's base station emulator generates a traffic channel, but does no signaling with the mobile station.

**General Test Mode Features** The basic features provided by the base station emulator when the operating mode is set to a test mode are:

- All measurements supported in the test application are available.
- No over-the-air signaling is available.
- The base station emulator automatically controls the test set's receivers, unless the user sets receiver control to manual.
- The forward channel frequency setting may be specified by the user if downlink frequency control is set to manual.

**DTC Test Mode Features** The basic features specific to DTC Test Mode are:

- A DTC (Digital Traffic Channel) is generated on the forward channel.
- A "forced call" can be established. See ["Establishing a "Forced Call" in DTC Test Mode" on page 239](#).
- The Loopback BER measurement is available.
- A user specified bit error ratio can be inserted into the data sent to the mobile station while on a digital traffic channel.

### AVC Test Mode Features

The basic features specific to AVC Test Mode are:

**Step 1: Set the Test Set's Operating Mode**

- An AVC (Analog Voice Channel) is generated on the forward channel.
- SAT can be turned on and off.
- External and Internal FM are available.

**Setting the Test Set's Operating Mode to DTC and AVC Test Mode**

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

**Example 16. Command Syntax**

```
CALL:OPERating:MODE <CALL|DTCtest|AVCTest|CW>
```

**Example 17. Programming Example for DTC Test Mode**

```
!*****  
! Step 1: Set Test Set Cell Operating Mode To DTC Test Mode  
!*****  
!  
OUTPUT Test_set;"CALL:OPER:MODE DTCT"
```

**Example 18. Programming Example for AVC Test Mode**

```
!*****  
! Step 1: Set Test Set Cell Operating Mode To AVC Test Mode  
!*****  
!  
OUTPUT Test_set;"CALL:OPER:MODE AVCT"
```

**Overview of CW Mode**

CW Mode uses the base station emulator's forward link as a basic signal generator with level and frequency control.

**CW Mode Features** The basic features provided when the operating mode is set to CW Mode are:

- A CW signal is generated on the forward channel.
- Receiver control is set to manual upon entering CW Mode and set to auto when exited.
- No reverse demodulation or channel decoding is available.
- All the measurements shall be accessible, although some may appear to hang if they are waiting on a trigger from protocol or may return invalid results.

**Setting the Test Set's Operating Mode to CW Mode**

**Example 19. Programming Example for CW Mode**

```
!*****  
! Step 1: Set Test Set Cell Operating Mode To CW Mode  
!*****  
!  
OUTPUT 714;"CALL:OPER:MODE CW"
```



## Step 2: Configure the Base Station Emulator

### Background

When operating in DTC and AVC test modes, the base station emulator, using the test set's  $\pi/4$  DQPSK-modulated source, generates a forward channel (base station emulator to mobile station direction) digital traffic channel (DTC) or an analog voice channel (AVC). This forward channel stimulus is necessary for the mobile station (operating in test mode) to transmit so reverse channel measurements can be made.

The base station emulator can emulate a cell in any one of the following TIA/EIA-136 frequency bands and modes:

- Cellular Analog (800 MHz)
- Cellular Digital (800 MHz)
- PCS Digital (1900 MHz)

The task of configuring the base station emulator for DTC and AVC test modes consists of configuring the traffic channels. There are numerous parameters that can be configured for the traffic channels.

In a manufacturing environment it may be desirable to explicitly configure all 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 Traffic Channel Parameters

Table 6. The traffic channel parameters are configured using the CALL processing subsystem commands shown in the following table.

#### Traffic Channel Settable Parameters

Parameter	Command Syntax	Footnotes
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>]	1
Digital Traffic Channel Band	CALL:SETUp:DTC:BAND <CELLular   PCS>	2
Digital Traffic Channel Number	CALL:SETUp:DTC[:CHANnel][:SELected] <numeric value> OR CALL:SETUp:DTC[:CHANnel]:<CELLular   PCS> <numeric value>	3
Digital Traffic Channel Timeslot	CALL:SETUp:DTC:TSLot <numeric value>	
Digital Verification Color Code	CALL:SETUp:DTC:DVCCode <numeric value>	
Digital Traffic Channel Induced Bit Error Rate	CALL:DTC:IBERror:RATio <numeric value>	4

**Step 2: Configure the Base Station Emulator****Traffic Channel Settable Parameters**

Parameter	Command Syntax	Footnotes
Digital Traffic Channel Induced Bit Error Rate State	CALL:DTC:IBERror:STATe <ON   1   OFF   0>	4
Digital Traffic Channel Induced Bit Error Rate and State	CALL:DTC:IBERror[:SRATio] <numeric value>	4,5
Analog Voice Channel Number	CALL:SETup:AVC[:CHANnel][:SELEcted] <numeric value> OR CALL:SETup:AVC[:CHANnel]:CELLular <numeric value>	6
SAT Frequency	CALL:SETup:AVC:SATone[:CCODE] <SAT1   SAT2   SAT3>	7
Internal FM Source State and Deviation	CALL:FM:INTernal[:SDEViation] <numeric value>[<suffix>]	7,8
Internal FM Source State	CALL:FM:INTernal:STATe <ON   1   OFF   0>	
Internal FM Source Deviation	CALL:FM:INTernal:DEViation <numeric value>[<suffix>]	7
Internal FM Source Frequency	CALL:FM:INTernal:FREQuency <numeric value>[<suffix>]	
External FM Input State	CALL:FM:EXTernal:STATe <ON   1   OFF   0>	7,9

**Table Footnotes**

- 1 Complex command to set the amplitude to <numeric value> and state to ON in one command.
- 2 The DTC band setting becomes the selected band (see Note 3).
- 3 Sets the DTC channel for the DTC band selected with the DTC Band command (see Note 2).
- 4 This parameter is available in Active Cell operating mode when generating a DTC, or in DTC Test operating mode.
- 5 Complex command to set the DTC induced bit error rate and to turn the DTC induced bit error rate to ON in one command
- 6 The selected (:SELEcted) band is Cellular, the only available band for an AVC.
- 7 Make sure that the sum of the 3 FM sources (Internal FM, External FM, and SAT) does not exceed 20kHz deviation.
- 8 Complex command to set the internal FM source deviation and to turn the internal FM source state to ON in one command.
- 9 The FM deviation is fixed at 20kHz/volt with a 1 volt maximum input voltage.

**Example 20. Programming Example:**

```
!*****  
! Step 2: Configure the Base Station Emulator  
!*****  
OUTPUT Test_set;"CALL:POW -50"  
OUTPUT Test_set;"CALL:SET:DTC:BAND CELL"  
OUTPUT Test_set;"CALL:SET:DTC:CHAN 1"
```



## Step 3: Configure the RF and Audio Analyzers

### RF Analyzer

Normally, the base station emulator internal receiver parameters are controlled automatically based on what protocol expects the mobile station to be transmitting. However, there are times when this does not offer sufficient control for some measurement scenarios. The following internal parameters sometimes require manual control:

- Internal Measurement Frequency
- Internal Receiver Power

### Measurement Receiver Frequency Controls

These Receiver Frequency Controls define whether the base station emulator's frequency tuning of the measurement receivers is controlled automatically by the base station emulator or manually by the user.

---

#### NOTE

Measurement Receiver Frequency Control is always set to manual when operating mode in CW Mode.

---

**Configuring the Measurement Receiver Frequency Parameters** When the user sets the Measurement Receiver Frequency Control to "Manual", the measurement receiver frequency is tuned to the value of the Manual Measurement Frequency.

#### Measurement Receiver Frequency Control and Settable Parameters

Parameter	Command Syntax	Footnotes
Measurement Receiver Frequency Control	RFANalyzer:CONTRol:MEASurement:FREQuency:AUTO <1   ON   0   OFF>	
Manual Measurement Frequency	RFANalyzer:MANual:MEASurement:FREQuency <numeric value>[<suffix>]	
Manual Measurement Frequency and Control	RFANalyzer:MANual:MEASurement[:MFREQuency] <numeric value>[<suffix>]	1

#### Table Footnotes

1 Sets frequency to <numeric value> and control to manual in one command.

### Measurement Receiver Input Power Level Controls

The Receiver Power Level Controls define whether the Internal Receiver Power parameter shall automatically be determined by the value of the MS Power Level parameter or if it shall be set manually by the user.

**Step 3: Configure the RF and Audio Analyzers**

**Configuring the Manual Receiver Power Level** There are four Manual Receiver Power Level parameters:

- Manual Digital Receiver Power Level <Cellular>
- Manual Digital Receiver Power Level <PCS>
- Manual Analog Receiver Power Level <Cellular>
- Manual CW Power Level

These parameters store the Manual Receiver Power Level in units of dBm. They are applied when the Receiver Input Power Control is set to Manual.

**NOTE**

When operating in CW Mode, the value of the Manual CW Power Level parameter is always used, even if the Receiver Input Power Control is set to Auto.

**Manual Receiver Input Power Control and Settable Parameters**

Parameter	Command Syntax
Receiver Input Power Control	RFANalyzer:CONTRol:POWer:AUTO <1   ON   0   OFF>
Manual Analog Receiver Power Level <Cellular>	RFANalyzer:MANual:ANALog:POWer[:SELEcted] <numeric value>[<suffix>] OR RFANalyzer:MANual:ANALog:POWer:CELLular <numeric value>[<suffix>]
Manual Digital Receiver Power Level	RFANalyzer:MANual:DIGital:POWer[:SELEcted] <numeric value>[<suffix>] OR RFANalyzer:MANual:DIGital:POWer:<CELLular   PCS> <numeric value>[<suffix>]
Manual CW Power Level	RFANalyzer:CW:EXPEcted:POWer <numeric value>[<suffix>]

The range of the Manual Receiver Power Level parameters (-60 dBm to +53 dBm) is beyond the capability of the hardware to support. (The hardware range is -25 dBm to +43 dBm.) This is because these parameters are intended to reflect the potential range of RF power at the DUT plane. This larger range of DUT plane power levels can then be accommodated by the use of a gain or loss network between the DUT and the instrument, in conjunction with the Amplitude Offset setting.

**How to determine Test Set's Expected Receiver Power value**

Operating Mode	Receiver Input Power Control	Expected Receiver Power	Range
DTC and AVC Test Modes	Auto	(Analog or Digital) MS Power Level (in cellular or PCS bands) + Amplitude Offset	-25 dBm to +43dBm
	Manual	Manual (Analog or Digital) Receiver Power Level + Amplitude Offset	
CW Mode	Manual (default) or Auto	Manual CW Power Level + Amplitude Offset	

---

**NOTE**

The Manual Receiver Power Level parameters are never overwritten by settings made to the corresponding MS TX Level parameter.

---

**Example 21. Programming Example**

```
!*****
! Step 3: Configure the RF and Audio Analyzers
!*****
OUTPUT Test_set;"RFAN:MAN:MEAS 870 MHZ"
OUTPUT Test_set;"RFAN:CONT:POW:AUTO OFF"
OUTPUT Test_set;"RFAN:MAN:DIG:POW 25 DBM"
```

**Audio Analyzer**

The Audio Analyzer Function is implemented as an “instrument” rather than a “measurement.” Therefore, from the user’s perspective, some parameters used for configuration are more like those associated with the base station emulator than those used by measurements.

Refer to the reference material for the additional parameters and functions associated with the Audio Analyzer.





## Step 4: 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:

- Statistical Measurement Results (used by most measurements)

Multi-Measurement Count State  
Multi-Measurement Count Number

- Measurement Timeouts (used by all measurements)

Measurement Timeout  
Measurement Timeout State

- Measurement Triggering (used by most measurements)

Trigger Arm (used by all measurements)  
Trigger Source (not used by AVC Test Mode)  
Trigger Delay (not used by AVC Test Mode)

---

**NOTE** Not all measurements use all the execution parameters shown above. Additionally, some measurements have parameters that are specific to the measurement. Each measurement has its own set of parameters that are unique to it and have no effect 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 Technologies E1961A 136/AMPS mobile test application and their associated <meas-mnemonic> used in the SETup command syntax.

**Measurement Mnemonics Used In The SETup Subsystem**

Measurement	<meas-mnemonic>
Adjacent Channel Power	ACPower
Analog Transmit Power	ATXPower
Audio Analyzer	AFANalyzer
Digital Transmit Power	DTXPower

**Step 4: Configure the Measurement Execution Parameters****Measurement Mnemonics Used In The SETup Subsystem**

Measurement	<meas-mnemonic>
Dynamic Transmit Power	DPOWer
Frequency Modulation	FM
Frequency Stability	FSTability
IQ Tuning	IQTuning
Loopback BER	LBError
Modulation Accuracy	MACCuracy

**Configuring Statistical Measurement Results Parameters****Statistical Measurement Results Parameters**

Parameter	Command Syntax
Measurement Count Number and State	SETup:<meas-mnemonic>:COUNT[:SNUMBER] <numeric value>
Measurement Count State	SETup:<meas-mnemonic>:COUNT:STATE <ON 1 OFF 0>
Measurement Count Number	SETup:<meas-mnemonic>:COUNT:NUMBER <numeric value>

**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 (See “Complex Commands” on page 219.)

**Example 22. Programming Example:**

```
OUTPUT Test_set;"SET:DTXP:COUN 10"
```

would set the multi-measurement count state to ON and set the number of averages to 10 for the digital transmit power measurement.

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

**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.

## Configuring Measurement Triggering Parameters

### Measurement Triggering Parameters

Parameter	Command Syntax
Trigger Arm	SETup:<meas-mnemonic>:CONTInuous <ON 1 OFF 0>
Trigger Source	SETup:<meas-mnemonic>:TRIGger:SOURce <AUTO IMMediate PROTOcol RISE>
Trigger Delay	SETup:<meas-mnemonic>:TRIGger:DELay <numeric value> [<suffix>]

**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).

---

**NOTE** The recommended trigger arm setting for all measurements when programming the test set is single (CONTInuous OFF).

---

#### Example 23. Programming Example:

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

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

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

---

**NOTE** The recommended trigger source setting for all measurements when programming the test set is AUTO.

---

#### Example 24. Programming Example:

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

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

---

**NOTE** Trigger Source is always IMMediate for measurements in AVC Test Mode and cannot be changed by the user.

---

### 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 25. Programming Example:

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

would set the trigger delay to 10  $\mu$ s for the digital transmit power measurement.

**Step 4: Configure the Measurement Execution Parameters**


---

**NOTE** Trigger Delay is not applicable to measurements in AVC Test Mode.

---

**Configuring Measurement Timeout Parameters****Measurement Timeout Parameters**

Parameters	Command Syntax
Measurement Timeout Time and State	SETup:<meas-mnemonic>:TIMEout[:STIME] <numeric value>[<suffix>]
Measurement Timeout State	SETup:<meas-mnemonic>:TIMEout:STATE <ON 1 OFF 0>
Measurement Timeout Time	SETup:<meas-mnemonic>:TIMEout:TIME <numeric value>[<suffix>]

**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 (See “Complex Commands” on page 219.)

**Example 26. Programming Example:**

```
OUTPUT Test_set;"SET:DTXP:TIM 10"
```

would set the measurement timeout state to ON and set the measurement timeout time to 10 seconds for the digital transmit power measurement.

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

**Example 27. Programming Example:**

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

would enable measurement timeouts for the modulation accuracy 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 28. Programming Example:**

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

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

**Example 29. Programming Example**

```
!*****
! Step 4: Configure Measurement Execution Parameters
!*****
!
! Configure Modulation Accuracy Measurement:
!
OUTPUT Test_set;"SET:MACC:COUN 5" ! Example of using a complex
```

**Step 4: Configure the Measurement Execution Parameters**

```
! command to set multi-meas
! state and count at same time.
OUTPUT Test_set;"SET:MACC:TRIG:SOUR AUTO"! Set trig source Auto.
OUTPUT Test_set;"SET:MACC:CONT OFF" ! Set trig mode to single.
OUTPUT Test_set;"SET:MACC:TIM 15" ! Set timeout time 15 sec.
OUTPUT Test_set;"SET:MACC:EVM10:STAT ON"! Turn EVM10 State ON
!
! Configure Digital TX Power Measurement:
!
OUTPUT Test_set;"SET:DTXP:COUN 5"
OUTPUT Test_set;"SET:DTXP:TRIG:SOUR AUTO"
OUTPUT Test_set;"SET:DTXP:CONT OFF"
OUTPUT Test_set;"SET:DTXP:TIM 15"
!
! Configure the Loopback BER Measurement
!
OUTPUT Test_set;"SET:LBER:CONT OFF;TIM 5"
OUTPUT Test_set;"SET:LBER:COUN 12000"
!
! Configure Analog TX Power Measurement
!
OUTPUT Test_set;"SET:ATXP:COUN 5"
OUTPUT Test_set;"SET:ATXP:CONT OFF"
OUTPUT Test_set;"SET:ATXP:TIM 15"
```

**Step 4: Configure the Measurement Execution Parameters**

## Step 5: Setup the MS Using MS Test Mode Commands

### Background

In DTC test mode, AVC test mode and CW mode, the test set provides forward channel stimulus but has no control over or communication with the mobile station. At this point, either the control program via a serial bus or other interface, or the user with the mobile's keypad, must set up the mobile station in order for the test set to make measurements.

### Establishing a “Forced Call” in DTC Test Mode

The user may manually synchronize the mobile station with the test set's DTC, and then turn on the mobile station's own DTC. If both the reverse and forward channels use the same channel number, band, DVCC, MS Tx Power Level and timeslot, what is sometimes known as a “forced call” is in progress.

### Characteristics of a “Forced Call”

- Demodulation and channel decoding of the reverse channel are available, although no messages will be decoded.
- The DTC burst contains a repeating random pattern.
- No voice echo is supported with a “forced call”.

### Mobile station and test set parameters which must be the same for a “forced call” to be established

- Band
- Channel Number
- Timeslot
- DVCC
- MS Transmit Power Level

---

#### NOTE

The method used to synchronize the mobile station with the test set is proprietary to the mobile station manufacturer. The base station emulator has no direct control of synchronization when the mobile station is operating in test mode.

---

**Step 5: Setup the MS Using MS Test Mode Commands**



---

## 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 required to implement measurement concurrency.

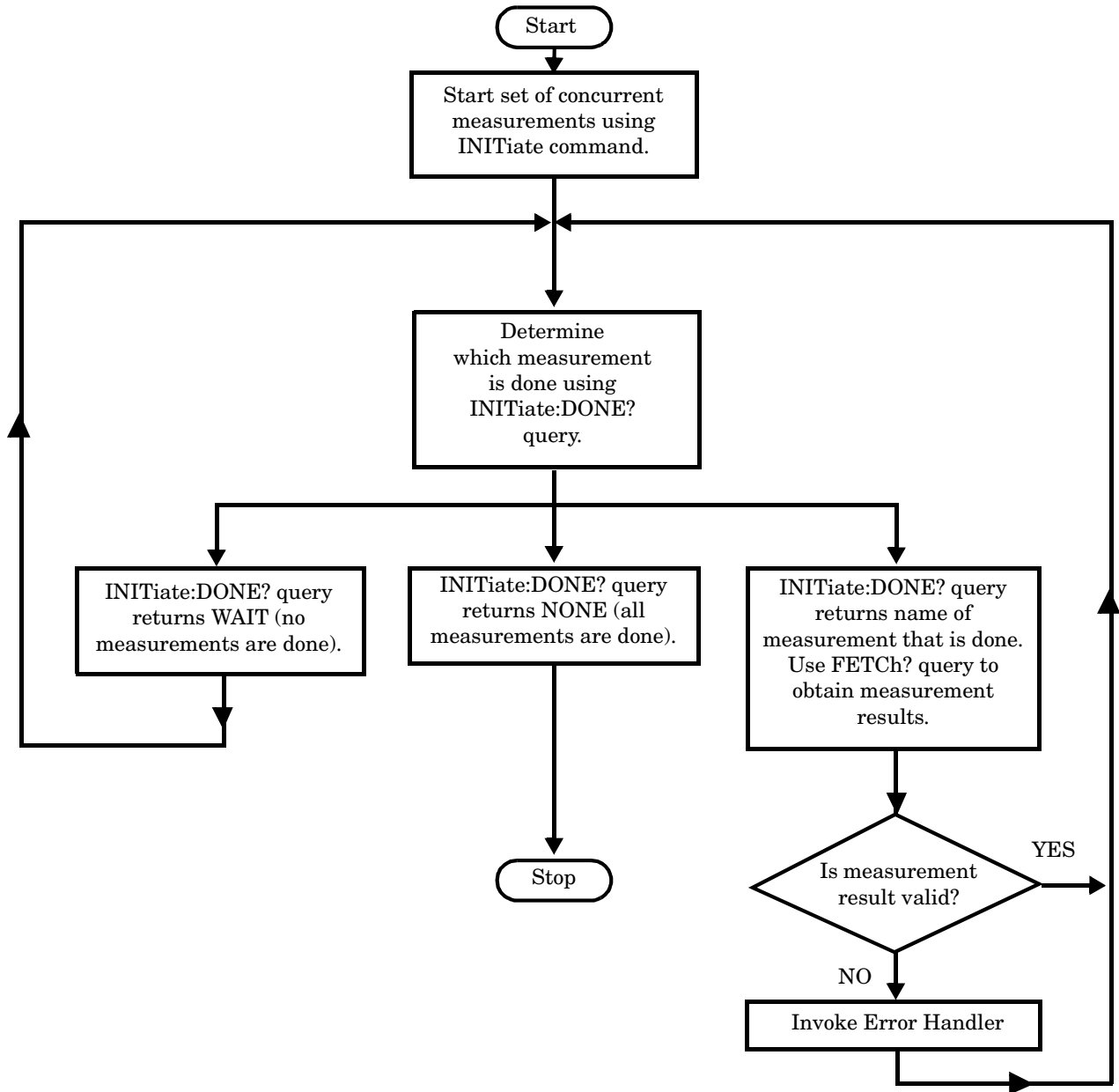
[“Step 6: Figure 1. Process for Making Concurrent Measurements” on page 242](#) shows the recommended process for making concurrent measurements using the test set’s command set.

### Making Sequential Measurements

Step 6 explains how to initiate measurements concurrently and what process to use when fetching results. These can be applied to sequential measurements. It is unnecessary to use the commands in Step 6b when performing sequential measurements.

Step 6: Make Measurements

Step 6: Figure 1. Process for Making Concurrent Measurements



**Example 30. Programming Example:**

The following program segment illustrates making a loopback BER measurement and a digital transmit power measurement concurrently using the recommended process shown in [“Step 6: Figure 1. Process for Making Concurrent Measurements”](#) on page 242.

```

810  !*****
820  ! Step 6: Make Measurements
830  !*****
840  !
850  ! Step 6a: Start Set of Concurrent Measurements:
860  !
870  OUTPUT Test_set;"INIT:LBER;DTXP"
880  !
890  ! Step 6b: Determine if A Measurement Is Done:
900  !
910  LOOP
920      OUTPUT Test_set;"INIT:DONE?"
930      ENTER Test_set;Meas_done$
940  !
950  ! Step 6c: Obtain Measurement Results
960  !
970      SELECT Meas_done$
980      CASE "DTXP"
990          OUTPUT Test_set;"FETC:DTXP:INT?;POW?"
1000         ENTER Test_set;Integrity,Avg_dig_pow
1010 ! Step 6d: Are Measurement Results Valid?
1020     IF Integrity=0 THEN
1030         PRINT "AVG DIG POW= ",Avg_dig_pow
1040     ELSE
1050         GOSUB Bad_int_ind ! Go to error handling subroutine
1060     END IF
1070     CASE "LBER"
1080         OUTPUT Test_set;"FETC:LBER?"
1090         ENTER Test_set;Integrity,Bits_tested,Ber_ratio,Ber_count
1100 ! Step 6d: Are Measurement Results Valid?
1110     IF Integrity=0 THEN
1120         PRINT "BITS TESTED = ";Bits_tested
1130         PRINT "BER = ";Ber_ratio
1140         PRINT "ERROR COUNT = ";Ber_count
1150     ELSE
1160         GOSUB Bad_int_ind ! Go to error handling subroutine
1170     END IF
1180     END SELECT
1190 EXIT IF Meas_done$="NONE"
1200 END LOOP

```

**Things That Can Go Wrong**

**Step 6: Make Measurements**

**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** You can compensate for fixture or cable loss by using the RF IN/OUT port's amplitude offset parameters. Twenty different offsets can be set up for twenty different frequencies. To set the frequencies use the command:

```
SYSTem:CORRection:SFRequency (comma separated numeric values)<suffix>
```

Similarly, to then set the offsets for these frequencies, use the following command syntax:

```
SYSTem:CORRection:SGain (comma separated numeric values)<suffix>
```

Refer to the reference documentation for details about how to use these commands properly.

---

## Step 6a: Start Set Of Concurrent Measurements

### Starting Measurements

Each measurement in a test application can be started using the INITiate command. The syntax of the INITiate command is as follows:

#### Example 1. Command Syntax:

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

The following table shows the measurements available in the Agilent Technologies E1961A AMPS/136 mobile test application and their associated <meas-mnemonic> used in the INITiate command syntax.

**Measurement Mnemonics Used In The INITiate Subsystem**

Measurement	<meas-mnemonic>
Adjacent Channel Power	ACPower
Analog Transmit Power	ATXPower
Audio Analyzer	AFANalyzer
Digital Transmit Power	DTXPower
Dynamic Transmit Power	DPOwer
Frequency Modulation	FM
Frequency Stability	FSTability
Loopback BER	LBError
IQ Tuning	IQTuning
Modulation Accuracy	MACCuracy

---

**NOTE** The Dynamic Transmit Power measurement closes all other active measurements when it is activated, therefore it should not be used concurrently with other measurements. Refer to the user documentation for more information.

---

#### Example 31. Programming Example:

```
OUTPUT Test_set;"INIT:DTXP"
```

would start the digital transmitter power measurement.

### Using Compound Commands to Start Concurrent Measurements

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

```
OUTPUT Test_set;"INIT:DTXP;LBError"
```

**Step 6a: Start Set Of Concurrent Measurements**

would start the digital transmit power measurement and the loopback BER measurement. These measurements would then run concurrently.

## Step 6b: Determine if a Measurement Is Done

### Background

After a set of concurrent measurements has been started, it is desirable that the control program be able to determine when individual measurement results are available. This enables the control program to request results for a completed measurement without having to wait for other measurements to finish.

---

**NOTE** Step 6b applies only to measurements that have been initiated concurrently. When measurements have been initiated one at a time (sequential measurements) it is unnecessary to use the INITiate:DONE? query command. Step 6b can be skipped for sequential measurements.

---

### 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 table on the following page.

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 assumes the control program immediately fetches a measurement's results once it is reported as being done.

#### Responses Returned from INITiate:DONE? Query

Response	Meaning
ACP	The adjacent channel power measurement is done.
ATXP	The analog transmit power measurement is done.
AFAN	The audio analyzer measurement is done.
DPOW	The dynamic transmit power measurement is done.
DTXP	The digital transmit power measurement is done.
FM	The frequency modulation measurement is done.
FST	The frequency stability measurement is done.
IQT	The IQ Tuning measurement is done.
LBER	The loopback BER measurement is done.
MACC	The modulation accuracy measurement is done.
WAIT	There are one or more measurements that are in progress, but none of those measurements are done yet.

**Step 6b: Determine if a Measurement Is Done**

**Responses Returned from INITiate:DONE? Query**

<b>Response</b>	<b>Meaning</b>
NONE	No measurements are in progress.

**Example 32. Command Syntax:**

INITiate:DONE?



## 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 digital transmit power measurement with statistical measurement results 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 digital 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 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 E1961A AMPS/136 mobile

**Step 6c: Obtain a Set of Measurement Results**

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>
Adjacent Channel Power	ACPower
Analog Transmit Power	ATXPower
Audio Analyzer	AFANalyzer
Digital Transmit Power	DTXPower
Dynamic Transmit Power	DPOWer
Frequency Modulation	FM
Frequency Stability	FSTability
IQ Tuning	IQTuning
Loopback BER	LBError
Modulation Accuracy	MACCuracy

**Example 1. Command Syntax:**

```
FETCh:<meas-mnemonic>:<result format>?
```

**Example 2. Programming Example:**

```
OUTPUT Test_set;"FETC:DTXP:POW:MIN?"
```

would return the minimum value from the set of samples taken during the digital transmit power measurement (when statistical measurement results are turned on and number of samples taken >1). The returned value can be assigned to a variable using the following HP Basic command:

```
ENTER Test_set;Min_dig_pow
```

---

## Step 6d: Validate Measurement Results

### Background

Validating measurement results is extremely important when using test modes. The test set will return a result if it is capable of making a measurement, even if this result was obtained under adverse conditions. The lack of signaling between the mobile and the test set prevents the test set from knowing the condition of the link. Therefore, the only indicator provided by the test set that the measurement conditions were unacceptable becomes the integrity indicator. It is essential to check the value returned for the integrity indicator of each measurement.

For example, when a “forced call” is established the MS should be synchronized with the test set. In some cases, the MS may not successfully synchronize to the test set but will still begin to transmit. The test set will make measurements, but they will be triggered in the wrong place and the results will most likely be invalid. When making measurements in DTC test mode, it is possible to set up the mobile on the correct channel and the wrong timeslot and still have the mobile’s transmitter turn on. The test set WILL return values for the measurements but will also return integrity indicators other than 0.

**Step 6d: Validate Measurement Results****Overview**

The integrity indicator is a measurement result and therefore is queried using the FETCh subsystem. A value of 0 indicates that the measurement is valid. A value other than 0 indicates that an error occurred during the measurement process.

**Integrity Indicators**

<b>Value Returned</b>	<b>Description (Message also appears on Test Set)</b>
0	Normal
1	No Result Available
2	Measurement Timeout
3	Hardware Not Installed
4	Hardware Error
5	Over Range
6	Under Range
7	Burst Short
8	Trigger Early or Fall Early
9	Trigger Late or Rise Late
10	Signal Too Noisy
11	Sync Not Found
12	Oven Out of Range
13	Unidentified Error

**Example 33. Programming Example**

```

OUTPUT Test_set;"FETC:DTXP?"
ENTER Test_set;Integrity,Avg_dig_pow
IF Integrity=0 THEN
    PRINT "AVG DIG POW= ";Avg_dig_pow
ELSE
    PRINT "DTXP Measurement Error"
    PRINT "DTXP Measurement Integrity is ";Integrity
END IF

```

## Step 7: Make Test Set Changes for New MS Configuration

### Background

The test set must be put into any new configuration before the mobile station in order for the mobile station to be able to synchronize to the test set. This involves repeating steps 1, 2, or 3 or any combination of the three. It is only necessary to perform step 4 once. Therefore, it is possible to set up both digital and analog measurements all at once and later initiate them when the test set is in the appropriate operating mode.

### Possible Test Set Changes

#### Repeat Step 1: Set the Test Set's Operating Mode

This step would be appropriate if all tests in one operating mode have been completed and more tests need to be performed in a different operating mode. There are four operating modes: DTC Test Mode, AVC Test Mode, CW Mode, and Active Cell Mode.

#### Repeat Step 2: Configure the Base Station Emulator

This step would be appropriate if testing at a new power level, channel, timeslot, or band.

#### Repeat Step 3: Configure the RF and Audio Analyzers

This step would be appropriate if testing at a new power level, frequency, timeslot, or band and control of the receiver was manual. Another instance would be if audio tests were to be performed.



## Comprehensive Program Example

This section presents two example programs for making measurements using the test set in DTC and AVC test modes. The first program follows the task flow presented at the beginning of this programming guide and illustrates how each step presented throughout the guide fits together into a single program. The second program is an example of more efficient programming techniques.

### Example Program 1

```

10      !*****
20      !   Program: PROG_EX.TXT                               October 9, 2000
30      !   Purpose:  Comprehensive Example of programming measurements on
40      !                   the Agilent Technologies 8960 using DTC and AVC
50      !                   test modes.
60      !                   This example is written in HP BASIC.
70      !*****
80      !
90      !   Configure the HP BASIC environment.
100     !   These actions are unrelated to configuring or performing tests
110     !       with the 8960.
120     !
130     OPTION BASE 1
140     COM Test_set
150     Test_set=714!   Test set's GPIB address
160     PRINTER IS CRT
170     CLEAR SCREEN
180     ON TIMEOUT 7,10 GOTO Timeout_routine
190     !
200     !   Turn on the GPIB debugger. This is for development purposes and
210     !   should be turned off after development is completed.
220     OUTPUT Test_set,"SYST:COMM:GPIB:DEB:STAT ON"
230     !
240     !*****
250     ! Step 1: Set Test Set Cell Operating Mode To DTC Test Mode
260     !*****
270     !
280     OUTPUT Test_set,"CALL:OPER:MODE DTCT"
290     !*****
300     ! Step 2: Configure the Base Station Emulator
310     !*****
320     OUTPUT Test_set,"CALL:POW -50"! Set cell power to -50 dBm and turn
330     !                               ! power state ON with complex command
340     OUTPUT Test_set,"CALL:SET:DTC:BAND CELL"! Set active band to cell
350     OUTPUT Test_set,"CALL:SET:DTC:CHAN 42"! Set traffic channel to 42
360     !
370     !*****
380     ! Step 3: Configure the RF and Audio Analyzers
390     !*****
400     !
410     OUTPUT Test_set,"RFAN:CONT:POW:AUTO OFF"

```

**Comprehensive Program Example**

```

420  OUTPUT Test_set;"RFAN:MAN:DIG:POW 25 DBM"
430  OUTPUT Test_set;"RFAN:MAN:ANAL:POW 25 DBM"
440  !*****
450  ! Step 4: Configure Measurement Execution Parameters
460  !*****
470  !
480  !   Configure Modulation Accuracy Measurement:
490  !
500  OUTPUT Test_set;"SET:MACC:COUN 5"   ! Example of using a complex
510                                     ! command to set multi-meas
520                                     ! state and count at same time.
530  OUTPUT Test_set;"SET:MACC:TRIG:SOUR AUTO"! Set trig source Auto.
540  OUTPUT Test_set;"SET:MACC:CONT OFF"   ! Set trig mode to single.
550  OUTPUT Test_set;"SET:MACC:TIM 15"     ! Set timeout time 15 sec.
560  OUTPUT Test_set;"SET:MACC:EVM10:STAT ON"! Turn EVM10 State ON
570  !
580  !   Configure Digital TX Power Measurement:
590  !
600  OUTPUT Test_set;"SET:DTXP:COUN 5"
610  OUTPUT Test_set;"SET:DTXP:TRIG:SOUR AUTO"
620  OUTPUT Test_set;"SET:DTXP:CONT OFF"
630  OUTPUT Test_set;"SET:DTXP:TIM 15"
640  !
650  !   Configure Analog TX Power Measurement
660  !
670  OUTPUT Test_set;"SET:ATXP:COUN 5"
680  OUTPUT Test_set;"SET:ATXP:CONT OFF"
690  OUTPUT Test_set;"SET:ATXP:TIM 15"
700  !
710  !   Configure Frequency Stability Measurement
720  !
730  OUTPUT Test_set;"SET:FST:CONT OFF;COUN 10;TIM 15"
740  !
750  !*****
760  ! Step 5: Set Up The MS Using MS Test Mode Commands
770  !*****
780  PRINT "PUT THE MS INTO DIGITAL TEST MODE NOW"
790  PRINT "PRESS CONTINUE"
800  PAUSE
810  !*****
820  ! Step 6: Make Measurements
830  !*****
840  !
850  ! Step 6a: Start Set of Concurrent Measurements:
860  !
870  OUTPUT Test_set;"INIT:DTXP;MACC"
880  !
890  ! Step 6b: Determine if A Measurement Is Done:
900  !
910  LOOP
920     OUTPUT Test_set;"INIT:DONE?"
930     ENTER Test_set;Meas_done$
940  !

```



```

950 ! Step 6c: Obtain Measurement Results
960 !
970 SELECT Meas_done$
980 CASE "MACC"
990     GOSUB Mod_acc !Example of using a subroutine to query
1000 CASE "DTXP"
1010     OUTPUT Test_set;"FETC:DTXP:INT?;POW?"
1020     ENTER Test_set;Integrity,Avg_dig_pow
1030     IF Integrity=0 THEN
1040         PRINT "AVG DIG POW= ",Avg_dig_pow
1050     ELSE
1060         GOSUB Bad_int_ind
1070 !
1080 ! Step 6d: Are Measurement Results Valid?
1090 !
1100     END IF
1110 END SELECT
1120 EXIT IF Meas_done$="NONE"
1130 END LOOP ! If 'WAIT' is returned from the 'INIT:DONE?' query, it
1140     ! will fall through the loop
1150 !*****
1160 ! Step 7: Make Test Set Changes for New MS Configuration
1170 !*****
1180 !
1190 ! Proceed to analog tests
1200 !
1210 !*****
1220 ! Step 1(REPEATED): Set Test Set Cell Operating Mode AVC Test Mode
1230 !*****
1240 !
1250 OUTPUT Test_set;"CALL:OPER:MODE AVCT"
1260 !*****
1270 ! Step 2: Configure the Base Station Emulator (BSEmul)
1280 !*****
1290 OUTPUT Test_set;"CALL:SET:AVC:CELL 42"! Set channel number
1300 !*****
1310 ! Step 5(REPEATED): Set Up The MS Using MS Test Mode Commands
1320 !*****
1330 PRINT " "
1340 PRINT "PUT THE MS INTO ANALOG TEST MODE NOW"
1350 PRINT "PRESS CONTINUE"
1360 PAUSE
1370 !
1380 !*****
1390 ! Step 6(REPEATED): Make Measurements
1400 !*****
1410 !
1420 ! Step 6a: Start Set of Concurrent Measurements:
1430 !
1440 OUTPUT Test_set;"INIT:ATXP;FST"
1450 !
1460 !
1470 ! Step 6b: Determine if a measurement is done:

```

## Comprehensive Program Example

```

1480 LOOP
1490     OUTPUT Test_set;"INIT:DONE?"
1500     ENTER Test_set;Ana_meas_done$
1510     !
1520     ! Step 6c: Obtain Measurement Results
1530     !
1540     SELECT Ana_meas_done$
1550     !
1560     CASE "ATXP"
1570         OUTPUT Test_set;"FETC:ATXP?"
1580         ENTER Test_set;Integrity,Avg_ana_pow
1590         IF Integrity=0 THEN
1600             PRINT "AVG ANALOG POW= ",Avg_ana_pow
1610         ELSE
1620             GOSUB Bad_int_ind
1630         END IF
1640     CASE "FST"
1650         OUTPUT Test_set;"FETC:FST?"
1660         ENTER Test_set;Integrity,Wfreq_err,Avg_freq
1670         IF Integrity=0 THEN
1680             PRINT
1690             PRINT "Analog Frequency Stability Measurement Results"
1700             PRINT "Worst Frequency Error = ";Wfreq_err
1710             PRINT "Average Frequency = ";Avg_freq
1720         ELSE
1730             GOSUB Bad_int_ind
1740         END IF
1750     END SELECT
1760 EXIT IF Ana_meas_done$="NONE"
1770 END LOOP
1780 !*****
1790 ! Step 7(REPEATED): Test Set Changes for New MS Configuration
1800 !*****
1810 !
1820 ! Proceed to audio tests
1830 !
1840 !*****
1850 ! Step 2: Configure the Base Station Emulator (BSEmul)
1860 !*****
1870 !
1880 OUTPUT Test_set;"CALL:POW -116 DBM"
1890 OUTPUT Test_set;"CALL:SET:AVC 600"
1900 !
1910 !*****
1920 ! Step 3(REPEATED): Configure the RF and Audio analyzers
1930 !*****
1940 OUTPUT Test_set;"CALL:FM:INT:FREQ 1004 HZ;SDEV 8 KHZ"
1950 OUTPUT Test_set;"CALL:AVCT:AVC:SAT:STAT OFF"
1960 OUTPUT Test_set;"SET:AFAN:CONT OFF;TIM 15"
1970 OUTPUT Test_set;"SET:AFAN:PEAK:VOLT 3V"
1980 OUTPUT Test_set;"SET:AFAN:SDIS:STAT ON"
1990 OUTPUT Test_set;"SET:AFAN:SDIS:FREQ 1004 HZ"
2000 OUTPUT Test_set;"SET:AFAN:FILT CMES"

```

```
2010 OUTPUT Test_set;"SET:AFAN:DEMP:STAT OFF"
2020 OUTPUT Test_set;"SET:AFAN:EXP:STAT OFF"
2030 !*****
2040 ! Step 5(REPEATED): Set Up The MS Using MS Test Mode Commands
2050 !*****
2060 PRINT " "
2070 PRINT "CONFIGURE THE MS FOR RECEIVER SENSITIVITY TESTING"
2080 PRINT "SET THE PHONE FOR A MIDDLE CHANNEL IN THE CELL BAND"
2090 PRINT "POWER LEVEL OF 0"
2100 PRINT "PRESS CONTINUE"
2110 PAUSE
2120 !
2130 !*****
2140 ! Step 6(REPEATED): Make Measurements
2150 !*****
2160 !
2170 OUTPUT Test_set;"INIT:AFAN"
2180 OUTPUT Test_set;"FETC:AFAN:INT?;SINAD?"
2190 ENTER Test_set;Integrity,Avg_sinad
2200 IF Integrity=0 THEN
2210 PRINT
2220 PRINT "Receiver Sensitivity Results"
2230 PRINT "SINAD = ";Avg_sinad;"dBm"
2240 ELSE
2250 PRINT "MEASUREMENT FAILED"
2260 PRINT "INTEGRITY = ";Integrity
2270 END IF
2280 !
2290 ! Change power for Distortion measurement
2300 !
2310 OUTPUT Test_set;"CALL:POW -50 DBM"
2320 !
2330 ! Measure Distortion
2340 !
2350 OUTPUT Test_set;"INIT:AFAN"
2360 OUTPUT Test_set;"FETC:AFAN:INT?;DIST?"
2370 ENTER Test_set;Integrity,Avg_distortion
2380 IF Integrity=0 THEN
2390 PRINT
2400 PRINT "Average Distortion Results"
2410 PRINT "Distortion = ";Avg_distortion;"%"
2420 ELSE
2430 PRINT "MEASUREMENT FAILED"
2440 PRINT "INTEGRITY = ";Integrity
2450 END IF
2460 STOP
2470 !
2480 ! Subroutines
2490 !
2500 Mod_acc:! Query and output results for MACC
2510 OUTPUT Test_set;"FETC:MACC:INT?;EVM10?"
2520 ENTER Test_set;Integrity,Max_evm10
2530 IF Integrity=0 THEN
```

**Comprehensive Program Example**

```

2540     PRINT "MAX EVM10 = ",Max_evml0
2550 ELSE
2560     GOSUB Bad_int_ind
2570 END IF
2580 RETURN
2590 Bad_int_ind: !
2600 PRINT Meas_done$&" Measurement Error"
2610 PRINT "Measurement Integrity Indicator: ",Integrity
2620 RETURN
2630 Timeout_routine: !
2640 PRINT "GPIB timeout has occurred."
2650 END

```

**Example Program 2**

```

10     !*****
20     ! Comprehensive Example Program
30     ! 8960 AMPS/136 Test Mode
40     !
50     ! This is an example program to demonstrate the use of Momentum
60     ! with AMPS/136 TA testing a dual-mode TDMA phone in Test Mode.
70     ! The program makes Digital Cellular, Digital PCS, and Analog
80     ! measurements in Test (no call processing) Mode.
90     !*****
100    !
110    COM /Address/ INTEGER Testset
120    Testset=714
130    ON TIMEOUT 7,20 GOSUB Timeout
140    Rf_level=-50
150    Ber_level=-110
160    Sinad_level=-116
170    CLEAR SCREEN
180    !
190    !*****
200    ! Configure Testset Parameters
210    !*****
220    !
230    OUTPUT Testset;"*RST"
240    OUTPUT Testset;"SYST:COMM:GPIB:DEB:STAT ON"
250    ! Remove after development is finished.
260    !
270    !*****
280    ! Configure Base Station Emulator Parameters
290    !*****
300    !
310    OUTPUT Testset;"CALL:CELL:OPER:MODE DTCT"
320    OUTPUT Testset;"SYST:CORR -0.7DB"
330    OUTPUT Testset;"CALL:POW ";Rf_level
340    OUTPUT Testset;"CALL:SET:AVC 400"
350    OUTPUT Testset;"CALL:SET:DTC:BAND CELL"
360    OUTPUT Testset;"CALL:SET:DTC:CHAN:CELL 42"
370    OUTPUT Testset;"CALL:SET:DTC:CHAN:PCS 1000"
380    OUTPUT Testset;"RFAN:CONT:POW:AUTO OFF"

```

```

390 OUTPUT Testset;"RFAN:MAN:ANAL:POW 25"
400 OUTPUT Testset;"RFAN:MAN:DIG:POW:CELL 25"
410 OUTPUT Testset;"RFAN:MAN:DIG:POW:PCS 25"
420 OUTPUT Testset;"CALL:FM:INT:STATE OFF;DEV 8KHZ;FREQ 1004HZ"
430 !
440 !*****
450 ! Configure Measurement Parameters
460 !*****
470 !
480 OUTPUT Testset;"SET:CONT:OFF"
490 OUTPUT Testset;"SET:DTXP:TIM 3"
500 OUTPUT Testset;"SET:MACC:TIM 3"
510 OUTPUT Testset;"SET:ACP:TIM 3"
520 OUTPUT Testset;"SET:LBER:COUN 10000;TIM 3"
530 OUTPUT Testset;"SET:FST:TIM 3"
540 OUTPUT Testset;"SET:ATXP:TIM 3"
550 OUTPUT Testset;"SET:AFAN:TIM 3"
560 OUTPUT Testset;"SET:FM:TIM 3"
570 OUTPUT Testset;"SET:MACC:EVM10:STAT OFF"
580 OUTPUT Testset;"SET:AFAN:PEAK:VOLT 1"
590 OUTPUT Testset;"SET:AFAN:SDIS:STAT ON"
600 OUTPUT Testset;"SET:AFAN:FILT CMES"
610 OUTPUT Testset;"SET:AFAN:SDIS:STATE ON;FREQ 1004"
620 OUTPUT Testset;"SET:FM:DIST:STATE ON;FREQ 6000"
630 OUTPUT Testset;"SET:FM:DETECTOR:TYPE PPEAK"
640 OUTPUT Testset;"SET:FM:FILT:TBP 6000"
650 OUTPUT Testset;"SET:FM:FILT TBP"
660 !
670 !*****
680 ! Put Mobile in Test Mode (Digital Cellular)
690 !*****
700 !
710 PRINT "Put phone in DTC Test Mode, Channel 42, Slot 1, DVCC 1."
720 PRINT "Press 'F2' to continue."
730 PAUSE
740 CLEAR SCREEN
750 PRINT "Cellular Results: "
760 !
770 !*****
780 ! Make Measurements (Digital Cellular and PCS)
790 !*****
800 !
810 FOR I=1 TO 2
820     OUTPUT Testset;"CALL:POW ";Ber_level
830     OUTPUT Testset;"INIT:LBER;DTXP;MACC;ACP"
840     REPEAT
850         OUTPUT Testset;"INIT:DONE?"
860         ENTER Testset;Measdone$
870         SELECT Measdone$
880         CASE "LBER"
890             OUTPUT Testset;"FETC:LBER:INT?;RAT?"
900             ENTER Testset;Integrity,Ber
910             IF Integrity<>0 THEN CALL Bad_measurement(Integrity,Measdone$)

```

## Comprehensive Program Example

```

920     Print_results (Measdone$,Ber)
930     CASE "DTXP"
940         OUTPUT Testset;"FETC:DTXP?"
950         ENTER Testset;Integrity,Power
960         IF Integrity<>0 THEN CALL Bad_measurement (Integrity,Measdone$)
970         Print_results (Measdone$,Power)
980     CASE "MACC"
990         OUTPUT Testset;"FETC:MACC?"
1000        ENTER Testset;Integrity,Evm,Ferr,Ooff,Perr,Mag
1010        IF Integrity<>0 THEN CALL Bad_measurement (Integrity,Measdone$)
1020        Print_results (Measdone$,Evm,Ferr,Ooff,Perr,Mag)
1030    CASE "ACP"
1040        OUTPUT Testset;"FETC:ACP?"
1050        ENTER Testset;Integrity,Adj1,Adjh,Alt1l,Alt1h,Alt2l,Alt2h
1060        IF Integrity<>0 THEN CALL Bad_measurement (Integrity,Measdone$)
1070        Print_results (Measdone$,Adj1,Adjh,Alt1l,Alt1h,Alt2l,Alt2h)
1080    END SELECT
1090    UNTIL Measdone$="NONE"
1100    OUTPUT Testset;"CALL:POW ";Rf_level
1110    !
1120    !*****
1130    ! Make Test Set Changes (Change to PCS, then Analog)
1140    !*****
1150    !
1160    !
1170    IF I=1 THEN ! Just did Digital 800, get ready for Digital 1900
1180        OUTPUT Testset;"CALL:SET:DTC:BAND PCS"
1190    ELSE      ! Done doing Digital 1900, get ready for Analog
1200        OUTPUT Testset;"CALL:CELL:OPER:MODE AVCT"
1210    END IF
1220    !
1230    !*****
1240    ! Change Phone's Test Mode (Digital PCS first, Analog Second)
1250    !*****
1260    !
1270    !
1280    IF I=1 THEN      !Finished with 800MHz, Change to 1900MHz
1290        PRINT "Change phone's channel to 1000 PCS, DVCC 1, Slot 1."
1300        PRINT "Press Continue."
1310        PAUSE
1320        PRINT
1330        PRINT "PCS Results:"
1340    ELSE      !Finished with Digital, change to analog test mode
1350        PRINT "Put phone in Analog Test Mode, Channel 400, SAT ON."
1360        PRINT "Press Continue."
1370        PAUSE
1380        PRINT
1390        PRINT "Analog Results:"
1400    END IF
1410    NEXT I
1420    !
1430    !*****
1440    ! Make Measurements (Analog RF,Audio,FM)

```

```

1450 !*****
1460 !
1470 OUTPUT Testset;"CALL:FM:INT:STATE ON"
1480 OUTPUT Testset;"CALL:POW ";Sinad_level
1490 OUTPUT Testset;"INIT:ATXP;FST;AFAN;FM"
1500 REPEAT
1510   OUTPUT Testset;"INIT:DONE?"
1520   ENTER Testset;Measdone$
1530   SELECT Measdone$
1540   CASE "ATXP"
1550     OUTPUT Testset;"FETC:ATXP?"
1560     ENTER Testset;Integrity,Power
1570     IF Integrity<>0 THEN CALL Bad_measurement(Integrity,Measdone$)
1580     Print_results(Measdone$,Power)
1590   CASE "FST"
1600     OUTPUT Testset;"FETC:FST?"
1610     ENTER Testset;Integrity,Ferr,Freq
1620     IF Integrity<>0 THEN CALL Bad_measurement(Integrity,Measdone$)
1630     Print_results(Measdone$,Ferr,Freq)
1640   CASE "AFAN"
1650     OUTPUT Testset;"FETC:AFAN?"
1660     ENTER Testset;Integrity,Level,Sinad,Dist
1670     IF Integrity<>0 THEN CALL Bad_measurement(Integrity,Measdone$)
1680     Print_results(Measdone$,Level,Dist,Sinad)
1690   CASE "FM"
1700     OUTPUT Testset;"FETC:FM?"
1710     ENTER Testset;Integrity,Dev,Dist
1720     IF Integrity<>0 THEN CALL Bad_measurement(Integrity,Measdone$)
1730     Print_results(Measdone$,Dev,Dist)
1740   END SELECT
1750 UNTIL Measdone$="NONE"
1760 !
1770 !*****
1780 ! Finish Testing
1790 !*****
1800 !
1810 PRINT "Testing Complete."
1820 PRINT
1830 OUTPUT Testset;"CALL:POW ";Rf_level
1840 STOP
1850 Timeout:   !Comes here only when program times out
1860 PRINT "Program time out."
1870 END
1880 !
1890 !*****
1900 ! Subroutine Section
1910 !*****
1920 SUB Print_results(Meas_name$,Res1,OPTIONAL Res2,Res3,Res4,Res5,Res6)
1930   SELECT Meas_name$
1940   CASE "LBER"
1950     PRINT USING "5X,""Loopback BER:"",10X,M2D.2D,"" %""";Res1
1960   CASE "DTXP"
1970     PRINT USING "5X,""Ave Digital Power:"",5X,M2D.2D,"" dBm""";Res1

```

## Comprehensive Program Example

```

1980     CASE "MACC"
1990         PRINT USING "5X, ""Max EVM1: "" ,14X,M2D.2D, "" %""";Res1
2000         PRINT USING "5X, ""Worst Freq Error: "" ,5X,M3D.2D, "" Hz""";Res2
2010         PRINT USING "5X, ""Max Mag. Error: "" ,8X,M2D.2D, "" %""";Res5
2020         PRINT USING "5X, ""Max Origin Offset: "" ,5X,M2D.2D, "" dB""";Res3
2030         PRINT USING "5X, ""Max Phase Error: "" ,7X,M2D.2D, "" Deg""";Res4
2040     CASE "ACP"
2050         PRINT USING "5X, ""ACP Adj Lo: "" ,12X,M2D.2D, "" dBc""";Res1
2060         PRINT USING "5X, ""ACP Adj Hi: "" ,12X,M2D.2D, "" dBc""";Res2
2070         PRINT USING "5X, ""ACP Alt1 Lo: "" ,11X,M2D.2D, "" dBc""";Res3
2080         PRINT USING "5X, ""ACP Alt1 Hi: "" ,11X,M2D.2D, "" dBc""";Res4
2090         PRINT USING "5X, ""ACP Alt2 Lo: "" ,11X,M2D.2D, "" dBc""";Res5
2100         PRINT USING "5X, ""ACP Alt2 Hi: "" ,11X,M2D.2D, "" dBc""";Res6
2110     CASE "ATXP"
2120         PRINT USING "5X, ""Ave Analog Power: "" ,6X,M2D.2D, "" dBm""";Res1
2130     CASE "FST"
2140         PRINT USING "5X, ""Worst Freq Error: "" ,5X,M3D.2D, "" ppm""";Res1
2150         PRINT USING "5X, ""Average Freq: "" ,6X,M3D.2DESZ, "" Hz""";Res2
2160     CASE "FM"
2170         PRINT USING "5X, ""SAT Deviation: "" ,9X,M5D, "" Hz""";Res1
2180         PRINT USING "5X, ""Distortion: "" ,11X,M3D.2D, "" %""";Res2
2190     CASE "AFAN"
2200         PRINT USING "5X, ""Audio Level: "" ,10X,M3D.2D, "" V""";Res1
2210         PRINT USING "5X, ""Audio Distortion: "" ,5X,M3D.2D, "" %""";Res2
2220         PRINT USING "5X, ""SINAD: "" ,16X,M3D.2D, "" dB""";Sinad
2230     END SELECT
2240     SUBEND
2250     SUB Bad_measurement (Integrity, Meas_name$)
2260         PRINT "      Measurement warning: ";Meas_name$
2270         PRINT "      Integrity =";Integrity
2280     SUBEND

```



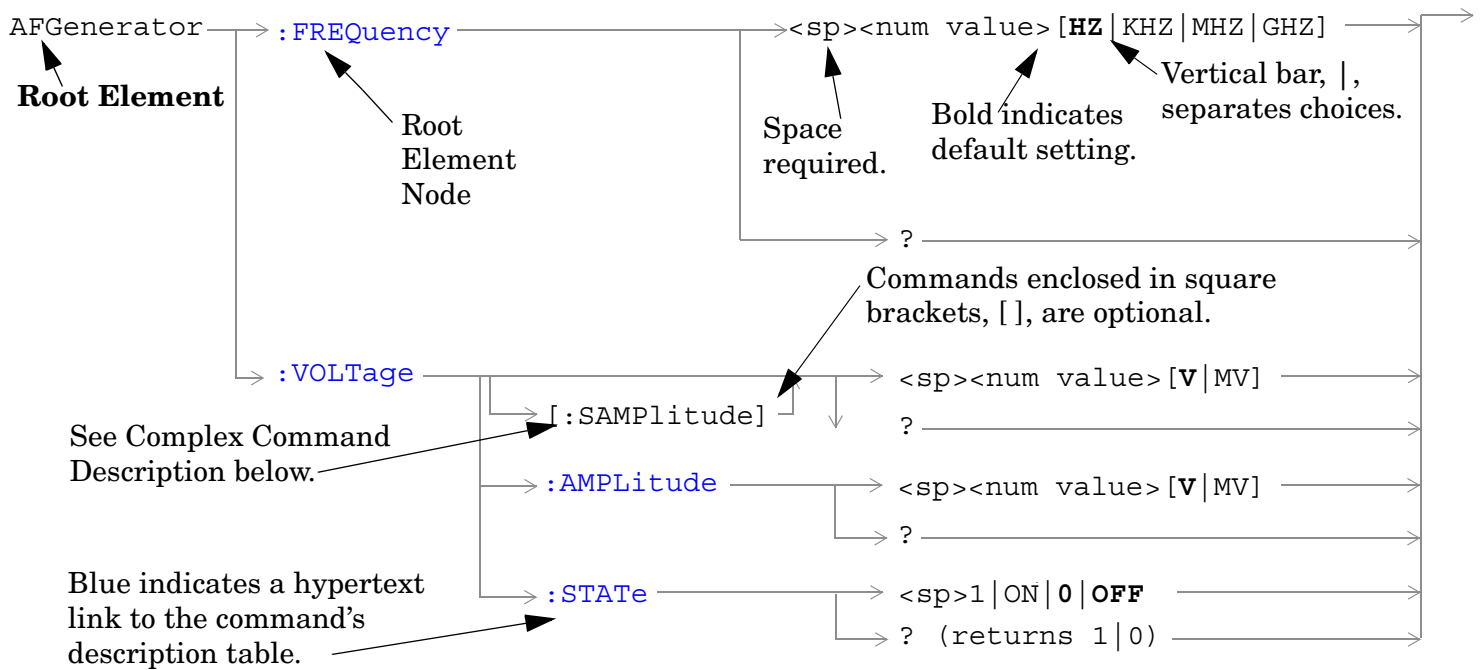
# 5 GPIB Command Syntax



## Diagram Conventions

October 18, 2000

### Description



### 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 **direction of the arrow** 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:

## Diagram Conventions

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 (trigger arm set to single) , the measurement will remain in the idle state after this event. If the measurement is being continuously armed (trigger arm set to continuous), 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

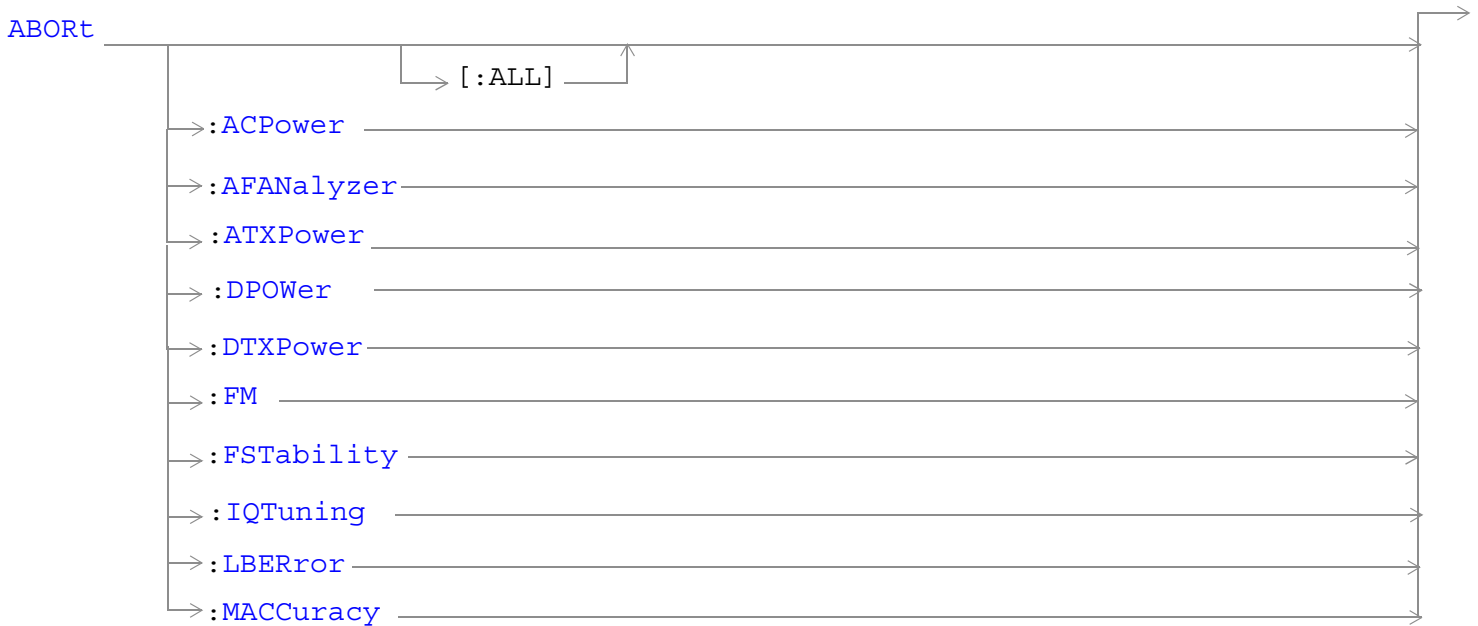
INITiate:<meas> will execute an ABORt:<meas> as part of the INITiate:<meas> command.

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



“Diagram Conventions” on page 267

### ABORt[:ALL]

Function	<p>Stops all measurements that are active. See “<a href="#">Measurement States</a>” on page 147.</p> <p>If the trigger arm is set to single the measurements will go to the idle state. See “<a href="#">Trigger Arm (Single or Continuous) Description</a>” on page 148.</p> <p>If the trigger arm is set to continuous the measurements will re-arm and initiate again.</p>
Setting	<p>Range</p> <ul style="list-style-type: none"> <li>• ACPower</li> <li>• AFANalyzer</li> <li>• ATXPower</li> <li>• DPOWer</li> <li>• DTXPower</li> <li>• FM</li> <li>• FSTability</li> <li>• IQTuning</li> <li>• LBError</li> <li>• MACCuracy</li> </ul>

**Programming Example**

```
OUTPUT 714;"ABORT:ALL" !Aborts all active measurements in progress.
```

**ABORt****ABORt:<meas-mnemonic>**

Function	<p>Stops the selected measurement if it is active. See <a href="#">“Measurement States” on page 147</a>.</p> <p>If the trigger arm is set to single the measurements will go to the idle state. See <a href="#">“Trigger Arm (Single or Continuous) Description” on page 148</a>.</p> <p>If the trigger arm is set to continuous the measurements will re-arm and initiate again.</p>
Setting	<p>Range</p> <ul style="list-style-type: none"> <li>• ACPower</li> <li>• AFANalyzer</li> <li>• ATXPower</li> <li>• DPOwer</li> <li>• DTXPower</li> <li>• FM</li> <li>• FSTability</li> <li>• IQTuning</li> <li>• LBERror</li> <li>• MACCuracy</li> </ul>
<p><b>Programming Example</b></p> <pre>OUTPUT 714;"ABORT:ATXP" !Aborts the analog transmitter power measurement.</pre>	



## AFGenerator Subsystem

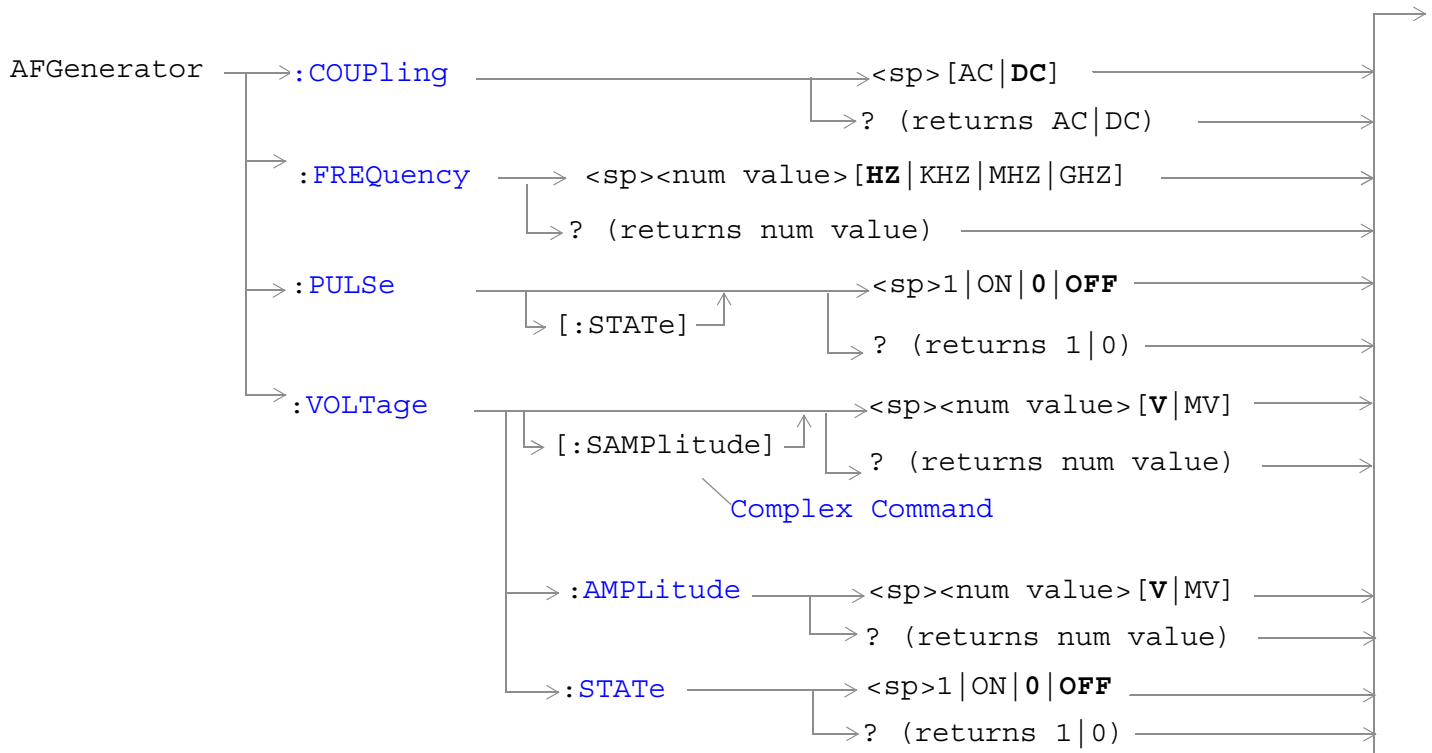
### Description

The AFGenerator subsystem is used to control the audio source that is available at the Audio Output connector.

### Syntax Diagram and Command Descriptions

[“AFGenerator” on page 274](#)

## AFGenerator



“Diagram Conventions” on page 267

**AFGenerator:COUPling**

Function	Sets the output of the audio generator to be ac or dc coupled to the front-panel AUDIO OUT port.
Setting	Range: AC or DC
Query	Range: AC   DC
*RST setting	DC
<b>Programming Example</b> <pre>OUTPUT 714;"AFGENERATOR:COUPling AC" !Sets the audio generator coupling to AC.</pre>	

**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:0 .1 HZ
Query	Range: 1 Hz to 20 kHz Resolution: 0.1 Hz
*RST setting	1 kHz
<b>Programming Example</b> <pre>OUTPUT 714;"AFGENERATOR:FREQUENCY 1000" !Sets the audio generator frequency to 1000 Hz.</pre>	

**AFGenerator:PULSe[:STATe]**

Function	<p>Sets/queries the audio generator pulse state.</p> <p>The pulse state must be on when the test set's audio generator is used for audio stimulation during a decoded audio measurement.</p> <p>When the state is on, the audio signal from the test set is pulsed at a 10 Hz rate with a 50% duty cycle.</p> <p>The amplitude and frequency of the pulse is set with afgenerator commands. See <a href="#">"AFGenerator" on page 274</a>.</p>
Setting	Range: 0   OFF   1   ON
Query	Range: 0   1
*RST setting	0 (off)
<b>Programming Example</b> <pre>OUTPUT 714;"AFGENERATOR:PULSE ON" !Sets the audio generator pulse to ON.</pre>	

**AFGenerator****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 to 9 V pk. Resolution: <ul style="list-style-type: none"> <li>• 0.5 mV pk. &lt;= 1 V pk. output</li> <li>• 5 mV pk. &gt; 1 V pk. output</li> </ul>
Query	Range: 0 to 9 V pk. Resolution: <ul style="list-style-type: none"> <li>• 0.5 mV pk. &lt;= 1 V pk. output</li> <li>• 5 mV pk. &gt; 1 V pk. output</li> </ul>
*RST setting	0 V
<b>Programming Example</b> <pre>OUTPUT 714;"AFGENERATOR:VOLTAGE 2.1" !Sets the state to on and the output !voltage to 2.1 volts.</pre>	

**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 to 9 V pk. Resolution: <ul style="list-style-type: none"> <li>• 0.5 mV pk. &lt;= 1 V pk. output</li> <li>• 5 mV pk. &gt; 1 V pk. output</li> </ul>
Query	Range: 0 to 9 V pk. Resolution: <ul style="list-style-type: none"> <li>• 0.5 mV pk. &lt;= 1 V pk. output</li> <li>• 5 mV pk. &gt; 1 V pk. output</li> </ul>
*RST setting	0 V
<b>Programming Example</b> <pre>OUTPUT 714;"AFGENERATOR:VOLTAGE:AMPLITUDE 1.414" !Sets the audio generator output !voltage to 1.414 volts peak.</pre>	

### **AFGenerator:VOLTage:STATE**

Function	Sets/queries the audio generator state
Setting	0   OFF   1   ON
Query	0   1
*RST setting	0 (off)
<b>Programming Example</b> OUTPUT 714;"AFGENERATOR:VOLTAGE:STATE ON" !Set the audio generator state to ON.	

## **CALibration Subsystem**

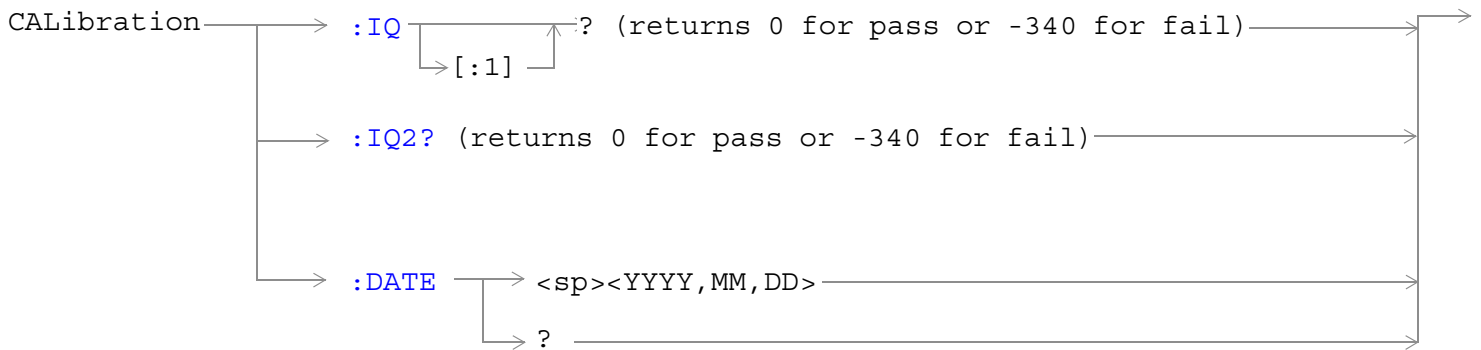
### **Description**

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



[“Diagram Conventions” on page 267](#)

### CALibration:IQ[:1]?

Function	<p>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.</p> <ul style="list-style-type: none"> <li>• Calibrates the IQ modulator for RF generator 1.</li> <li>• Returns a value indicating success or failure of calibration.</li> </ul>
Query	<p>Range</p> <ul style="list-style-type: none"> <li>• 0 = Pass</li> <li>• -340 = Fail</li> </ul>
<p>Programming Example</p> <pre> OUTPUT 714;"CALIBRATION:IQ1?" !Performs a calibration of the IQ modulator                                 !for RF generator 1 and returns 0 or -340 </pre>	

**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****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. <ul style="list-style-type: none"> <li>• Calibrates the IQ modulator for RF generator 2.</li> <li>• Returns a value indicating success or failure of calibration.</li> </ul>
Query	Range <ul style="list-style-type: none"> <li>• 0 = Pass</li> <li>• -340 = Fail</li> </ul>
<b>Programming Example</b> <pre>OUTPUT 714;"CALIBRATION:IQ2?" !Performs a calibration of the IQ modulator                                 !for RF generator 2 and returns 0 or -340</pre>	

---

**NOTE** When the the calibration is done the test set display will display:  
 IQ Calibration completed successfully for modulator 2. 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 <ul style="list-style-type: none"> <li>• Year = 0000 to 9999</li> <li>• Month = 01 to 12</li> <li>• Day = 01 to 31</li> </ul>
Query	Returns the date when system calibration was performed. Range <ul style="list-style-type: none"> <li>• Year = 0000 to 9999</li> <li>• Month = 1 to 12</li> <li>• Day = 1 to 31</li> </ul>
<b>Programming Example</b> <pre>OUTPUT 714;"CALIBRATION:DATE 1999,01,04" !Sets the date of the last system                                 !calibration year, month and day.</pre>	



---

## CALL Subsystem

### Description

The CALL subsystem handles all setup, control, and query functions for call processing. This includes mobile station (MS) and Base Station (cell) functions.

### Syntax Diagrams and Command Descriptions

[“CALL:ACC” on page 282](#)

[“CALL:AVCTest” on page 283](#)

[“CALL:CCHannel” on page 284](#)

[“CALL:CONNEcted” on page 285](#)

[“CALL:CONTRol:DOWNlink:FREQuency:AUTO” on page 288](#)

[“CALL:DCCH” on page 289](#)

[“CALL:DTC:BURSt” on page 292](#)

[“CALL:DTC:IBERror” on page 293](#)

[“CALL:END” on page 295](#)

[“CALL:FM” on page 296](#)

[“CALL:HANDoff” on page 300](#)

[“CALL:MCCode” on page 301](#)

[“CALL:MS” on page 302](#)

[“CALL:OPERating” on page 315](#)

[“CALL:ORIGinate” on page 316](#)

[“CALL:PAGing:PNUMber” on page 317](#)

[“CALL:PAGing:REPeat” on page 318](#)

[“CALL:POWer” on page 319](#)

[“CALL:REGister” on page 321](#)

[“CALL:RFGenerator” on page 323](#)

[“CALL:SETup” on page 324](#)

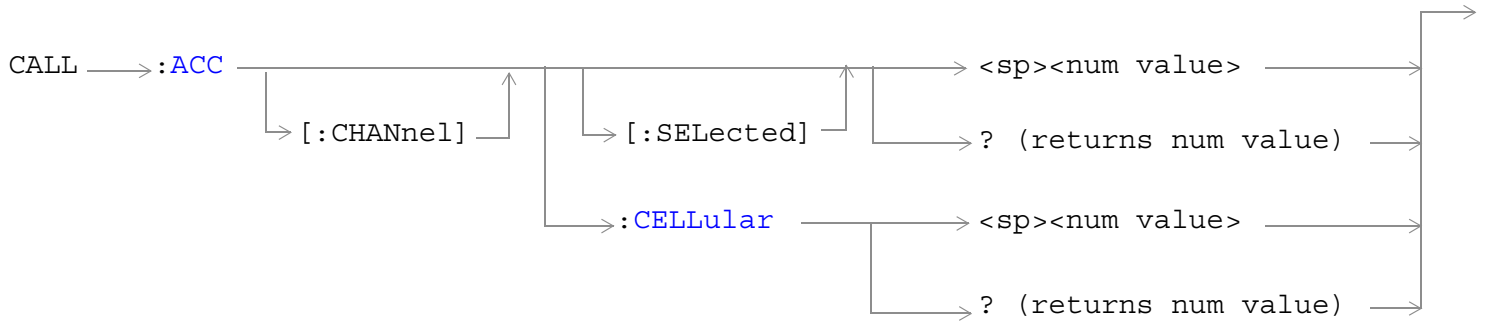
[“CALL:SID” on page 335](#)

[“CALL:SOCode” on page 336](#)

[“CALL:STATus” on page 337](#)

[“CALL:TCHannel” on page 342](#)

## CALL:ACC



“Diagram Conventions” on page 267

### CALL:ACC[:CHANnel][:SElected]

Function	Specifies the RF channel number of the analog control channel (cellular band is inferred).
Setting	range: 1 to 799, 991 to 1023
Query	range: 1 to 799, 991 to 1023
*RST Setting	333
Programming Example	
OUTPUT 714; "CALL:ACC:CHANNEL:SELECTED 799" !Sets the analog control channel to 799.	

### CALL:ACC[:CHANnel]:CELLular

Function	Specifies the RF channel number of the analog control channel (cellular band is specified).
Setting	range: 1 to 799, 991 to 1023
Query	range: 1 to 799, 991 to 1023
*RST Setting	333
Programming Example	
OUTPUT 714; "CALL:ACC:CHANNEL:CELLULAR 991" !Set cell band analog control channel to 991.	

## CALL:AVCTest

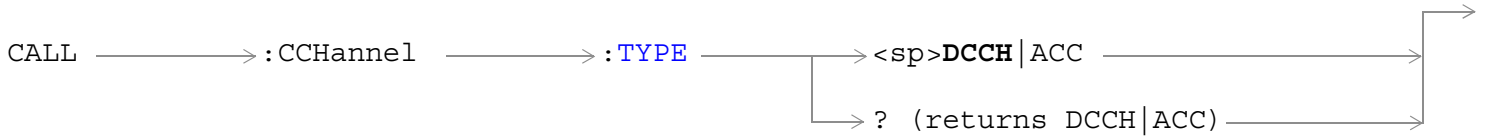
CALL → :AVCTest → :AVC → :SATone → :STATE → <sp>1 | ON | 0 | OFF  
 ↳ ? (returns 1 | 0)

[“Diagram Conventions” on page 267](#)

### CALL:AVCTest:AVC:SATone:STATE

Function	Turns SAT on or off. Applies only in AVC test mode. In active cell mode SAT state is not controlled by the user.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	1 (ON)
<b>Programming Example</b> OUTPUT 714; "CALL:AVCTEST:AVC:SATONE:STATE 0" !Turns the supervisory audio tone off.	

## CALL:CCHannel

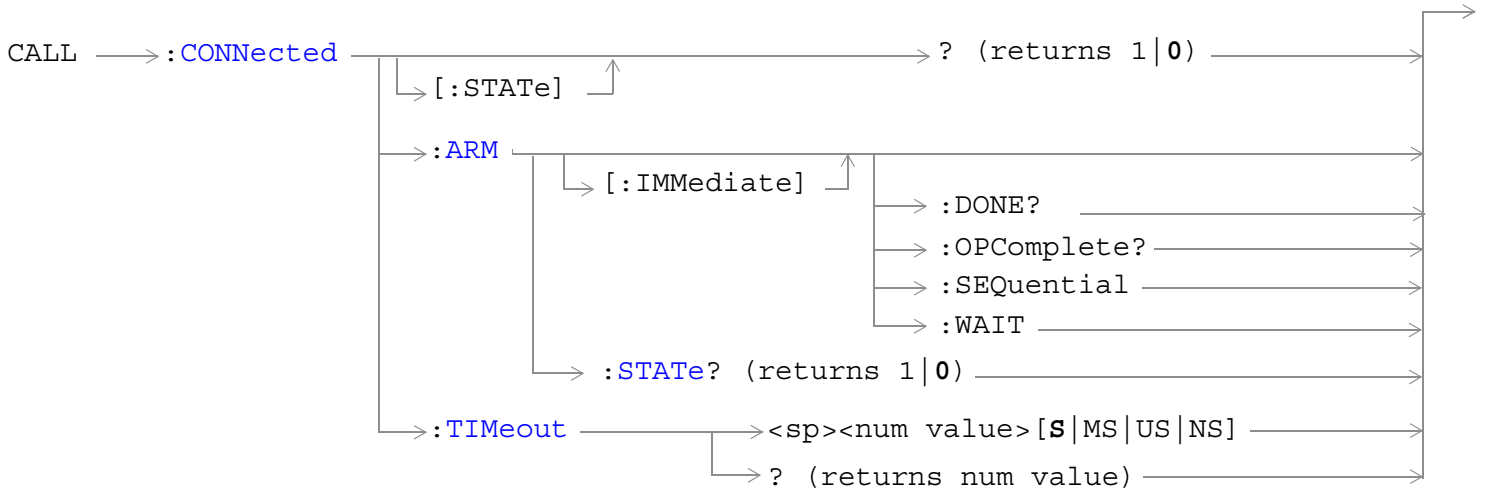


[“Diagram Conventions” on page 267](#)

### CALL:CCHannel:TYPE

Function	Specifies which type of control channel is to be generated.
Setting	range: DCCH ACC
Query	range: DCCH ACC
*RST Setting	DCCH
<b>Programming Example</b> OUTPUT 714;"CALL:CCH:TYPE DCCH" !Sets control channel type to digital control channel.	

## CALL:CONNEcted



[“Diagram Conventions” on page 267](#)

**CALL:CONNeCTed****CALL:CONNeCTed[:STATe]**

Function	Queries the connected/disconnected state of the call. A one is returned if the call is in the connected state. A zero is returned if the call is in the idle (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 <a href="#">“Call Processing State Synchronization” on page 39</a> .
Query	Range: 0 1
*RST Setting	0
Programming Example	
OUTPUT 714;“CALL:CONNECTED:STATE?” !returns 1 if call is connected, 0 if call is idle.	

**CALL:CONNeCTed:ARM[:IMMeDiate]**

Function	Sets (arms) the call-state-change detector. Arming this detector allows the control program to tell the test set that it is expecting a change in 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, 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 <a href="#">“Call Processing State Synchronization” on page 39</a> .
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 one if the detector is armed, or a zero if the detector is not armed. See <a href="#">“Call Processing State Synchronization” on page 39</a> .
Query	Range: 1 0
*RST Setting	0
Programming Example	
OUTPUT 714;“CALL:CONN:ARM:STATE?” !Returns arm state of the call-state-change detector.	

**CALL:CONNECTed:TIMEout**

Function	<p>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 an optional unit specifier in the command string.</p> <p>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 set using the CALL:CONNECTed:TIMEout command and should be greater than the maximum amount of time the control program needs 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 to one of the transitory states, the IS136 defined protocol timers take over and prevent the call state from staying in a transitory state forever. See <a href="#">“Call Processing State Synchronization” on page 39</a>.</p>
Setting	<p>Range: 0 to 100 seconds Resolution: 0.1 seconds</p>
Query	<p>Range: 0 to 100 seconds Resolution: 0.1 seconds</p>
*RST Setting	10 seconds
<p><b>Programming Example</b></p> <pre>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 Sets the CALL:CONNECTed:STATE? query timeout time to 500 milliseconds.</pre>	

## CALL:CONTROL:DOWNlink:FREQuency:AUTO

CALL →:CONTROL →:DOWNlink → :FREQuency → :AUTO → <sp>1 | ON | 0 | OFF →  
 → ? (returns 1 | 0) →

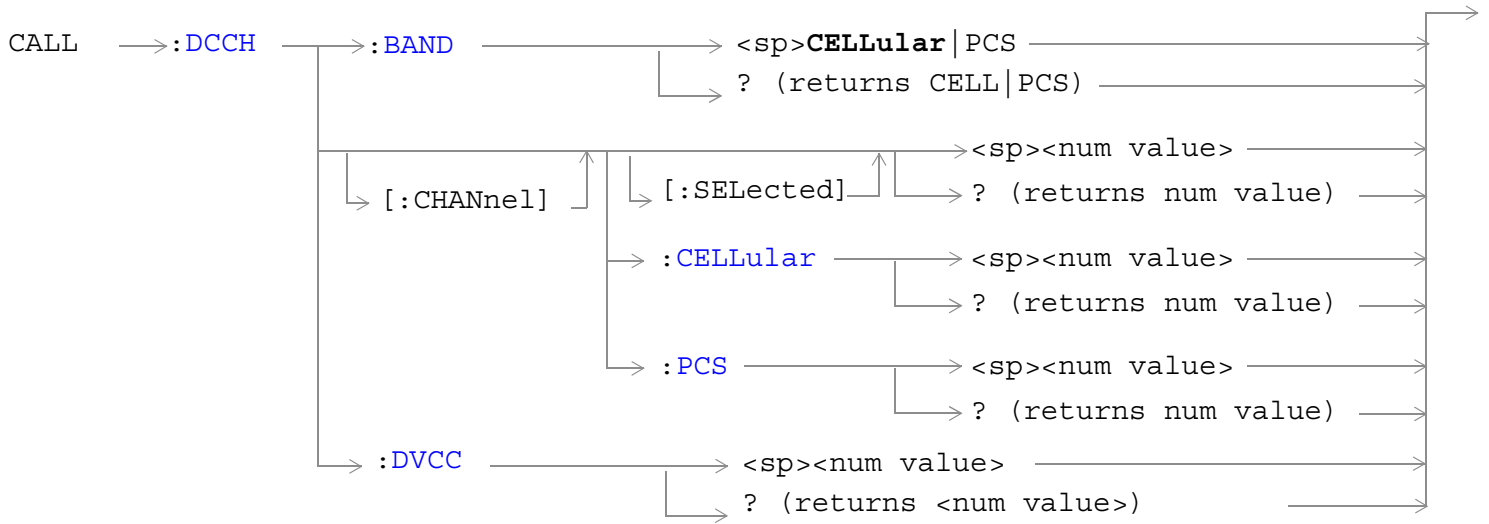
[“Diagram Conventions” on page 267](#)

### CALL:CONTROL:DOWNlink:FREQuency:AUTO

Function	Sets/queries whether the user or the base station emulator is in control of the RF generator’s frequency setting while in either AVC or DTC test mode. If set to auto (1), the appropriate band and channel parameters are used to set the frequency of the downlink. If set to manual (0), the RF Generator Frequency parameter value is used.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	1 (AUTO)
<b>Programming Example</b> OUTPUT 714 ; “CALL:CONTROL:DOWNLINK:FREQUENCY:AUTO OFF” !Enables manual frequency setting.	



## CALL:DCCH



“Diagram Conventions” on page 267

**CALL:DCCH****CALL:DCCH:BAND**

Function	Sets/queries the band for the digital control channel during active cell operating mode.
Setting	Range: CELLular   PCS
Query	Range: CELL   PCS
*RST Setting	CELL
<b>Programming Example</b> OUTPUT 714;"CALL:DCCH:BAND PCS" !Selects the PCS band for the DCCH.	

**CALL:DCCH[:CHANnel][:SElected]**

Function	Sets/queries the RF channel number of the digital control channel for the selected band during active cell operating mode.
Setting	Depends upon the selected band: CELLular: 1 to 799, 991 to 1023 PCS: 1 to 1999
Query	Range:CELLular: 1 to 799, 991 to 1023 PCS: 1 to 1999
*RST Setting	CELLular: 991 PCS: 251
<b>Programming Example</b> OUTPUT 714;"CALL:DCCH:CHANNEL:SELECTED 777" !Sets the DCCH for the selected band to 777.	

**CALL:DCCH[:CHANnel]:CELLular**

Function	Sets/queries the RF channel number of the digital control channel in the cellular band (applies to active cell operating mode).
Setting	Range: 1 to 799, 991 to 1023
Query	Range: 1 to 799, 991 to 1023
*RST Setting	991
<b>Programming Example</b> OUTPUT 714;"CALL:DCCH:CHANNEL:CELLULAR 799" !Sets the DCCH channel number in the cellular !band to 799.	

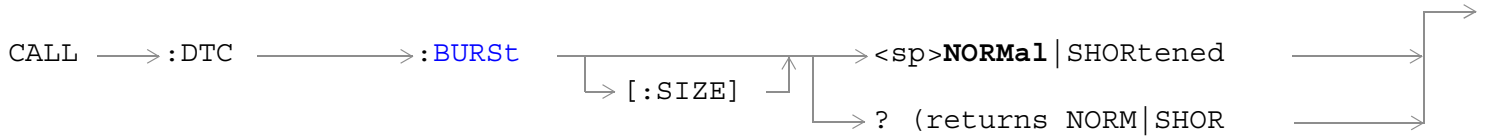
**CALL:DCCH[:CHANnel]:PCS**

Function	Sets/queries the RF channel number of the digital control channel in the PCS band (applies to active cell operating mode).
Setting	Range: 1 to 1999
Query	Range: 1 to 1999
*RST Setting	251
<b>Programming Example</b> <pre>OUTPUT 714;"CALL:DCCH:CHANNEL:PCS 331" !Sets the!Sets the DCCH channel number in the !cellular band to 331.</pre>	

**CALL:DCCH:DVCC**

Function	Sets/queries the digital verification color code (DVCC) that is carried on the digital control channel (DCCH).
Setting	Range: 0 to 255
Query	Range: 0 to 255
*RST Setting	1
<b>Programming Example</b> <pre>OUTPUT 714;"CALL:DCCH:DVCC 10" !Sets the DCCH DVCC TO 10.</pre>	

## CALL:DTC:BURSt

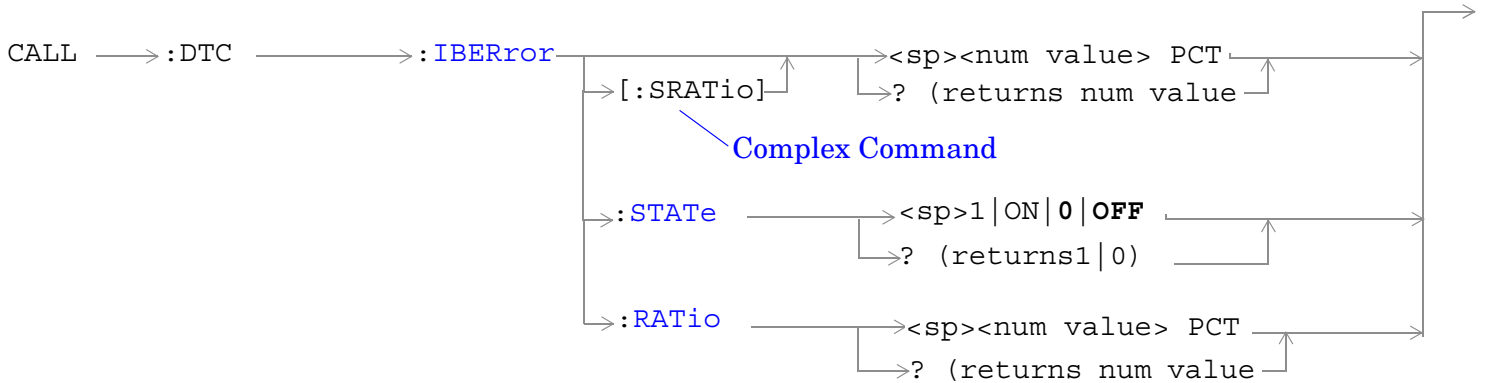


“Diagram Conventions” on page 267

### CALL:DTC:BURSt

Function	Specifies the digital traffic channel (DTC) burst size to be used during assignments and handoffs to DTCs (applies in active cell mode).  Note: This setting is ignored when a mobile that is camped on an ACC is commanded to go to a DTC. In this case, the mobile is <u>always</u> commanded to use shortened bursts on the DTC. However, when originating a call from a DCCH to a DTC, or anytime a handoff to a DTC is performed, the DTC Burst Size you specify is used.
Setting	Range: NORMal   SHORtened
Query	Range: NORM   SHOR
*RST Setting	NORM
<b>Programming Example</b> OUTPUT 714;"CALL:DTC:BURST SHORTENED" !Sets the DTC burst size to shortened burst.	

## CALL:DTC:IBERror



“Diagram Conventions” on page 267

### CALL:DTC:IBERror[:SRATio]

Function	Sets/queries the level (in percent) of induced bit errors sent to the mobile on a DTC. When setting a value, the CALL:DTC:IBERror:STATe is automatically set to ON. When querying the value, the state is not affected.
Setting	Range: 0 PCT to 20 PCT
Query	Range: 0 to 20
*RST Setting	0 (Off)
Programming Example	
OUTPUT 714;"CALL:DTC:IBERror 7 PCT" !Enables induced bit errors and sets the induced Bit Error Ratio to 7 percent.	

### CALL:DTC:IBERror:STATe

Function	Sets/queries the state of the DTC induced errors function.
Setting	Range: 1 ON 0 OFF
Query	Range: 1 0
*RST Setting	0 (Off)
Programming Example	
OUTPUT 714;"CALL:DTC:IBERror:STATe ON" !Turns on the DTC induced bit error function.	

**CALL:DTC:IBERror:RATio**

Function	Sets/queries the level (in percent) of induced bit errors sent to the mobile on a DTC when the STATE is set to ON.
Setting	Range: 0 PCT to 20 PCT
Query	Range: 0 to 20
*RST Setting	Off
<b>Programming Example</b>	
OUTPUT 714;"CALL:DTC:IBERror:RATio 5 PCT" !Sets the induced Bit Error Ratio to 5 percent.	

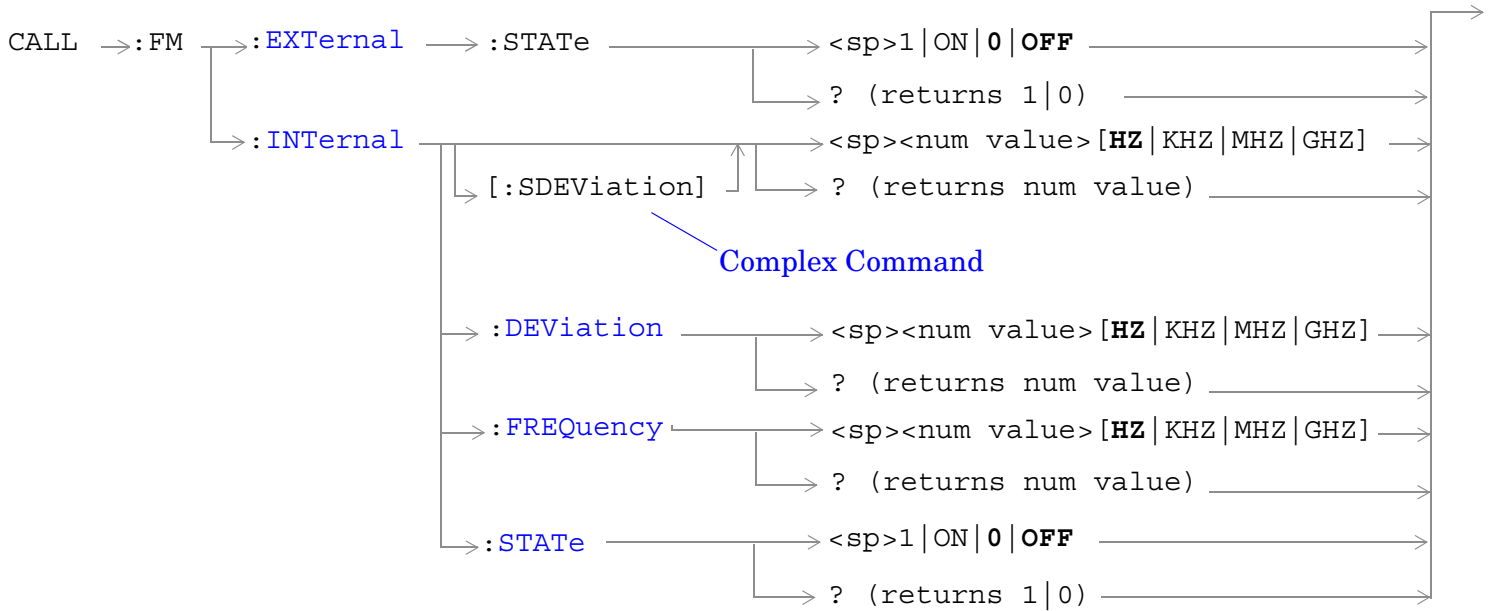
**CALL:END**

[“Diagram Conventions” on page 267](#)

**CALL:END**

Function	<p>Terminates the active call.</p> <p>Note: Immediately following this command with the CALL:ORIGinate command may result in an error. This is often caused by the mobile not being able to respond to the page quickly enough after terminating a call. If the error “Call Operation Rejected; Protocol request ignored” is displayed, wait until the mobile has camped on the control channel before issuing the CALL:ORIGinate command.</p>
<p>Programming Example</p> <pre>OUTPUT 714;"CALL:END" !Terminates the active call.</pre>	

## CALL:FM



“Diagram Conventions” on page 267

### CALL:FM:EXTeRnal:STATe

Function	Sets/queries the external FM input (on or off). The FM deviation is fixed at 20 kHz/volt with a 1 volt maximum input voltage. You must make sure that the sum of the three FM sources (internal FM, external FM, and SAT) do not exceed 20 kHz deviation. The performance of the signal is not specified beyond 20 kHz deviation.  While in active cell mode, the internal and external FM states parameters will be overridden and FM turned off temporarily by the call processing state machine during wideband signaling with the mobile station. Querying during this temporary state will return user defined values. This command applies in active cell mode while on an AVC, and in AVC test mode.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	OFF
Programming Example	
OUTPUT 714; "CALL:FM:EXTERNAL:STATE ON" !Turns on the external FM input.	

### CALL:FM:INTeRnal[:SDEVIation]

Function	Sets/queries the internal FM source's deviation and automatically sets the internal FM state to ON. This is “complex” command.
----------	--



Setting	Range: 0 to 20 kHz Resolution: 0.1 Hz
Query	Range: 0 to 20 kHz Resolution: 0.1 Hz
*RST Setting	Internal FM: OFF Internal FM: OFF
<b>Programming Example</b> <pre> OUTPUT 714;"CALL:FM:INTERNAL:SDEVIATION 10 kHz" !Sets internal FM deviation to 10 kHz and !automatically turns on the internal FM !source. </pre>	

**CALL:FM****CALL:FM:INTERNAL:DEVIATION**

Function	<p>Sets/queries the internal FM source's deviation. When querying the internal FM deviation, the current setting of this parameter will always be returned regardless of the setting for the internal FM state.</p> <p>You must make sure that the sum of the three FM sources (internal FM, external FM, and SAT) do not exceed 20 kHz deviation. The performance of the signal is not specified beyond 20 kHz deviation.</p> <p>This command applies in active cell mode while on an AVC, and in AVC test mode.</p>
Setting	<p>Range: 0 to 20 kHz</p> <p>Resolution: 0.1 Hz</p>
Query	<p>Range: 0 to 20 kHz</p> <p>Resolution: 0.1 Hz</p>
*RST Setting	8 kHz
<p>Programming Example</p> <pre>OUTPUT 714;"CALL:FM:INTERNAL:DEVIATION 10 KHZ" !Sets internal FM deviation to 10 kHz.</pre>	

**CALL:FM:INTERNAL:FREQUENCY**

Function	<p>Sets/queries the frequency of the internal FM source. Applies in active cell mode while on an AVC, and in AVC test mode.</p>
Setting	<p>Range: 20 Hz to 20 kHz</p> <p>Resolution: 0.1 Hz</p>
Query	<p>Range: 20 Hz to 20 kHz</p> <p>Resolution: 0.1 Hz</p>
*RST Setting	1004 Hz
<p>Programming Example</p> <pre>OUTPUT 714;"CALL:FM:INTERNAL:FREQUENCY 60 HZ" !Sets the internal FM source's frequency to !60 Hz.</pre>	

**CALL:FM:INTERNAL:STATE**

Function	Sets/queries the internal FM source (on or off).  While in active cell mode, the internal and external FM states parameters will be overridden and FM turned off temporarily by the call processing state machine during wideband signaling with the mobile station. Querying during this temporary state will return user defined values. This command applies in active cell mode while on an AVC, and in AVC test mode.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	OFF
<b>Programming Example</b> OUTPUT 714;"CALL:FM:INTERNAL:STATE ON" !Turns on the internal FM source.	

## CALL:HANdOff



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### CALL:HANdOff[:IMMediate]

Function	<p>Causes the test set to handoff the call to a new set of traffic channel parameters. The parameters involved are as follows: Traffic Channel Type, and Control Channel Type.</p> <ul style="list-style-type: none"> <li>• If Traffic Channel Type is AVC:           <ul style="list-style-type: none"> <li>— AVC Channel Number</li> <li>— Analog MS Power Level</li> <li>— FVC SAT Color Code</li> </ul> </li> <li>• If Traffic Channel Type is DTC:           <ul style="list-style-type: none"> <li>— DTC Band</li> <li>— DTC Channel Number</li> <li>— Digital MS Power Level</li> <li>— DTC DVCC</li> <li>— Slot Number</li> <li>— Vocoder Type</li> </ul> </li> </ul> <p>Once the handoff is complete the "Current" channel parameters will be updated to reflect the values of the channel parameter settings. This command only applies in active cell mode while on a traffic channel.</p>
Programming Example	<pre>OUTPUT 714;"CALL:HANdOFF:IMMediate" !Hands the call off to a new traffic channel.</pre>

## CALL:MCCCode

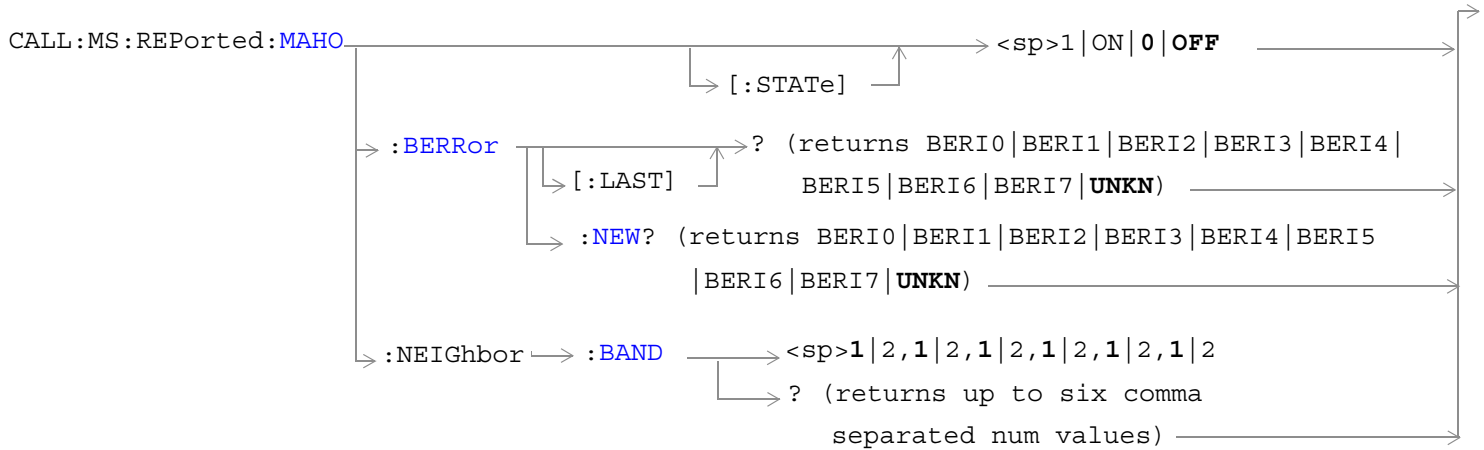
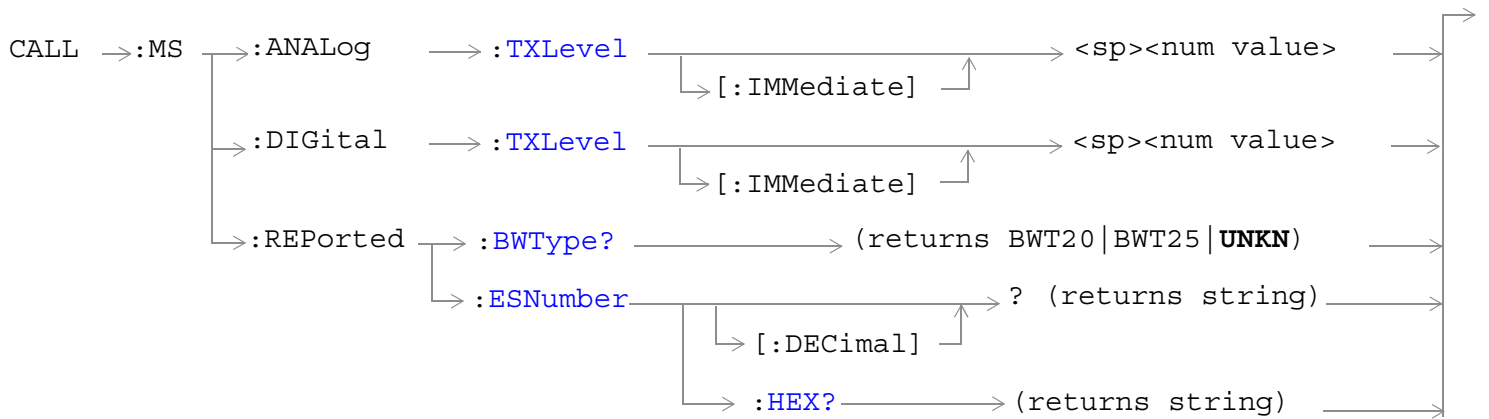


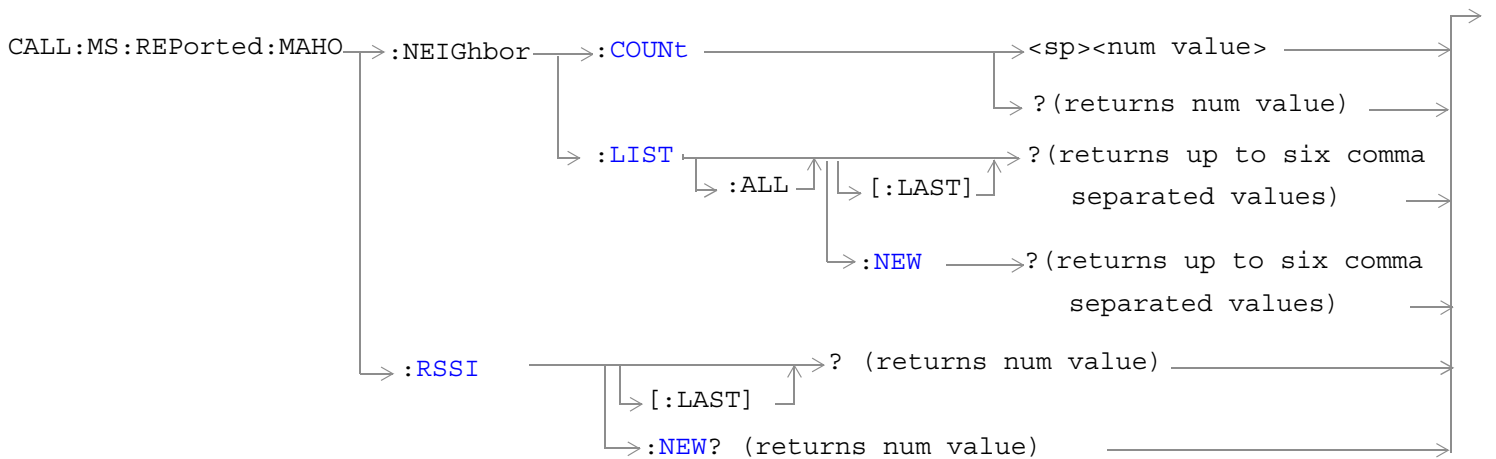
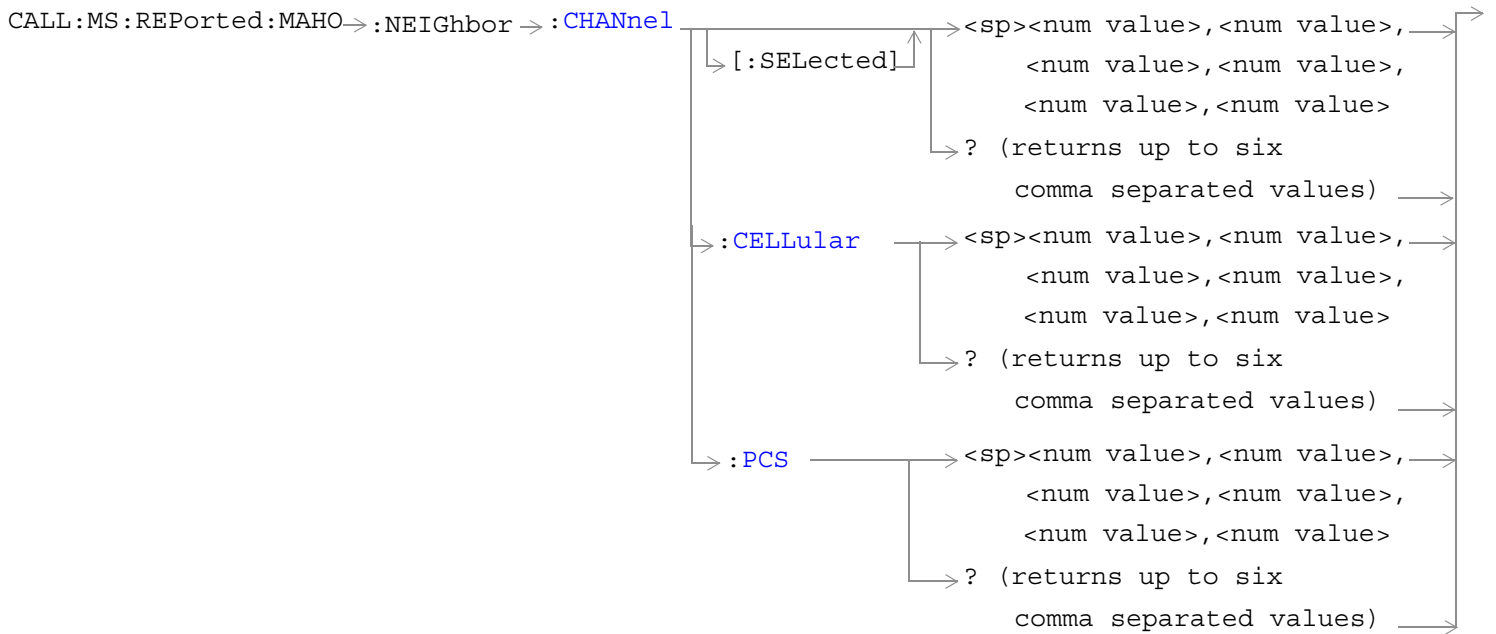
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### CALL[:CELL]:MCCCode

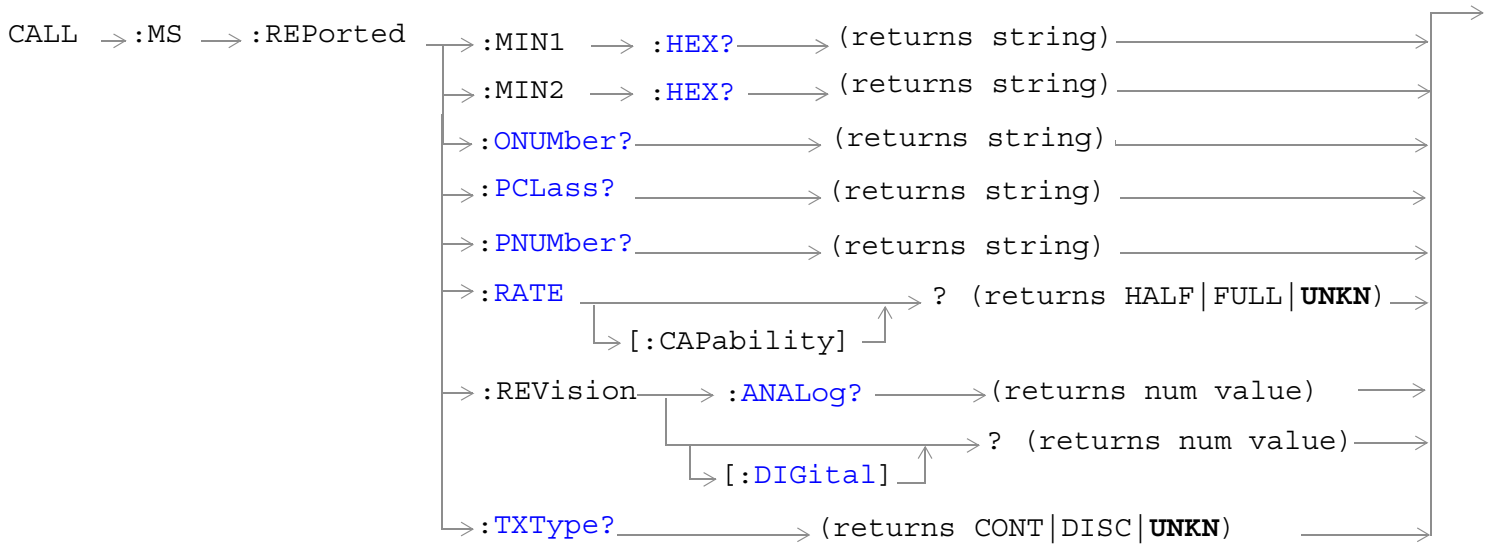
Function	Sets/queries the mobile country code.
Setting	Range: 0 to 999
Query	Range: 0 to 999
*RST Setting	310
<b>Programming Example</b> OUTPUT 714;"CALL:CELL:MCCODE 314" !Sets the mobile country code to 314.	

## CALL:MS





**CALL:MS**



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**CALL:MS:ANALog:TXLevel**

Function	Sets/queries the mobile station transmit level while on an analog voice channel. This commnad is used in active cell operating mode to immediately change the mobile level while on an AVC.
Setting	Range: 0 to 7 MS TX Level 0: expected power, 36 dBm* MS TX Level 1: expected power, 32 dBm MS TX Level 2: expected power, 28 dBm MS TX Level 3: expected power, 24 dBm MS TX Level 4: expected power, 20 dBm MS TX Level 5: expected power, 16 dBm MS TX Level 6: expected power, 12 dBm MS TX Level 7: expected power, 8 dBm *all values for MS TX level assume 0 dB antenna gain
Query	Range: 0 to 7
*RST Setting	2
<b>Programming Example</b> OUTPUT 714;"CALL:MS:ANALOG:TXLEVEL 5" !Sets mobile station AVC transmit power level to 5 (expected power 16 dBm).	



**CALL:MS:DIGital:TXLevel**

Function	<p>Sets/queries the mobile station transmit level for a digital traffic channel on the selected band.</p> <p>This command is used in active cell operating mode to immediately change the mobile level while on an DTC.</p> <p>Note: This setting is NOT used when the mobile station is camped on a Digital Control Channel (DCCH) and the test set is in the idle state. If a forward control channel message is sent to the mobile while camped on a DCCH, the mobile is always commanded to respond on the reverse channel at Dig MS TX Level 2, regardless of this setting.</p>
Setting	<p>Range: 0 to 10</p> <p>MS TX Level 0: expected power, 36 dBm (cellular or PCS)*</p> <p>MS TX Level 1: expected power, 32 dBm (cellular or PCS)</p> <p>MS TX Level 2: expected power, 28 dBm (cellular or PCS)</p> <p>MS TX Level 3: expected power, 24 dBm (cellular or PCS)</p> <p>MS TX Level 4: expected power, 20 dBm (cellular or PCS)</p> <p>MS TX Level 5: expected power, 16 dBm (cellular or PCS)</p> <p>MS TX Level 6: expected power, 12 dBm (cellular or PCS)</p> <p>MS TX Level 7: expected power, 8 dBm (cellular or PCS)</p> <p>MS TX Level 8: expected power, 3 dBm (cellular), 2 dBm (PCS)</p> <p>MS TX Level 9: expected power, -2 dBm (cellular), -3 dBm (PCS)</p> <p>MS TX Level 10: expected power, -7 dBm (cellular), -8 dBm (PCS)</p> <p>*all values for MS TX level assume 0 dB antenna gain</p>
Query	Range: 0 to 10
*RST Setting	Cellular: 2 PCS: 2
<p>Programming Example</p> <pre>OUTPUT 714;"CALL:MS:DIGITAL:TXLEVEL 5" !Sets mobile station transmit power level to 5 (expected power 16 dBm).</pre>	

**CALL:MS:REPorted:BWType?**

Function	<p>Queries the mobile reported bandwidth support as part of the station class mark (SCM). Bandwidths supported are 20 MHz, 25 MHz, or none. Used only in active cell operating mode.</p>
Query	Range: BWT20   BWT25   UNKN
*RST Setting	UNKN
<p>Programming Example</p> <pre>OUTPUT 714;"CALL:MS:REPORTED:BWTYPE?" !Queries the reported SCM bandwidth support.</pre>	

**CALL:MS****CALL:MS:REPorted:ESN[:DECimal]?**

Function	Queries the decimal formatted version of the electronic serial number. Returns a string of decimal characters. Used only in active cell operating mode.
Query	Range: 0000000000 to 4294967295, or null
*RST Setting	null
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:ESNUMBER:DECIMAL?" !Queries the decimal value of the ESN.	

**CALL:MS:REPorted:ESNumber:HEX?**

Function	Queries the hexadecimal formatted version of the electronic serial number. Returns a string of hexadecimal characters. Used only in active cell operating mode.
Query	Range: 0x00000000 to 0xFFFFFFFF, or null
*RST Setting	null
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:ESNUMBER:HEX?" !Queries the Hexadecimal value of the ESN.	

**CALL:MS:REPorted:MAHOff[:STATe]**

Function	Sets MAHO reporting on or off. When on, the mobile reports MAHO BER, MAHO RSSI, and Neighbor List RSSI information back to the base station while it is on a DTC. Used only in active cell operating mode.
Setting	Range: 1   ON   0   OFF
*RST Setting	OFF
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:MAHOFF:STATE ON" !Turns MAHO reporting on.	

**CALL:MS:REPorted:MAHOff:BERRor[:LAST]?**

Function	Queries the MAHO BER (Bit Error Ratio) measurement results. Used only in active cell operating mode.
Query	Range: BERI0   BERI1   BERI2   BERI3   BERI4   BERI5   BERI6   BERI7   UNKN BER Interval 0 (<0.01%) BER Interval 1 (0.01 to <0.1%) BER Interval 2 (0.1 to <0.5%) BER Interval 3 (0.5 to <1.0%) BER Interval 4 (1.0 to <2.0%) BER Interval 5 (2.0 to <4.0%) , BER Interval 6 (4.0 to <8.0%) BER Interval 7 (>= 8.0%) UNKNown
*RST Setting	UNKN
<b>Programming Example</b> OUTPUT 714; "CALL:MS:REPORTED:MAHO:BERROR:LAST?" !Returns results for MAHO BER measurement.	

**CALL:MS:REPorted:MAHOff:BERRor:NEW?**

Function	Clears the last MAHO BER result and requests a new MAHO BER measurement from the mobile.
Query	Range: BERI0   BERI1   BERI2   BERI3   BERI4   BERI5   BERI6   BERI7   UNKN BER Interval 0 (<0.01%) BER Interval 1 (0.01 to <0.1%) BER Interval 2 (0.1 to <0.5%) BER Interval 3 (0.5 to <1.0%) BER Interval 4 (1.0 to <2.0%) BER Interval 5 (2.0 to <4.0%) , BER Interval 6 (4.0 to <8.0%) BER Interval 7 (>= 8.0%) UNKNown
*RST Setting	UNKN
<b>Programming Example</b> OUTPUT 714; "CALL:MS:REPORTED:MAHO:BERROR:NEW?" !Clears the last measurement and returns results for a new MAHO BER measurement.	

**CALL:MS****CALL:MS:REPorted:MAHOff:NEIGHbor:BAND**

Function	Sets/queries the band type of the neighbor channels. Bands can be set for up to six neighbor channels. The CALL:MS:REP:MAHO:NEIG:COUN command selects the number of channels in the neighbor list.
Setting	Range: 1 = Cellular band 2 = PCS band
Query	Range: 1 2
*RST Setting	1 (cellular band)
<b>Programming Example</b> <pre>OUTPUT 714;"CALL:MS:REPORTED:MAHO:NEIGHBOR 1,2,1,2,1,1" !Sets up the RSSI measurement to return results in the cellular band for neighbor 1, the !PCS band for neighbor 2, cellular band for neighbor 3, PCS band for neighbor 4, and !cellular band for neighbors 5 and 6.</pre>	

**CALL:MS:REPorted:MAHOff:NEIGHbor:CHANnel[:SElected]**

Function	Sets/queries the channels for the neighbor cells (up to six) that the mobile station is instructed to report RSSI for in the band selected with the CALL:MS:REP:MAHO:NEIG:BAND command.
Setting	Range: Cell band: 1 to 799, 991 to 1023 PCS band: 2 to 1998
Query	Range: Cell band: 1 to 799, 991 to 1023 PCS band: 2 to 1998
*RST Setting	1 (cellular band) 2 (PCS band)
<b>Programming Example</b> <pre>OUTPUT 714;"CALL:MS:REPORTED:MAHO:NEIGHBOR:CHANNEL:SELECTED 112,223,334,445,556,667" !Sets the channel number for neighbor 1 to 112, neighbor 2 to 223, and so forth.</pre>	

**CALL:MS:REPorted:MAHOff:NEIGHbor:CHANnel:CELLular**

Function	Sets/queries the channels for the neighbor cells (up to 6) that are set to the cellular band using the CALL:MS:REP:MAHO:NEIG:BAND command.
Query	Range: 1 to 799, 991 to 1023
*RST Setting	1
<b>Programming Example</b> OUTPUT 714;"CALL:MS:REPORTED:MAHO:NEIGHBOR:CHANNEL:CELLULAR 112,223,334,445,556,667" !Sets the cellular band channel number for neighbor 1 to 112, neighbor 2 to 223, !and so forth.	

**CALL:MS:REPorted:MAHOff:NEIGHbor:CHANnel:PCS**

Function	Sets/queries the channels for the neighbor cells (up to 6) that are set to the PCS band using the CALL:MS:REP:MAHO:NEIG:BAND command.
Query	Range: 2 to 1998
*RST Setting	2
<b>Programming Example</b> OUTPUT 714;"CALL:MS:REPORTED:MAHO:NEIGHBOR:PCS 112,223,334,445,556,667" !Sets the PCS band channel number for neighbor 1 to 112, neighbor 2 to 223, and so forth.	

**CALL:MS:REPorted:MAHOff:NEIGHbor:COUNT**

Function	Sets/queries the number of cells in the neighbor list.
Setting	Range: 1 to 6
Query	Range: 1 to 6
*RST Setting	1
<b>Programming Example</b> OUTPUT 714;"CALL:MS:REPORTED:MAHO:NEIGHBOR:COUNT 5" !Sets the number of cells in the neighbor list to 5.	

**CALL:MS****CALL:MS:REPorted:MAHOff:NEIGHbor:LIST[:ALL][:LAST]?**

Function	Queries the last RSSI measurement in the neighbor cells specified by the CALL:MS:REP:MAHO:NEIG:COUN command . This query returns a comma separated list <band>,<band>,<band>,<band>,<band>,<band>,<channel>,<channel>,<channel>,<channel>,<channel>,<channel>,<RSSI>,<RSSI>,<RSSI>,<RSSI>,<RSSI>,<RSSI>. Results for band, channel, and RSSI will be 9.91E+37 for any neighbor cells that are not specified by the CALL:MS:REP:MAHO:NEIG:COUN command.
Query	Range: -113 to -30 dBm, 9.91E+37
<b>Programming Example</b> OUTPUT 714;"CALL:MS:REPORTED:MAHO:NEIGHBOR:LIST:ALL:LAST?" !Returns the last RSSI measurement results for the specified neighbor cells.	

**CALL:MS:REPorted:MAHOff:NEIGHbor:LIST[:ALL]:NEW?**

Function	Triggers and queries a new set of RSSI measurements in the neighbor cells specified by the CALL:MS:REP:MAHO:NEIG:COUN command . This query returns a comma separated list <band>,<band>,<band>,<band>,<band>,<band>,<channel>,<channel>,<channel>,<channel>,<channel>,<channel>,<RSSI>,<RSSI>,<RSSI>,<RSSI>,<RSSI>,<RSSI>. Results for band, channel, and RSSI will be 9.91E+37 for any neighbor cells that are not specified by the CALL:MS:REP:MAHO:NEIG:COUN command.
Query	Range: -113 to -30 dBm, 9.91E+37
<b>Programming Example</b> OUTPUT 714;"CALL:MS:REPORTED:MAHO:NEIGHBOR:LIST:ALL:NEW?" !Clears the last RSSI measurement and returns a new set of results for the neighbor list .	

**CALL:MS:REPorted:MAHOff:RSSI[:LAST]?**

Function	Clears the last MAHO RSSI result and requests a new MAHO RSSI measurement from the mobile.
Query	Range: -113 dBm to -30 dBm, 9.91 E+37
*RST Setting	9.91 E+37
<b>Programming Example</b> OUTPUT 714;"CALL:MS:REPORTED:MAHO:RSSI:NEW?" !Clears the last measurement and returns a new received signal strength result.	

**CALL:MS:REPorted:MAHOff:RSSI:NEW?**

Function	Queries the MAHO RSSI (Received Signal Strength Indicator) measurement. Used only in active cell operating mode.
Query	Range: -113 dBm to -30 dBm, 9.91 E+37
*RST Setting	9.91 E+37
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:MAHO:RSSI?" !Returns received signal strength result.	

**CALL:MS:REPorted:MIN1:HEX?**

Function	Queries the 24 bits of the mobile identification number that represent the mobile station's 7 digit phone number. Returns a string of hexadecimal characters.  When the MS registers, the MS sends a 34 bit Mobile Identification Number that is divided into MIN1 (24 bits) representing the MS's 7 digit phone number and MIN2 (10 bits) representing the 3 digit area code. When the 34 bit Mobile Identification Number value is received by the test set, Paging Phone Number, MIN1 and MIN2 will be updated.  Used only in active cell operating mode.
Query	Range: 0x000000 to 0xFFFFFFFF, or null
*RST Setting	null
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:MIN1:HEX?" !Returns the MIN1 value.	

**CALL:MS:REPorted:MIN2:HEX?**

Function	Queries the 10 bits of the mobile identification number that represent the mobile station's 3 digit area. Returns a string of hexadecimal characters. Used only in active cell operating mode.  When the MS registers, the MS sends a 34 bit Mobile Identification Number that is divided into MIN1 (24 bits) representing the MS's 7 digit phone number and MIN2 (10 bits) representing the 3 digit area code. When the 34 bit Mobile Identification Number value is received by the test set, Paging Phone Number, MIN1 and MIN2 will be updated.
Query	Range: 0x000 to 0x3FF, or null
*RST Setting	null
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:MIN2:HEX?"	

**CALL:MS****CALL:MS:REPorted:ONUMber?**

Function	Queries the phone number the mobile station dialed in a mobile originated call. Used only in active cell mode. Returns a string of up to 16 digits.
Query	Range: up to 16 digits: 0 through 9, *,#, or null
*RST Setting	null
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:ONUMBER?" !Returns the phone number the mobile dialed.	

**CALL:MS:REPorted:PCLass?**

Function	Queries the mobile reported power class as part of the station class mark (SCM). Used only in active cell operating mode.
Query	Range: 1 through 8, 9.91 E+37
*RST Setting	9.91 E+37
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:PCLASS?" !Returns the reported power class for the mobile.	

**CALL:MS:REPorted:PNUMber?**

Function	Queries the mobile station reported phone number. When the mobile station registers, the 34 bit mobile identification number (MIN) is used to set the MS reported phone number and paging phone number. If the MIN does not translate into a valid phone number, set the ms reported phone number and paging phone number to 0000000000. Used only in active cell operating mode.
Query	Range: Up to 10 characters 0 through 9, or null
*RST Setting	null
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:PNUMBER?" !Returns the phone number of the mobile.	

**CALL:MS:REPorted:RATE[:CAPability]?**

Function	Queries the mobile station reported half rate or full rate capability. Used only in active cell operating mode.
Query	Range: HALF   FULL   UNKN
*RST Setting	UNKN
Programming Example	
OUTPUT 714;"CALL:MS:REPORTED:RATE:CAPABILITY?" !Returns the reported rate capability.	



**CALL:MS:REPorted:REVision[:DIGital]?**

Function	Queries the digital mobile reported protocol version that the mobile station supports. Used only in active cell operating mode.
Query	Range: 0 to 15, 9.91 E+37  Protocol Version: 0 (TIA/EIA-553/IS-54-A) 1 (TIA/EIA 627) 2 (IS-136 Rev 0) 3 (Permanently Reserved) 4 (EIA/TIA-136-0 pv0) 5 (EIA/TIA-136-A pv1) 6 (EIA/TIA-136-A p2) 7 (EIA/TIA-136-A pv3) 8 through 15 (9.91 e+37)
*RST Setting	9.91 E+37
Programming Example OUTPUT 714 ; "CALL:MS:REPORTED:REVISION:DIGITAL?"	

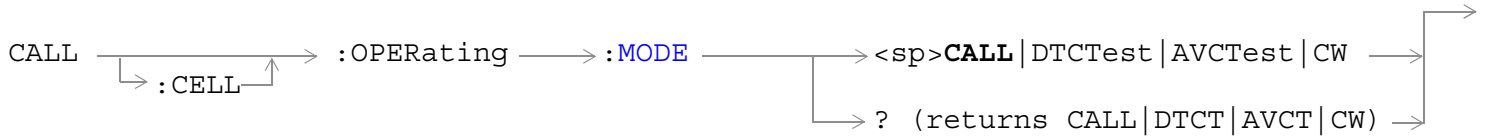
**CALL:MS:REPorted:REVision:ANALog?** (Not supported in the first release of this mobile test application.)

Function	Queries the analog mobile reported protocol version that the mobile station supports. Used only in active cell operating mode.
Query	Range: 0 to 3, 9.91E+37  Protocol Version: 0 (TIA/EIA-553/IS-54-A MS) 1 (TIA/EIA 627 dual-mode MS) 2 (IS-95 dual mode MS) 3 (TIA/EIA-136 dual-mode MS) 9.91E+37
*RST Setting	9.91 E+37
Programming Example OUTPUT 714 ; "CALL:MS:REPORTED:REVISION:ANALOG?"	

**CALL:MS****CALL:MS:REPorted:TXType?**

Function	Queries the mobile reported discontinuous transmission support as part of the station class mark (SCM).
Query	Range: CONT   DISC   UNKN
*RST Setting	UNKN
<b>Programming Example</b> OUTPUT 714 ; "CALL:MS:REPORTED:TXTYPE?"	

## CALL:OPERating

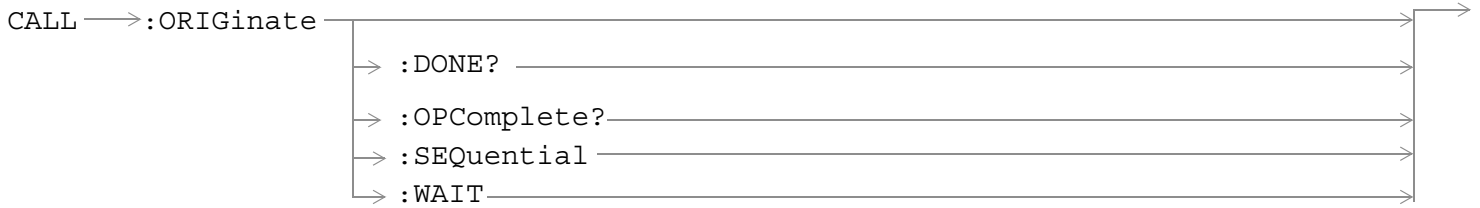


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### CALL[:CELL]:OPERating:MODE

Function	<p>Sets/queries the mode of the base station emulator.</p> <p>CALL is the default operating mode. In CALL mode (also called active cell mode), signaling between the mobile station and the base station emulator is used for call origination, handoffs, MS power level changes, and other operations that simulate in-service mobile interaction.</p> <p>DTCTest generates a forward digital traffic channel to make measurements on mobiles in digital test mode. There is no over-the-air signaling available.</p> <p>AVCTest generates a forward analog voice channel to make measurements on mobiles in analog test mode. The SAT can be turned on or off in this mode. Internal and external FM are available. There is no over-the-air signaling available.</p> <p>CW generates a continuous wave forward signal. This turns the base station emulator’s forward link into a basic signal generator with level (cell power) and frequency (RF generator frequency) control. No reverse demodulation or decoding is available. There is no over-the-air signaling available.</p>
Setting	Range: CALL   DTCTest   AVCTest   CW
Query	Range: CALL   DTCT   AVCT   CW
*RST Setting	CALL
<b>Programming Example</b> OUTPUT 714; "CALL:CELL:OPERATING:MODE DTCTEST" !Selects DTC Test mode.	

## CALL:ORIGinate



[“Diagram Conventions” on page 267](#)

### CALL:ORIGinate

Function	<p>Performs a base station originated call. See <a href="#">“Call Processing Event Synchronization” on page 35</a>.</p> <p>Additional commands can be appended to aid in controller or mobile station synchronization.</p> <p>Note: Immediately preceding this command with the CALL:END command may result in an error. This is often caused by the mobile not being able to respond to the page quickly enough after terminating a call. If the error “Call Operation Rejected; Protocol request ignored” is displayed, wait until the mobile has camped on the control channel before issuing the CALL:ORIGinate command.</p>
<p><b>Programming Example</b></p> <pre> OUTPUT 714;"CALL:ORIGINATE:SEQUENTIAL" !Originates a base station call.  !Appending SEQUENTIAL to this command  !causes the command to be  !performed sequentially.           </pre>	

## CALL:PAGing:PNUMber

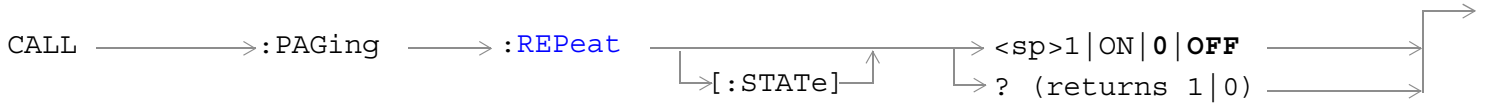


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### CALL:PAGing:PNUMber

Function	Sets/queries the paging phone number. When the mobile station registers, the 34 bit mobile identification number (MIN) is used to set the MS reported phone number and paging phone number. If the MIN does not translate into a valid phone number, the ms reported phone number and paging phone number are set to 0000000000. This setting is overwritten when the phone number is updated.  When setting the paging number, the value is entered as a string (not as a numeric entry). Be sure to enclose the paging number in single quotes.
Setting	Range: up to 10 characters: 0 through 9, or null
Query	Range: up to 10 characters: 0 through 9, or null
*RST Setting	null
<b>Programming Example</b> OUTPUT 714;"CALL:PAGING:PNUMBER '8005551212'" !Set the paging number to 8005551212.	

## CALL:PAGing:REPeat



[“Diagram Conventions” on page 267](#)

### CALL:PAGing:REPeat[:STATE]

Function	<p>Sets/queries whether the test set sends a single page command to the mobile when originating a call (repeat=off) or continues to send page commands to the mobile until the mobile responds (repeat=on).</p> <p>When repeat paging is on, the test set will appear to be “frozen” until the mobile responds to the paging command or until repeat paging is turned off (if the mobile does not respond).</p> <p>Repeat paging is only controlled using the Remote User Interface (RUI); no front panel control is provided at this time.</p>
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714; "CALL:PAGING:REPeat ON" !Enables repeat paging.	



**CALL:POWer****CALL[:CELL]:POWer:AMPLitude**

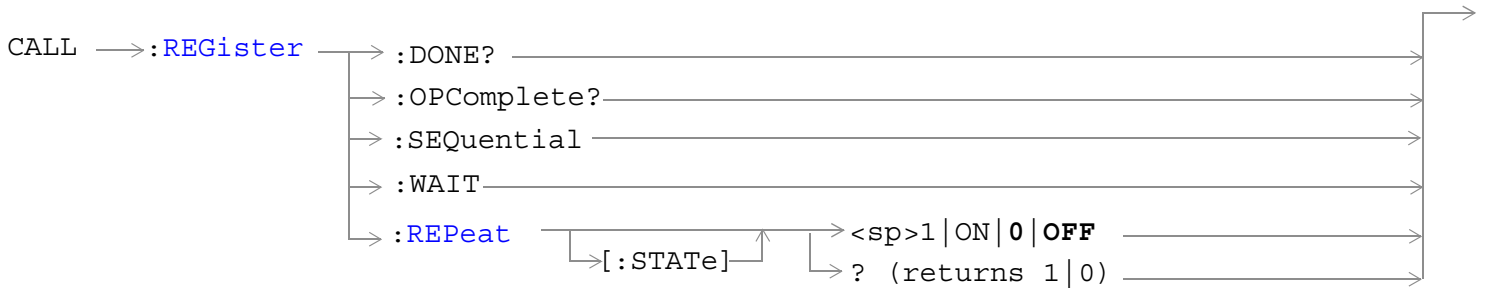
Function	Sets/queries the test set RF output power at the test set's front panel RF IN/OUT connector (including compensation for amplitude offset). This command does not affect the cell power state (on/off).
Setting	Range: -10 dBm to -127 dBm Resolution 0.01 dBm The actual cell power range is defined by adding the value of the associated amplitude offset. For example, if amplitude offset is -3.5 dB, then the Cell Power range will be -13.5 to -130.5 dBm.
Query	Range: -10 dBm to -127 dBm Resolution 0.01 dBm The actual cell power range is defined by adding the value of the associated amplitude offset. For example, if amplitude offset is -3.5 dB, then the Cell Power range will be -13.5 to -130.5 dBm.
*RST Setting	-50 dBm
Programming Example	
OUTPUT 714;"CALL:CELL:POWER:AMPLITUDE -30" !Set the RF output power to -30 dBm.	

**CALL[:CELL]:POWer:STATE**

Function	Sets/queries the test set RF output power on/off state at the test set's front panel RF IN/OUT connector.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	ON
Programming Example	
OUTPUT 714;"CALL:CELL:POWER:STATE OFF" !Turns off RF output power.	



## CALL:REGister



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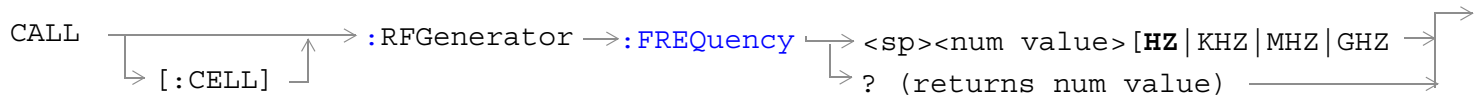
### CALL:REGister

Function	<p>Performs a base station registration. See <a href="#">“Call Processing Event Synchronization” on page 35</a>.</p> <p>Additional commands can be appended to aid in controller or mobile station synchronization.</p> <p>Note: Immediately preceding this command with the CALL:END command may result in an error. This is often caused by the mobile not being able to respond to the registration quickly enough after terminating a call. If the error “Call Disconnected; No response to registration request” is displayed, wait until the mobile has camped on the control channel before issuing the CALL:REGister command, or turn on repeat registration (CALL:REG:REP ON).</p>
Programming Example	<pre> OUTPUT 714;"CALL:REGISTER:SEQUENTIAL" !Originates a base station registration.  !Appending SEQUENTIAL to this command  !causes the command to be  !performed sequentially. </pre>

**CALL:REGister****CALL:REGister:REPeat[:STATe]**

Function	<p>Sets/queries whether the test set sends a single registration command to the mobile when registering a mobile (repeat=off) or continues to send the registration command to the mobile until the mobile responds (repeat=on).</p> <p>When repeat registration is on, the test set will appear to be “frozen” until the mobile responds to the registration command or until repeat registration is turned off (if the mobile does not respond).</p> <p>Repeat registration is only controlled using the Remote User Interface (RUI); no front panel control is provided at this time.</p>
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714; "CALL:REGister:REPeat ON" !Enables repeat registration.	

## CALL:RFGenerator

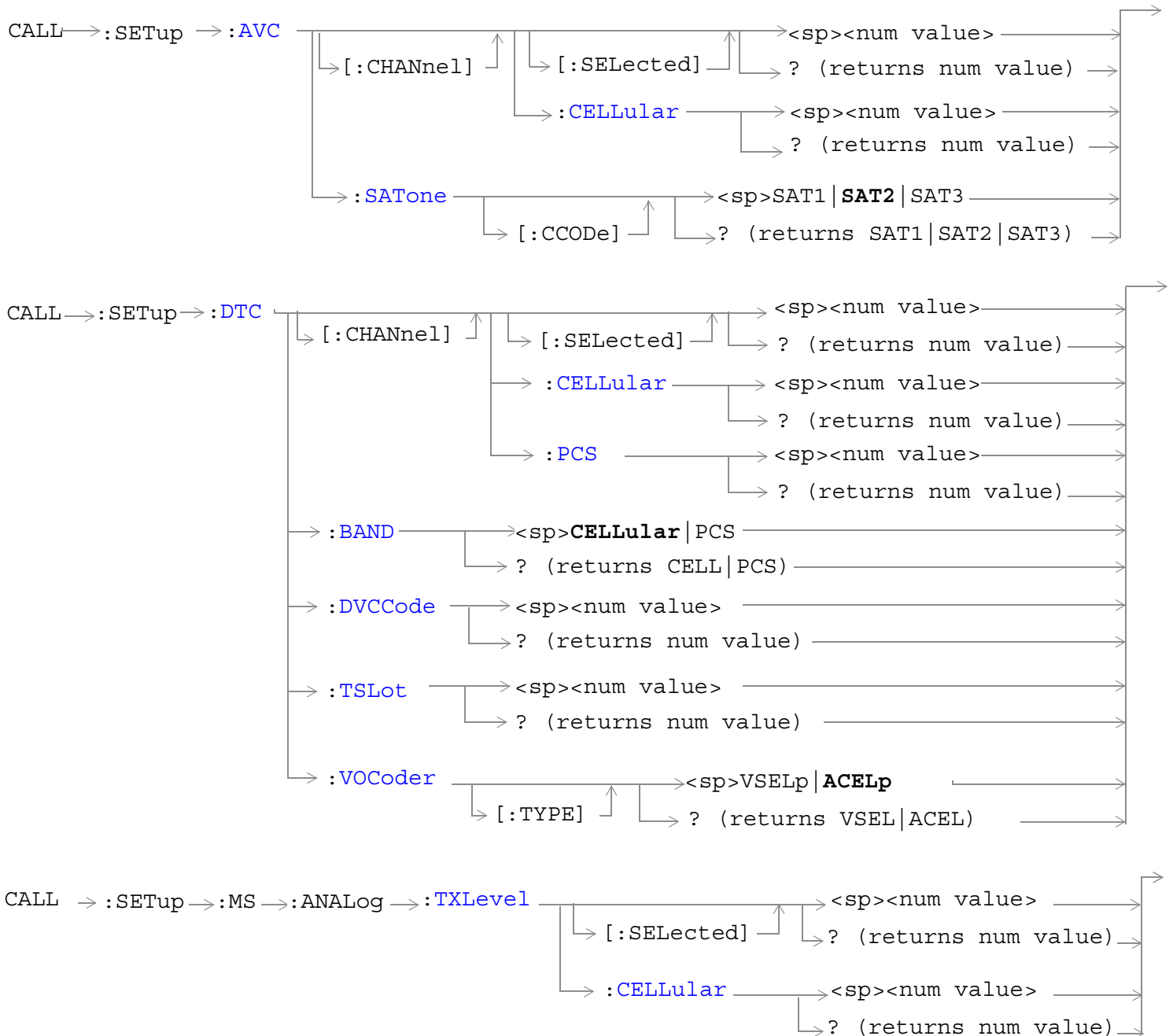


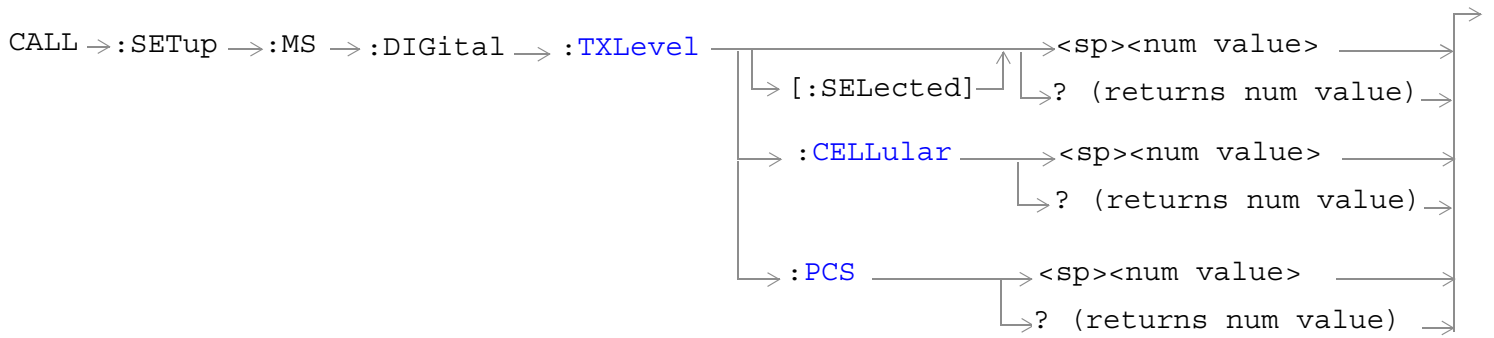
[“Diagram Conventions” on page 267](#)

### CALL[:CELL]:RFGenerator:FREQUENCY

Function	Sets/queries RF generator frequency. If no units are specified the setting defaults to Hz. This setting is only used with AVC Test, DTC Test, and CW operating modes.
Setting	Range: 292 MHz to 2700 MHz Resolution: 0.1 Hz
Query	Range: 292 MHz to 2700 MHz Resolution: 0.1 Hz
*RST Setting	851 MHz
<b>Programming Example</b> OUTPUT 714 ; "CALL:CELL:RFGENERATOR:FREQUENCY 450 MHZ"	

## CALL:SETup





“Diagram Conventions” on page 267

**CALL:SETup****CALL:SETup:AVC[:CHANnel][:SELEcted]**

Function	Sets/queries the RF channel number of the analog voice channel.  During active cell operating mode, this setting does not take affect until a call is originated on the AVC or a handoff occurs to a new AVC. This setting takes effect immediately during AVC Test operating mode.
Setting	Range: 1 through 799, 991 through 1023, 9.91 E+37
Query	Range: 1 through 799, 991 through 1023, 9.91 E+37
*RST Setting	300
Programming Example	
OUTPUT 714;"CALL:SETUP:AVC:CHANNEL:SELECTED 799" !Set the AVC to channel 799.	

**CALL:SETup:AVC[:CHANnel]:CELLular**

Function	Sets/queries the RF channel number of the analog voice channel, specifying the cellular band (800 MHz).  During active cell operating mode, this setting does not take affect until a call is originated on the AVC or a handoff occurs to a new AVC. This setting takes effect immediately during AVC Test operating mode. PCS band analog operation is currently not supported.
Setting	Range: 1 through 799, 991 through 1023, 9.91 E+37
Query	Range: 1 through 799, 991 through 1023, 9.91 E+37
*RST Setting	300
Programming Example	
OUTPUT 714;"CALL:SETUP:AVC:CHANNEL:CELLULAR 799" !Set the AVC to cell band channel 799.	

**CALL:SETup:AVC:SATone[:CCODE]**

Function	Sets/queries the supervisory audio tone's color code (frequency).  In active cell mode, this command sets/queries the SAT color code (frequency) to be used on the next handoff.  In test mode, this command sets/queries the current SAT color code (frequency).
Setting	Range: SAT1   SAT2   SAT3  SAT1 = 5970 Hz SAT2 = 6000 Hz SAT3 = 6030 Hz
Query	Range: SAT1   SAT2   SAT3
*RST Setting	SAT2
Programming Example	
OUTPUT 714;"CALL:SETUP:AVC:SATONE:CCODE SAT1" !Sets the SAT frequency to 5970 Hz.	

**CALL:SETup:DTC[:CHANnel][:SElected]**

Function	Specifies the RF channel number of the digital traffic channel in the selected band. Used only in active cell and DTC test mode.  In active cell mode, this command sets/queries the RF channel number to be used when originating a call or when a handoff takes place.  In DTC test mode this command sets/queries the current RF channel number.
Setting	Range: <ul style="list-style-type: none"> <li>• Cellular: 1 through 799, 991 through 1023</li> <li>• PCS: 1 through 1999</li> </ul>
Query	Range: <ul style="list-style-type: none"> <li>• Cellular: 1 through 799, 991 through 1023</li> <li>• PCS: 1 through 1999</li> </ul>
*RST Setting	Cellular: 300 PCS: 300
Programming Example OUTPUT 714 ; "CALL : SETUP : DTC : CHANNEL : SELECTED"	

**CALL:SETup:DTC[:CHANnel]:CELLular**

Function	Sets/queries the RF channel number of the digital traffic channel in the cellular band. Used only in active cell and DTC test modes.  In active cell mode, this command sets/queries the RF channel number to be used when originating a call or when a handoff takes place.  In DTC test mode this command sets/queries the current RF channel number.
Setting	Range: 1 through 799, 991 through 1023
Query	Range: 1 through 799, 991 through 1023
*RST Setting	300
Programming Example OUTPUT 714 ; "CALL : SETUP : DTC : CHANNEL : CELLULAR 799"	

**CALL:SETup****CALL:SETup:DTC[:CHANnel]:PCS**

Function	Sets/queries the RF channel number of the digital traffic channel in the PCS band. Used only in active cell and DTC test modes.  In active cell mode, this command sets/queries the RF channel number to be used when originating a call or when a handoff takes place.  In DTC test mode this command sets/queries the current RF channel number.
Setting	Range: 1 through 1999
Query	Range: 1 through 1999
*RST Setting	300
Programming Example  OUTPUT 714 ; "CALL:SETUP:DTC:CHANNEL:PCS 777"	

**CALL:SETup:DTC:BAND**

Function	Sets/queries the digital traffic channel band.  In active cell mode, this command sets/queries the DTC band to be used when originating a call or when a handoff takes place.  In DTC test mode this command sets/queries the current DTC band.
Setting	Range: CELLular   PCS
Query	Range: CELL   PCS
*RST Setting	CELL
Programming Example  OUTPUT 714 ; "CALL:SETUP:DTC:BAND PCS"	

**CALL:SETup:DTC:DVCCode**

Function	Sets/queries the digital verification color code (DVCC) that is carried on the digital traffic channel (DTC).  In active cell mode, this command sets/queries the DTC's DVCC to be used when originating a call or when a handoff takes place.  In DTC test mode this command sets/queries the current DTC DVCC.
Setting	Range: 0 to 255
Query	Range: 0 to 255, 9.91 E+37
*RST Setting	1
Programming Example  OUTPUT 714 ; "CALL:SETUP:DTC:DVCC 210"	



**CALL:SETup:DTC:TSLot**

Function	Sets/queries the digital traffic channel timeslot. Since the test set only supports full rate vocoders, 2 slots are used to make up a DTC. For example if the user selects 1 the DTC will actually use slots 1 and 4, if 2 is selected, slots 2 and 5 will be used, if 6 is selected, slots 3 and 6 will be used.  In active cell mode, this command sets/queries the DTC timeslot to be used when originating a call or when a handoff takes place.  In DTC test mode this command sets/queries the current DTC timeslot.
Setting	Range: 1 to 6
Query	Range: 1 to 6
*RST Setting	1
Programming Example OUTPUT 714 ; "CALL:SETUP:DTC:TSLot 3"	

**CALL:SETup:DTC:VOCoder**

Function	Sets/queries the vocoder type for the DTC when in active cell operating mode.
Setting	Range: VSELP   ACELP1
Query	Range: VSEL   ACEL1
*RST Setting	ACEL1
Programming Example OUTPUT 714 ; "CALL:SETUP:DTC:VOCODER VSELP"	

**CALL:SETup****CALL:SETup:MS:ANALog:TXLevel[:SElected]**

Function	Sets/queries the mobile power level to be used when originating a call on an AVC, or when performing a handoff to an AVC in the selected band, when in active cell operating mode.  In AVC Test operating mode, this command immediately changes the expected analog MS TX level.
Setting	Range: 0 to 7  MS TX Level 0: expected power, 36 dBm* MS TX Level 1: expected power, 32 dBm MS TX Level 2: expected power, 28 dBm MS TX Level 3: expected power, 24 dBm MS TX Level 4: expected power, 20 dBm MS TX Level 5: expected power, 16 dBm MS TX Level 6: expected power, 12 dBm MS TX Level 7: expected power, 8 dBm  *all values for MS TX level assume 0 dB antenna gain
Query	Range: 0 to 7
*RST Setting	2
<b>Programming Example</b>  OUTPUT 714;"CALL:SETUP:MS:ANALOG:TXLEVEL:SELECTED 5" !Sets the handoff transmit power level to 5.	

**CALL:SETup:MS:ANALog:TXLevel:CELLular**

Function	Sets/queries the mobile power level to be used when originating a call on an AVC, or when performing a handoff to an AVC in the cellular (800 MHz) band, when in active cell operating mode.  In AVC Test operating mode, this command immediately changes the expected analog MS TX level.
Setting	Range: 0 to 7  MS TX Level 0: expected power, 36 dBm* MS TX Level 1: expected power, 32 dBm MS TX Level 2: expected power, 28 dBm MS TX Level 3: expected power, 24 dBm MS TX Level 4: expected power, 20 dBm MS TX Level 5: expected power, 16 dBm MS TX Level 6: expected power, 12 dBm MS TX Level 7: expected power, 8 dBm  *all values for MS TX level assume 0 dB antenna gain
Query	Range: 0 to 7
*RST Setting	2
<b>Programming Example</b>  OUTPUT 714;"CALL:SETUP:MS:ANALOG:TXLEVEL:CELLULAR 5" !Sets the handoff transmit power level to 5 in the cellular band.	

**CALL:SETup****CALL:SETup:MS:DIGital:TXLevel[:SElected]**

Function	Sets/queries the mobile power level to be used when originating a call on a DTC, or when performing a handoff to a DTC in the selected band, when in active cell operating mode.  In DTC Test operating mode, this command immediately changes the expected digital MS TX level.
Setting	Range: 0 to 10  MS TX Level 0: expected power, 36 dBm (cellular or PCS)* MS TX Level 1: expected power, 32 dBm (cellular or PCS) MS TX Level 2: expected power, 28 dBm (cellular or PCS) MS TX Level 3: expected power, 24 dBm (cellular or PCS) MS TX Level 4: expected power, 20 dBm (cellular or PCS) MS TX Level 5: expected power, 16 dBm (cellular or PCS) MS TX Level 6: expected power, 12 dBm (cellular or PCS) MS TX Level 7: expected power, 8 dBm (cellular or PCS) MS TX Level 8: expected power, 3 dBm (cellular), 2 dBm (PCS) MS TX Level 9: expected power, -2 dBm (cellular), -3 dBm (PCS) MS TX Level 10: expected power, -7 dBm (cellular), -8 dBm (PCS)  *all values for MS TX level assume 0 dB antenna gain
Query	Range: 0 to 10
*RST Setting	Cellular: 2 PCS: 2
<b>Programming Example</b>  OUTPUT 714;"CALL:SETUP:MS:DIGITAL:TXLEVEL:SELECTED 5" !Sets mobile station transmit power level to 5 (expected power 16 dBm).	

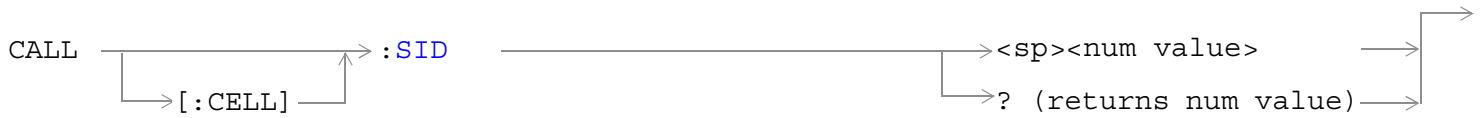
**CALL:SETup:MS:DIGital:TXLevel:CELLular**

Function	Sets/queries the mobile power level to be used when originating a call on a DTC, or when performing a handoff to a DTC in the cellular (800 MHz) band, when in active cell operating mode.  In DTC Test operating mode, this command immediately changes the expected digital MS TX level.
Setting	Range: 0 to 10  MS TX Level 0: expected power, 36 dBm* MS TX Level 1: expected power, 32 dBm MS TX Level 2: expected power, 28 dBm MS TX Level 3: expected power, 24 dBm MS TX Level 4: expected power, 20 dBm MS TX Level 5: expected power, 16 dBm MS TX Level 6: expected power, 12 dBm MS TX Level 7: expected power, 8 dBm MS TX Level 8: expected power, 3 dBm MS TX Level 9: expected power, -2 dBm MS TX Level 10: expected power, -7 dBm  *all values for MS TX level assume 0 dB antenna gain
Query	Range: 0 to 10
*RST Setting	2
<b>Programming Example</b>  OUTPUT 714;"CALL:SETUP:MS:DIGITAL:TXLEVEL:CELLULAR 5" !Sets the handoff transmit power level to 5 (expected power 16 dBm) .	

**CALL:SETup****CALL:SETup:MS:DIGital:TXLevel:PCS**

Function	Sets/queries the mobile power level to be used when originating a call on a DTC, or when performing a handoff to a DTC in the PCS (1900 MHz) band, when in active cell operating mode. In DTC Test operating mode, this command immediately changes the expected digital MS TX level
Setting	<p>Range: 0 to 10</p> <p>MS TX Level 0: expected power, 36 dBm*</p> <p>MS TX Level 1: expected power, 32 dBm</p> <p>MS TX Level 2: expected power, 28 dBm</p> <p>MS TX Level 3: expected power, 24 dBm</p> <p>MS TX Level 4: expected power, 20 dBm</p> <p>MS TX Level 5: expected power, 16 dBm</p> <p>MS TX Level 6: expected power, 12 dBm</p> <p>MS TX Level 7: expected power, 8 dBm</p> <p>MS TX Level 8: expected power, 2 dBm</p> <p>MS TX Level 9: expected power, -3 dBm</p> <p>MS TX Level 10: expected power, -8 dBm</p> <p>*all values for MS TX level assume 0 dB antenna gain</p>
Query	Range: 0 through 10
*RST Setting	2
<p><b>Programming Example</b></p> <pre>OUTPUT 714;"CALL:SETUP:MS:DIGITAL:TXLEVEL:PCS 5"</pre> <p>!Sets the handoff transmit power level to 5 (expected power 16 dBm).</p>	

## CALL:SID



[“Diagram Conventions” on page 267](#)

### CALL[:CELL]:SID

Function	Sets/queries the system identification number.
Setting	Range: 0 to 32767
Query	Range: 0 to 32767
*RST Setting	231
Programming Example	
OUTPUT 714;"CALL:CELL:SID 30" !Set the system identification number to 30.	

## CALL:SOCode



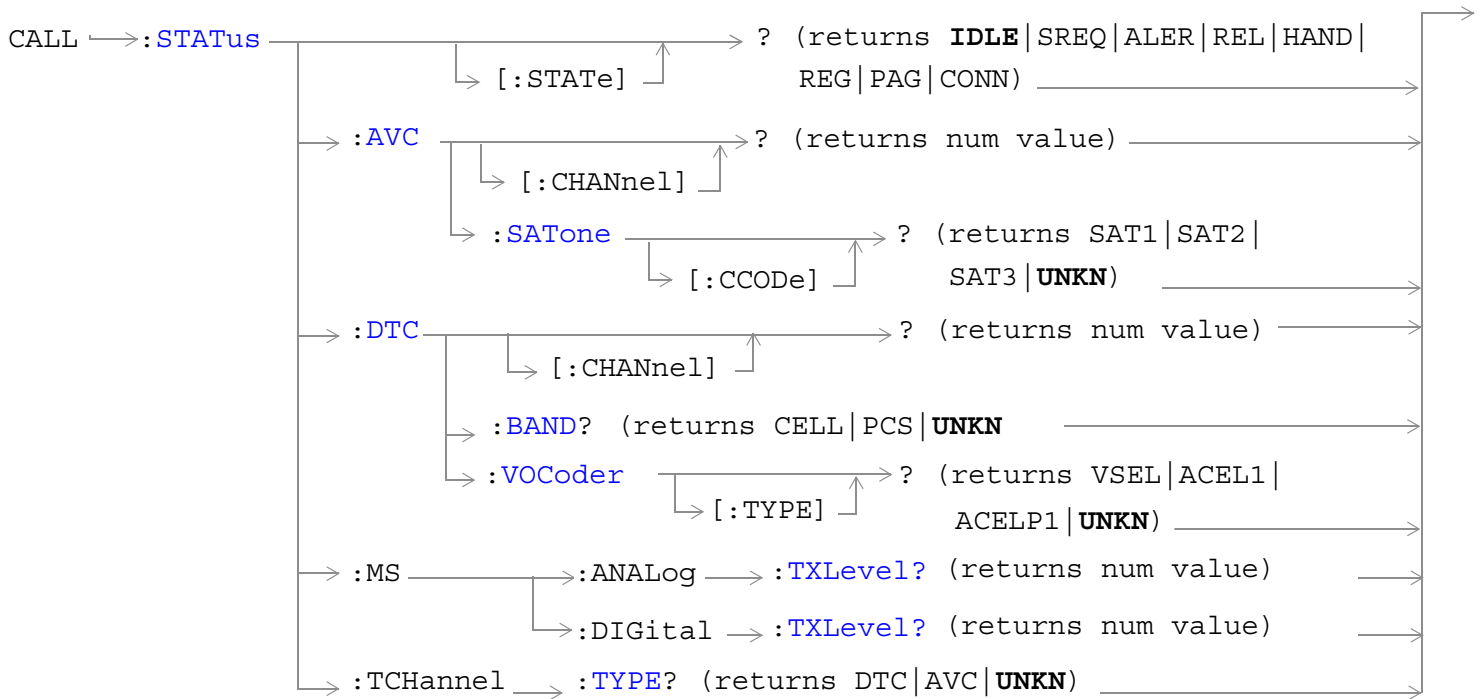
“Diagram Conventions” on page 267

### CALL[:CELL]:SOCode

Function	Sets/queries the system operator code.
Setting	Range: 0 to 4095
Query	Range: 0 to 4095
*RST Setting	0
Programming Example	
OUTPUT 714;"CALL:CELL:SOCODE 314" !Sets the system operator code to 314.	



## CALL:STATUs



“Diagram Conventions” on page 267

**CALL:STATUS****CALL:STATUS[:STATE]?**

Function	Queries the status of the call. Only used in active cell operating mode.
Setting	Range: IDLE   SREQ   ALER   REL   HAND   REG   PAG   CONN (Idle, requesting service, alerting, releasing, handing off, registering, paging, connected)
Query	Range: IDLE   SREQ   ALER   REL   HAND   REG   PAG   CONN
*RST Setting	IDLE
Programming Example	
OUTPUT 714;"CALL:STATUS:STATE?" !Query the current call status.	

**CALL:STATUS:AVC[:CHANnel]?**

Function	Queries the active channel number when connected on an analog voice channel. Only used in active cell operating mode.
Query	Range: 1 through 799, 991 through 1023, 9.91 E+37
*RST Setting	9.91E37 (*RST disconnects the call, so the mobile is no longer on an AVC.)
Programming Example	
OUTPUT 714;"CALL:STATUS:AVC:CHANNEL?"	

**CALL:STATUS:AVC:SATone[:CCODE]?**

Function	Queries the active supervisory audio tone frequency when connected on an analog voice channel. Only used in active cell operating mode.
Query	Range: SAT1   SAT2   SAT3   UNKN SAT1 = 5970 Hz SAT2 = 6000 Hz SAT3 = 6030 Hz
*RST Setting	UNKN (*RST disconnects the call, so the mobile is no longer on an AVC.)
Programming Example	
OUTPUT 714;"CALL:STATUS:AVC:SATONE:CCODE?"	

**CALL:STATUS:DTC[:CHANnel]?**

Function	Queries the active channel number when connected on a digital traffic channel. Only used in active cell operating mode.
Query	Range: <ul style="list-style-type: none"> <li>• Cellular: 1 through 799, 990 through 1023, 9.91E37</li> <li>• PCS: 1 through 1999, 9.91E37</li> </ul>
*RST Setting	9.91E37 (*RST disconnects the call, so the mobile is no longer on a DTC.)
Programming Example OUTPUT 714 ; "CALL : STATUS : DTC : CHANNEL?"	

**CALL:STATUS:DTC:BAND?**

Function	Queries the band of the active digital traffic channel. Only used in active cell operating mode.
Query	Range: CELL   PCS   UNKN
*RST Setting	UNKN (*RST disconnects the call, so the mobile is no longer on a DTC.)
Programming Example OUTPUT 714 ; "CALL : STATUS : DTC : BAND?"	

**CALL:STATUS:DTC:VOCoder[:TYPE]?**

Function	Queries the vocoder type for the active digital traffic channel. Only used in active cell operating mode.
Query	Range: VSEL   ACEL1   UNKN
*RST Setting	UNKN (*RST disconnects the call, so the mobile is no longer on a DTC.)
Programming Example OUTPUT 714 ; "CALL : STATUS : DTC : VOCODER : TYPE?"	

**CALL:STATUS****CALL:STATUS:MS:ANALog:TXLevel?**

Function	Queries the power level setting of the mobile on an active analog voice channel. Only used in active cell operating mode.
Query	<p>Range: 0 to 7, 9.91E37</p> <p>MS TX Level 0: expected power, 36 dBm*</p> <p>MS TX Level 1: expected power, 32 dBm</p> <p>MS TX Level 2: expected power, 28 dBm</p> <p>MS TX Level 3: expected power, 24 dBm</p> <p>MS TX Level 4: expected power, 20 dBm</p> <p>MS TX Level 5: expected power, 16 dBm</p> <p>MS TX Level 6: expected power, 12 dBm</p> <p>MS TX Level 7: expected power, 8 dBm</p> <p>*all values for MS TX level assume 0 dB antenna gain</p>
*RST Setting	9.91E37 (*RST disconnects the call, so the mobile is no longer on an AVC.)
<b>Programming Example</b> OUTPUT 714 ; "CALL : STATUS : MS : ANALOG : TXLEVEL ? "	

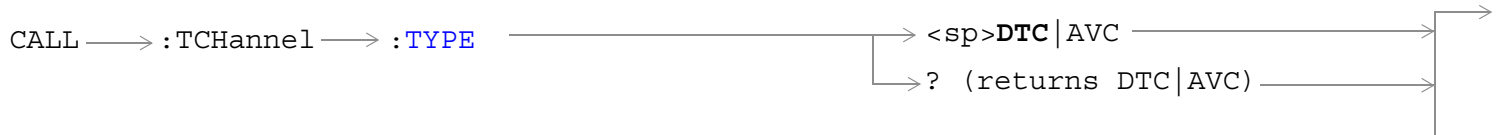
**CALL:STATUS:MS:DIGital:TXLevel?**

Function	Queries the uplink power control level. Only used in active cell operating mode.
Query	<p>Range: 0 to 10, 9.91E37</p> <p>MS TX Level 0: expected power, 36 dBm (cellular or PCS)*</p> <p>MS TX Level 1: expected power, 32 dBm (cellular or PCS)</p> <p>MS TX Level 2: expected power, 28 dBm (cellular or PCS)</p> <p>MS TX Level 3: expected power, 24 dBm (cellular or PCS)</p> <p>MS TX Level 4: expected power, 20 dBm (cellular or PCS)</p> <p>MS TX Level 5: expected power, 16 dBm (cellular or PCS)</p> <p>MS TX Level 6: expected power, 12 dBm (cellular or PCS)</p> <p>MS TX Level 7: expected power, 8 dBm (cellular or PCS)</p> <p>MS TX Level 8: expected power, 3 dBm (cellular), 2 dBm (PCS)</p> <p>MS TX Level 9: expected power, -2 dBm (cellular), -3 dBm (PCS)</p> <p>MS TX Level 10: expected power, -7 dBm (cellular), -8 dBm (PCS)</p> <p>*all values for MS TX level assume 0 dB antenna gain</p>
*RST Setting	9.91E37 (*RST disconnects the call, so the mobile is no longer on a DTC.)
<b>Programming Example</b> OUTPUT 714 ; "CALL : STATUS : MS : DIGITAL : TXLEVEL ? "	

**CALL:STATUS:TCHannel:TYPE?**

Function	Queries the active traffic channel type. Only used in active cell operating mode.
Query	Range: DTC   AVC   UNKN
*RST Setting	UNKN (*RST disconnects the call, so the mobile is no longer on an active traffic channel.)
Programming Example	
OUTPUT 714 ; "CALL : STATUS : TCHANNEL : TYPE ?"	

## CALL:TCHannel



[“Diagram Conventions” on page 267](#)

### CALL:TCHannel:TYPE

Function	Sets/queries the traffic channel type (DTC or AVC) to use when originating a call or performing a handoff.
Setting	Range: DTC   AVC
Query	Range: DTC   AVC
*RST setting	DTC
<b>Programming Example</b> OUTPUT 714; "CALL:TCHANNEL:TYPE AVC" !Selects an analog voice channel.	

---

## IEEE 488.2 Common Commands

### Description

#### **\*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.

\*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.

#### **\*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 for use as an overlapped command.

#### **\*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 for use as an overlapped command.

#### **\*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 returned with the query.

#### **\*RST**

The \*RST, full preset command, is defined in “IEEE Std 488.2-1992”, 10.32. A full preset is also accomplished using the SYStem:PRESet2 command. A full preset restores the majority of settings to their default values and sets measurement trigger arm to single.

**IEEE 488.2 Common Commands**

**\*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 for use as an overlapped command.

**Related Topics**

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[“Measurement Event Synchronization” on page 128](#)

[“Preset Descriptions” on page 567](#)

[“Obtaining Test Application Information” on page 603](#)

\*\*\*\*\*



## 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.

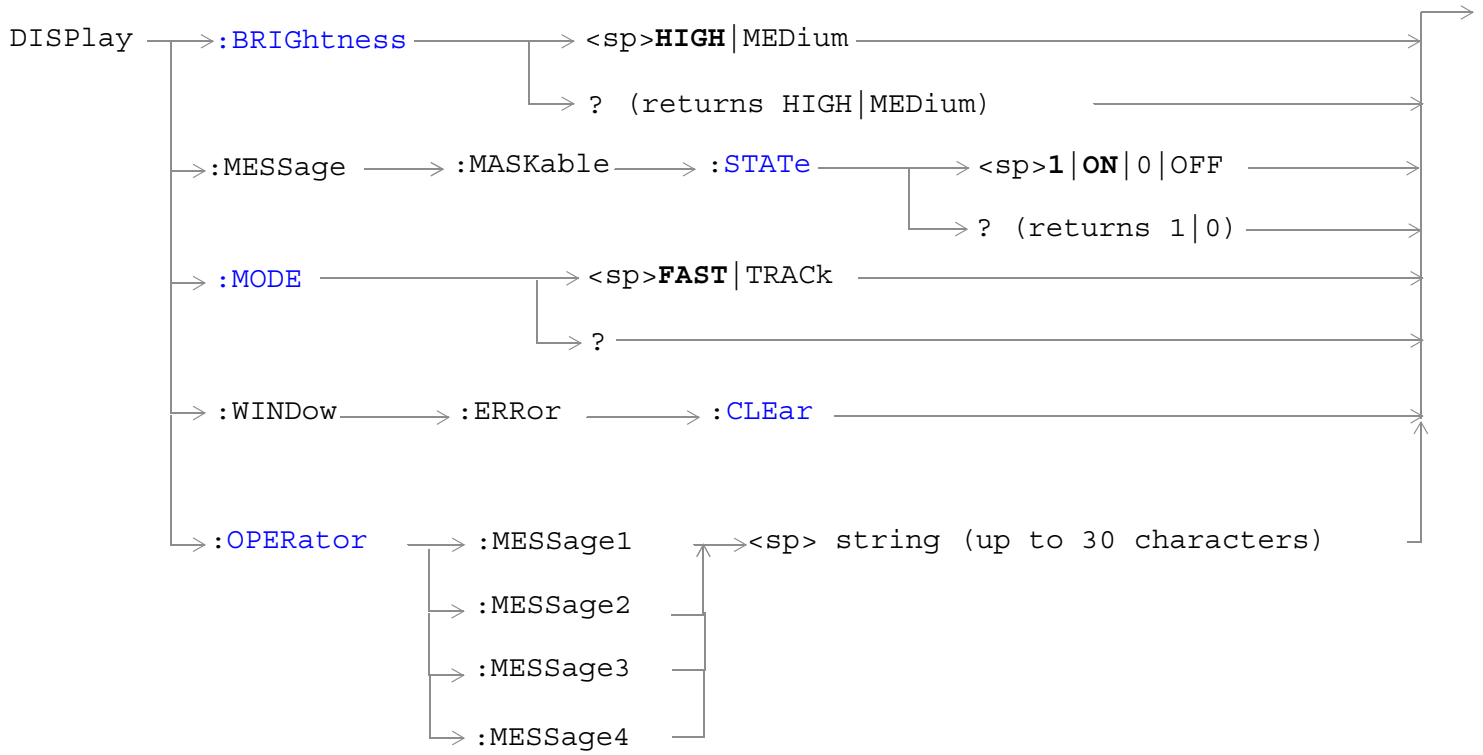
### Display Backlight Dimming

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”

## DISPlay



[“Diagram Conventions” on page 267](#)

**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 <a href="#">“Display Backlight Dimming” on page 345</a> .
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:MESSAge:MASKable:STATE**

Function	Blocks maskable messages from appearing on the test set display display screen but not from the Message Log. Maskable messages are reported to the Message Log in either state. See <a href="#">“Error Message Descriptions” on page 611</a> .
Setting	Range: 1   On   0   Off
Query	Range: 1   On   0   Off
Factory setting	1 (on)
Programming Example	
OUTPUT 714;“DISPLAY:MESSAGE:MASKABLE:STATE OFF” !Prevents certain messages from appearing on the display.	

**DISPlay:MODE**

Function	Sets/queries the test set's display mode.  See <a href="#">“Display Mode (Track/Fast)” on page 591</a> .
Setting	Range: FAST   TRACK
Query	Range: 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.
----------	--

**DISPlay**

**Programming Example**

```
OUTPUT 714;"DISPLAY:WINDOW:ERROR:CLEAR" !Clears an error message from the display.
```

**DISPlay:OPERator:MESSage**

Function	Allows the operator to enter up to four messages, each up to 30 characters in length. These messages will be printed to the display when the command is sent and "DISPlay:MODE" is set to FAST.
Setting	1   2   3   4 1=uppermost field, 4=lowermost field
Factory setting	Each message is initialized to a null string. Nothing will be displayed until one or more of the four GPIB messages is sent to the test set.
<b>Programming Example</b> OUTPUT 714;"DISP:OPER:MESS1`Press F6 to stop test`"!Writes the message "Press F6 to stop test" to the uppermost display field.	

## 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:ACPower” on page 351](#)

[“FETCh:AFANalyzer” on page 355](#)

[“FETCh:ATXPower” on page 364](#)

[“FETCh:DPOWer” on page 367](#)

[“FETCh:DTXPower” on page 369](#)

[“FETCh:FM” on page 372](#)

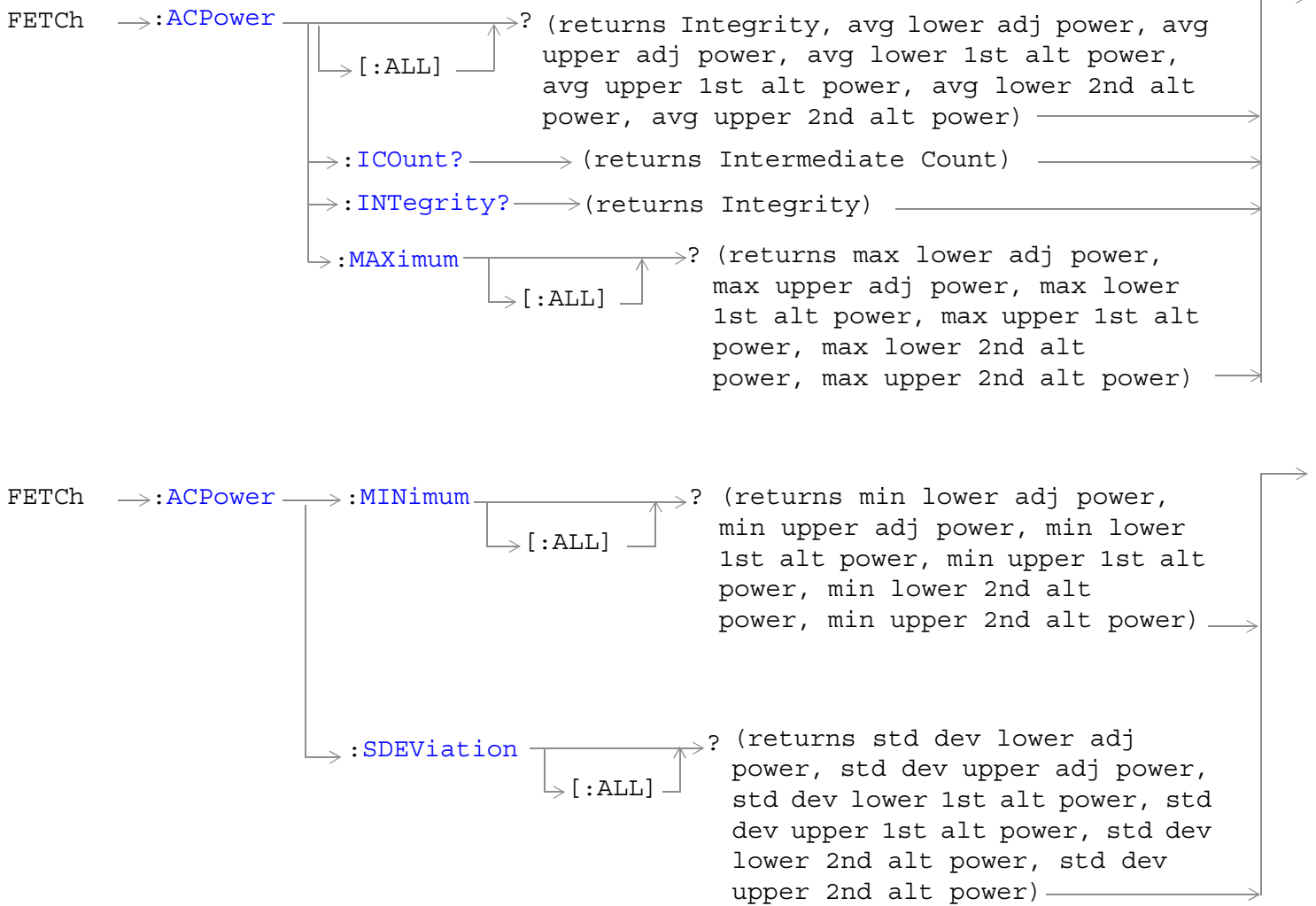
[“FETCh:FSTability” on page 378](#)

[“FETCh:IQTuning” on page 383](#)

[“FETCh:MACCuracy” on page 389](#)

[“FETCh:LBError” on page 386](#)

## FETCh:ACPower



“Diagram Conventions” on page 267

**FETCh:ACPower****FETCh:ACPower[:ALL]?**

Function	Queries the adjacent channel power measurement results.  Returns measurement results in the following order: integrity, average lower adjacent channel power, average upper adjacent channel power, average lower first alternate power, average upper first alternate power, average lower second alternate power, average upper second alternate power.
Query	<ul style="list-style-type: none"> <li>• Range: -999 to 999 dBc</li> <li>• Resolution: 0.1</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCH:ACPOWER:ALL?"
```

```
! Returns the measurement integrity value and average adjacent channel power measurement results.
```

**FETCh:ACPower:MAXimum[:ALL]?**

Function	Queries the maximum adjacent channel power measurement results.  Returns measurement results in the following order: maximum lower adjacent channel power, maximum upper adjacent channel power, maximum lower first alternate power, maximum upper first alternate power, maximum lower second alternate power, maximum upper second alternate power.
Query	<ul style="list-style-type: none"> <li>• Range: -999 to 999 dBc</li> <li>• Resolution: 0.1</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCH:ACPOWER:MAXIMUM:ALL?" !Returns maximum adjacent channel power measurment results.
```

**FETCh:ACPower:MINinum[:ALL]?**

Function	Queries the minimum adjacent channel power measurement results.  Returns measurement results in the following order: integrity, minimum lower adjacent channel power, minimum upper adjacent channel power, minimum lower first alternate power, minimum upper first alternate power, minimum lower second alternate power, minimum upper second alternate power.
Query	<ul style="list-style-type: none"> <li>• Range: -999 to 999 dBc</li> <li>• Resolution: 0.1</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCH:ACPOWER:MINIMUM:ALL?" !Returns minimum adjacent channel power measurment results.
```



**FETCh:ACPower:SDEviation[:ALL]?**

Function	Queries the standard deviation adjacent channel power measurement results.  Returns measurement results in the following order: standard deviation lower adjacent channel power, standard deviation upper adjacent channel power, standard deviation lower first alternate power, standard deviation upper first alternate power, standard deviation lower second alternate power, standard deviation upper second alternate power.
Query	<ul style="list-style-type: none"> <li>• Range: 0 to 999 dB</li> <li>• Resolution: 0.1</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCh:ACPower:SDEviation:ALL?"
!Returns standard deviation adjacent channel power measurement results.
```

**FETCh:ACPower:ICount?**

Function	Queries the intermediate count of measurements completed in a multi-measurement.
Query	Range: 0 to 999

**Programming Example**

```
OUTPUT 714;"FETCh:ACPower:ICount?"
```

**FETCh:ACPower:INTEgrity?**

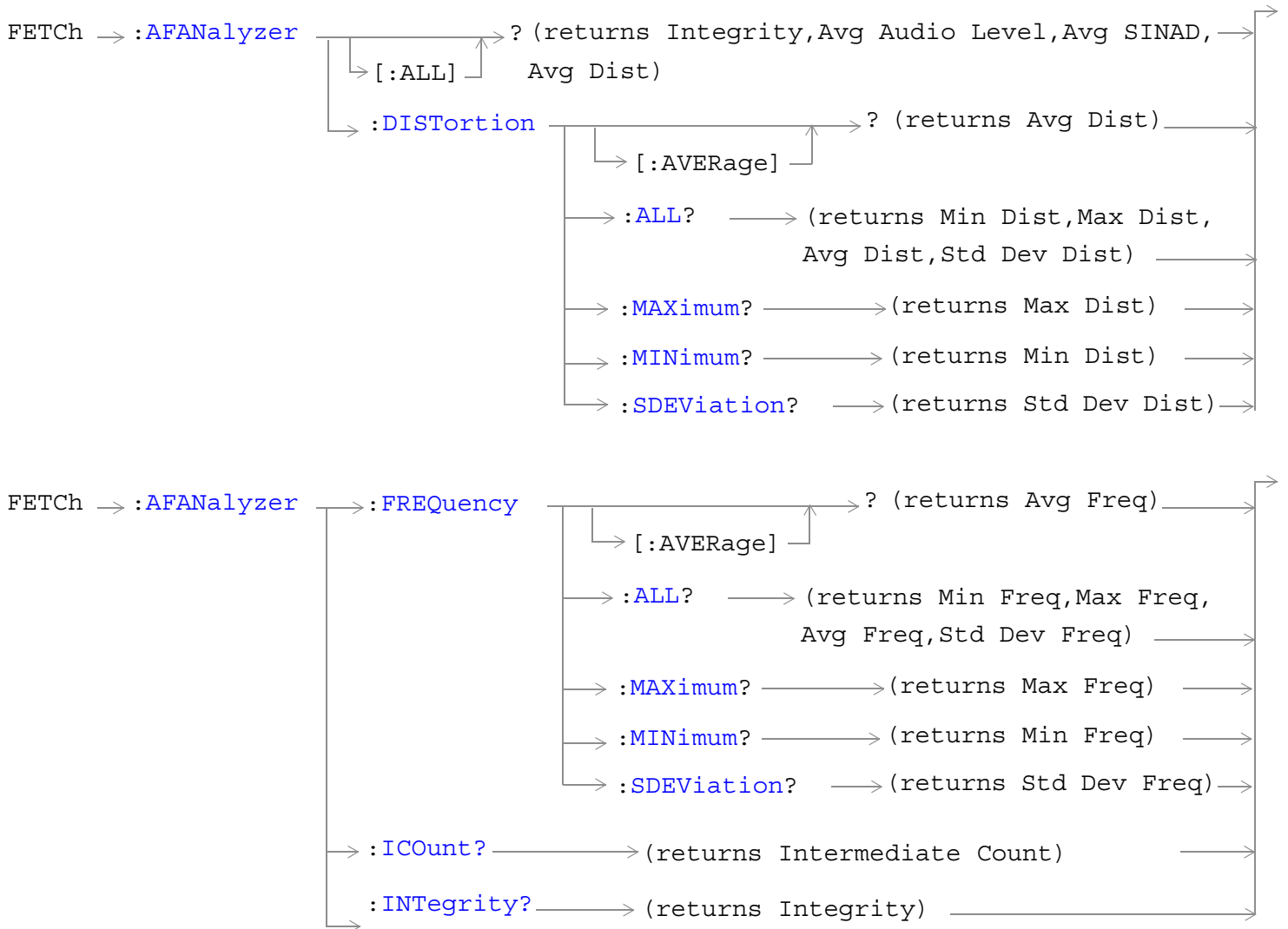
Function	Queries the measurement integrity indicator for the last adjacent channel power measurement completed.  Zero indicates a normal measurement. See <a href="#">“Integrity Indicator” on page 121</a> for information about non-zero integrity results.
Query	Range: 1 to 16

**Programming Example**

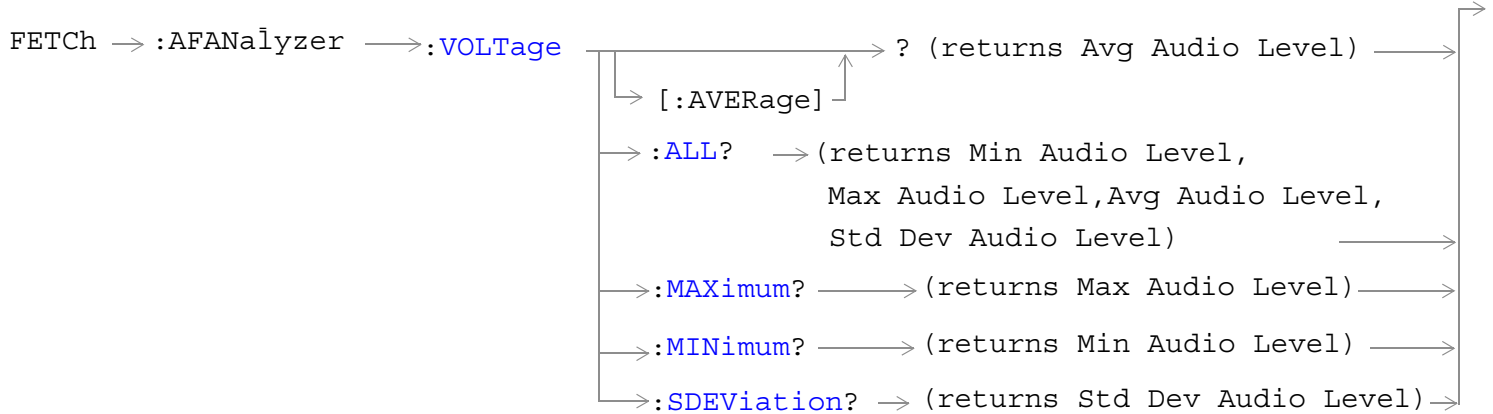
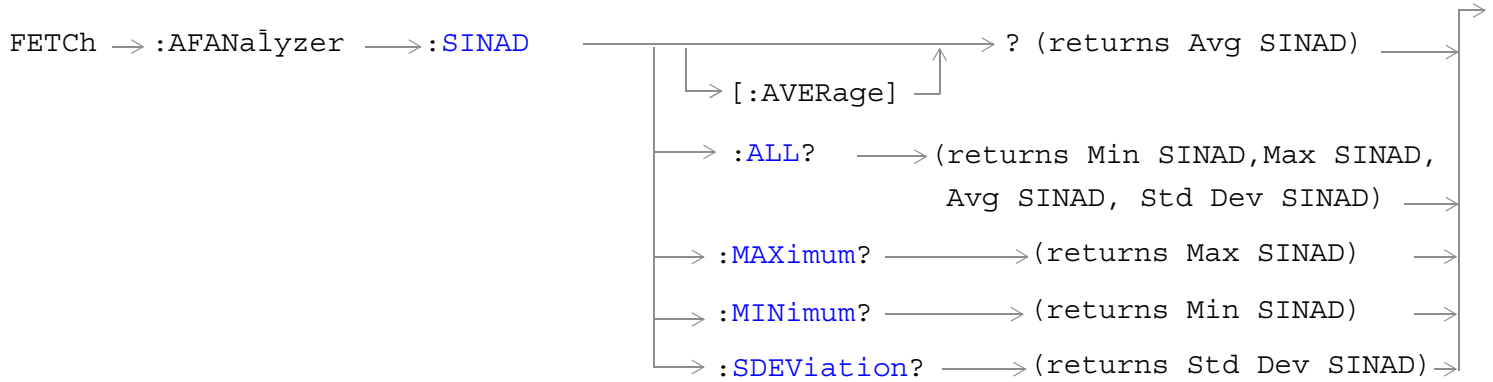
```
OUTPUT 714;"FETCh:ACPower:INTEgrity?"
!Query the integrity value for the last adjacent channel power measurement.
```



## FETCh:AFANalyzer



**FETCh:AFANalyzer**



“Diagram Conventions” on page 267

**FETCh:AFANalyzer[:ALL]?**

Function	Queries the AF analyzer measurements. Measurement results are returned in the following order: integrity, average audio level, average SINAD, average distortion.
Query	<p>Average analog audio level</p> <ul style="list-style-type: none"> <li>• Range: 0 to 20 volts, 9.91 E+37</li> <li>• Resolution: The lesser of 4 significant digits or 10 uV</li> </ul> <p>Average SINAD</p> <ul style="list-style-type: none"> <li>• Range:-99 to 99 dB, 9.91 E+37</li> <li>• Resolution: 0.01 dB</li> </ul> <p>Average audio distortion</p> <ul style="list-style-type: none"> <li>• Range: 0 to 99%, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCh:AFANALYZER:ALL?"
!Returns integrity, average audio level, average SINAD,and average audio distortion.
```

**FETCh:AFANalyzer:DIS TORTion[:AVERAge]?**

Function	Queries the average audio distortion measurement.
Query	<p>Average audio distortion</p> <ul style="list-style-type: none"> <li>• Range: 0 to 99%, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCh:AFANALYZER:DIS TORTION:AVERAGE?"
```

**FETCh:AFANalyzer:DIS TORTion:ALL?**

Function	Queries the audio distortion measurements. The measurement results are returned in the following order: minimum distortion, maximum distortion, average distortion, standard deviation distortion.
Query	Minimum, maximum, and average audio distortion: <ul style="list-style-type: none"> <li>• Range: 0 to 99%, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul> Standard deviation audio distortion: <ul style="list-style-type: none"> <li>• Range: 0 to 99%, 9.91 E+37</li> <li>• Resolution: 0.001%</li> </ul>

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:DIS TORTION:ALL?"
!Returns minimum, maximum, average, and standard deviation audio distortion.
```

**FETCh:AFANalyzer:DIS TORTion:MAXimum?**

Function	Queries the maximum audio distortion.
Query	Range: 0 to 99%, 9.91 E+37 Resolution: 0.01%

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:DIS TORTION:MAXIMUM?"
```

**FETCh:AFANalyzer:DIS TORTion:MINimum?**

Function	Queries the minimum audio distortion.
Query	Range: 0 to 99%, 9.91 E+37 Resolution: 0.01%

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:DIS TORTION:MINIMUM?"
```

**FETCh:AFANalyzer:DIS TORTion:SDEVIation?**

Function	Queries the standard deviation audio distortion.
Query	Range: 0 to 99%, 9.91 E+37 Resolution: 0.001%

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:DIS TORTION:SDEVIATION?"
```

### FETCh:AFANalyzer:FREQuency[:AVERage]?

Function	Queries the average audio frequency measurement.
Query	Average audio frequency <ul style="list-style-type: none"> <li>• Range: 0 to 99999 Hz, 9.91 E+37</li> <li>• Resolution: 0.1 Hz</li> </ul>

#### Programming Example

OUTPUT 714 ; "FETCh:AFANALYZER:FREQUENCY:AVERAGE?"

### FETCh:AFANalyzer:FREQuency:ALL?

Function	Queries the audio frequency measurements. The measurement results are returned in the following order: minimum frequency, maximum frequency, average frequency, standard deviation frequency.
Query	Miniumum, maximum, and average audio frequency: <ul style="list-style-type: none"> <li>• Range: 0 to 99999 Hz, 9.91 E+37</li> <li>• Resolution: 0.1 Hz</li> </ul> Standard deviation audio frequency: <ul style="list-style-type: none"> <li>• Range: 0 to 99999 Hz, 9.91 E+37</li> <li>• Resolution: 0.01 Hz</li> </ul>

#### Programming Example

OUTPUT 714 ; "FETCh:AFANALYZER:FREQUENCY:ALL?"  
!Returns mininum, maximum, average, and standard deviation audio frequency.

### FETCh:AFANalyzer:FREQuency:MAXimum?

Function	Queries the maximum audio frequency.
Query	Range: 0 to 99999 Hz, 9.91 E+37 Resolution: 0.1 Hz

#### Programming Example

OUTPUT 714 ; "FETCh:AFANALYZER:FREQUENCY:MAXIMUM?"

### FETCh:AFANalyzer:FREQuency:MINinum?

Function	Queries the minimum audio frequency.
Query	Range: 0 to 99999 Hz, 9.91 E+37 Resolution: 0.1 Hz

#### Programming Example

OUTPUT 714 ; "FETCh:AFANALYZER:FREQUENCY:MINIMUM?"

**FETCh:AFANalyzer****FETCh:AFANalyzer:FREQuency:SDEVIation?**

Function	Queries the standard deviation audio frequency.
Query	Range: 0 to 99999 Hz, 9.91 E+37 Resolution: 0.01 Hz

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:FREQUENCY:SDEVIATION?"
```

**FETCh:AFANalyzer:ICount?**

Function	Queries the intermediate count of measurements completed in a multi-measurement.
Query	Range: 0 to 999

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:ICOUNT?"
```

**FETCh:AFANalyzer:INTegrity?**

Function	Queries the measurement integrity indicator for the last AF analyzer measurement completed. Zero indicates a normal measurement. See <a href="#">“Integrity Indicator” on page 121</a> for information about non-zero integrity results.
Query	Range: 1 through 16

## Programming Example

```
OUTPUT 714;"FETCh:AFANalyzer:INTegrity?"
!Query the integrity indicator for the AF analyzer results.
```

**FETCh:AFANalyzer:SINAD[:AVERAge]?**

Function	Queries the average SINAD measurement.
Query	Average SINAD <ul style="list-style-type: none"> <li>• Range:-99 to 99 dB, 9.91 E+37</li> <li>• Resolution: 0.01 dB</li> </ul>

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:SINAD:AVERAGE"
```



**FETCh:AFANalyzer:SINAD:ALL?**

Function	Queries the SINAD measurements. Measurement results are returned in the following order: minimum SINAD, maximum SINAD, average SINAD, and standard deviation SINAD.
Query	Minimum, maximum, average SINAD: <ul style="list-style-type: none"> <li>• Range: -99 to 99 dB, 9.91 E+37</li> <li>• Resolution: 0.01 dB</li> </ul> Standard deviation SINAD <ul style="list-style-type: none"> <li>• Range: -99 to 99 dB, 9.91 E+37</li> <li>• Resolution: 0.001 dB</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCh:AFANALYZER:SINAD:ALL?"
!Returns minimum, maximum, average, and standard deviation SINAD.
```

**FETCh:AFANalyzer:SINAD:MAXimum?**

Function	Queries the maximum SINAD measurements.
Query	Range: -99 to 99 dB, 9.91 E+37 Resolution: 0.01 dB

**Programming Example**

```
OUTPUT 714;"FETCh:AFANALYZER:SINAD:MAXIMUM?"
```

**FETCh:AFANalyzer:SINAD:MINimum?**

Function	Queries the minimum SINAD measurements.
Query	Range: -99 to 99 dB, 9.91 E+37 Resolution: 0.01 dB

**Programming Example**

```
OUTPUT 714;"FETCh:AFANALYZER:SINAD:MINIMUM?"
```

**FETCh:AFANalyzer:SINAD:SDEVIation?**

Function	Queries the standard deviation SINAD measurements.
Query	Range: 0 to 99 dB, 9.91 E+37 Resolution: 0.001 dB

**Programming Example**

```
OUTPUT 714;"FETCh:AFANALYZER:SINAD:SDEVIATION?"
```

**FETCh:AFANalyzer:VOLTage[:AVERage]?**

Function	Queries the average audio level measurement.
Query	Range: 0 to 20 volts, 9.91 E+37 Resolution: the lesser of 4 significant digits or 10 uV

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:VOLTAGE:AVERAGE"
```

**FETCh:AFANalyzer:VOLTage:ALL?**

Function	Queries the audio level measurements. Measurement results are returned in the following order: minimum audio level, maximum audio level, average audio level, standard deviation audio level.
Query	Range: 0 to 20 V, 9.91 E+37 Resolution: 4 significant digits

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:VOLTAGE:ALL?"
!Returns minimum, maximum, average, and standard deviation audio level.
```

**FETCh:AFANalyzer:VOLTage:MAXimum?**

Function	Queries the maximum audio level measurement.
Query	Range: 0 to 20 V, 9.91 E+37 Resolution: 4 significant digits

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:VOLTAGE:MAXIMUM?"
```

**FETCh:AFANalyzer:VOLTage:MINimum?**

Function	Queries the minimum audio level measurement.
Query	Range: 0 to 20 V, 9.91 E+37 Resolution: 4 significant digits

## Programming Example

```
OUTPUT 714;"FETCh:AFANALYZER:VOLTAGE:MAXIMUM?"
```

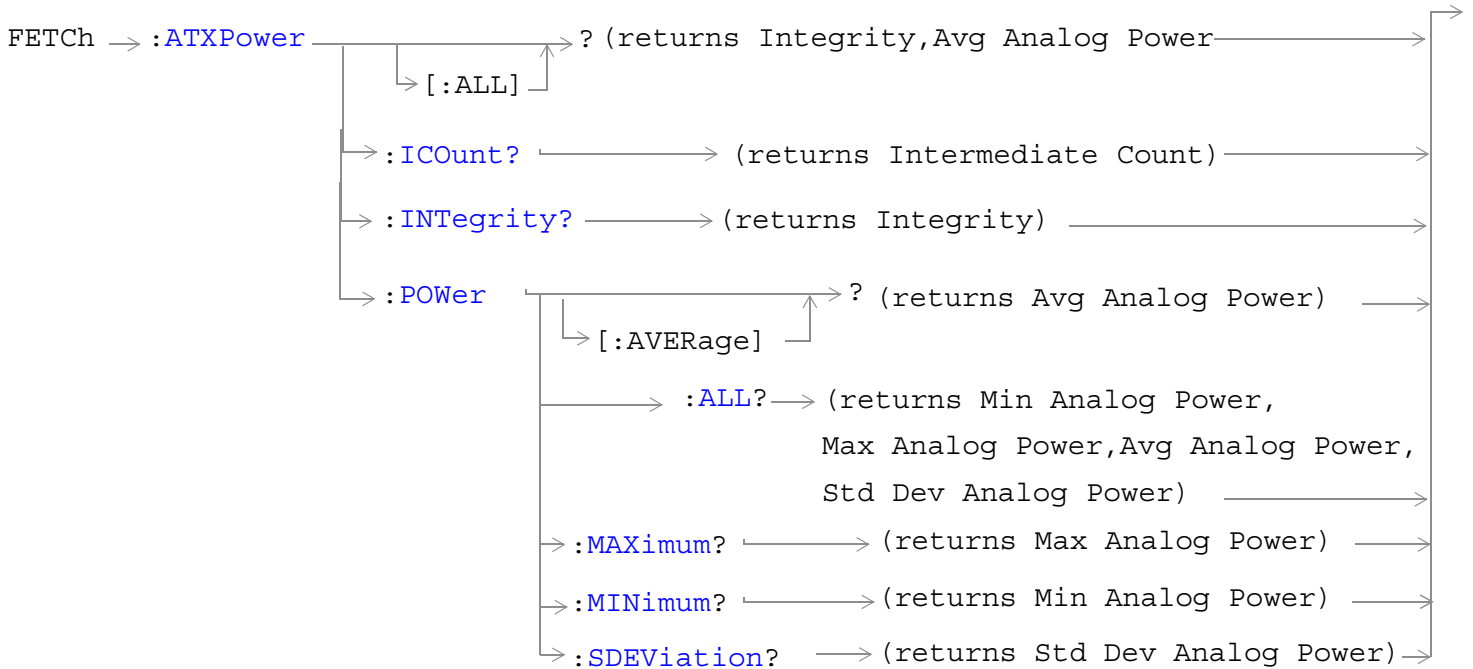
### FETCh:AFANalyzer:VOLTage:SDEVIation?

Function	Queries the standard deviation audio level measurement.
Query	Range: 0 to 20 V, 9.91 E+37 Resolution: 4 significant digits

#### Programming Example

OUTPUT 714;"FETCh:AFANALYZER:VOLTAGE:SDEVIATION?"

## FETCh:ATXPower



“Diagram Conventions” on page 267

### FETCh:ATXPower[:ALL]?

Function	Queries the average analog transmitter power measurement. The query returns integrity, and average analog power.
Query	Range: -100 dBm to +100 dBm Resolution: 0.01 dB

#### Programming Example

OUTPUT 714; "FETCh:ATXPOWER:ALL?" !Returns integrity and average analog power.

**FETCh:ATXPower:ICount?**

Function	Queries the intermediate count of measurements completed in a multi-measurement.
Query	Range: 0 to 999

## Programming Example

```
OUTPUT 714;"FETCh:ATXPower:ICOUNT?"
```

**FETCh:ATXPower:INTEgrity?**

Function	Queries the measurement integrity indicator for the last analog transmitter power measurement completed.  Zero indicates a normal measurement. See <a href="#">“Integrity Indicator” on page 121</a> for information about non-zero integrity results.
Query	Range: 1 through 16

## Programming Example

```
OUTPUT 714;"FETCh:ATXPower:INTEgrity?"
!Query the integrity indicator for the analog TX power measurement.
```

**FETCh:ATXPower:POWER[:AVERage]?**

Function	Queries the average analog transmitter power.
Query	Range: -100 to 100 dBm Resolution: 0.01 dB

## Programming Example

```
OUTPUT 714;"FETCh:ATXPower:POWER:AVERAGE?"
```

**FETCh:ATXPower:POWER:ALL?**

Function	Queries the analog transmitter power measurements. Measurement results are returned in the following order: minimum analog power, maximum analog power, average analog power, standard deviation analog power.
Query	Minimum, maximum, and average analog power: <ul style="list-style-type: none"> <li>• Range: -100 to 100 dBm</li> <li>• Resolution: 0.01 dB</li> </ul> Standard deviation analog power: <ul style="list-style-type: none"> <li>• Range: 0 to 100 dB</li> <li>• Resolution: 0.001 dB</li> </ul>

## Programming Example

```
OUTPUT 714;"FETCh:ATXPower:POWER:ALL?"
!Returns minimum, maximum, average, and standard deviation analog power.
```

**FETCh:ATXPower****FETCh:ATXPower:POWer:MAXimum?**

Function	Queries the maximum analog transmitter power.
Query	Range: -100 to 100 dBm Resolution: 0.01 dB

## Programming Example

```
OUTPUT 714;"FETCh:ATXPower:POWer:MAXimum?"
```

**FETCh:ATXPower:POWer:MINimum?**

Function	Queries the minimum analog transmitter power.
Query	Range: -100 to 100 dBm Resolution: 0.01 dB

## Programming Example

```
OUTPUT 714;"FETCh:ATXPower:POWer:MINimum?"
```

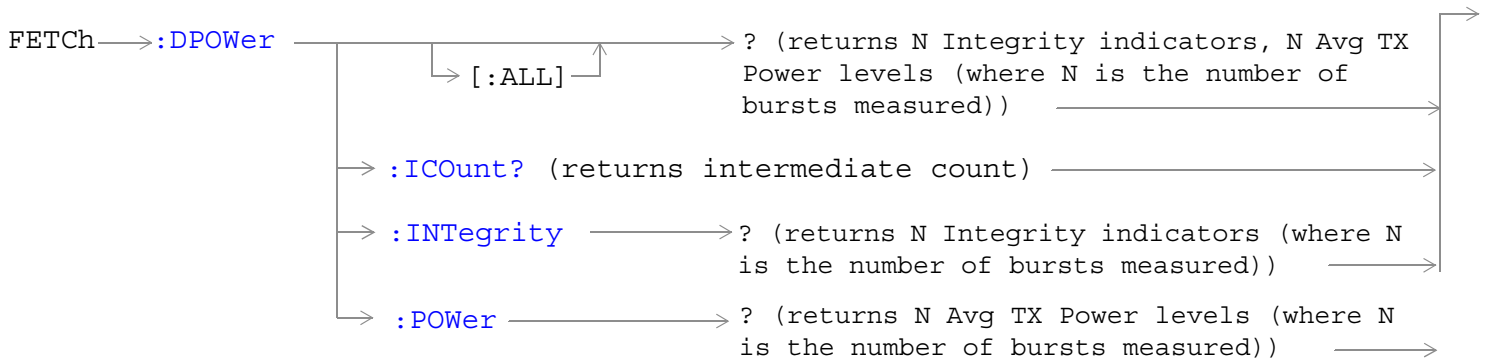
**FETCh:ATXPower:POWer:SDEVIation?**

Function	Queries the standard deviation analog transmitter power.
Query	Range: 0 to 100 dB Resolution: 0.001 dB

## Programming Example

```
OUTPUT 714;"FETCh:ATXPower:POWer:SDEVIation?"
```

## FETCh:DPOWer



“Diagram Conventions” on page 267

**FETCh:DPOWer****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 <a href="#">“SETup:DPOWer:COUNT:NUMBER[:SElected][:DIGital136]”</a> on page 439.
Query	<p>Integrity indicators for each individual burst</p> <ul style="list-style-type: none"> <li>• Range: 0 to 16</li> <li>• Resolution: 1</li> </ul> <p>Average TX power levels for each individual burst</p> <ul style="list-style-type: none"> <li>• Range: -100 to +100 dBm and 9.91 E+37 (NAN)</li> <li>• Resolution: 0.01 dB</li> </ul>

## Programming Example

```
OUTPUT 714; "FETCh:DPOWer?"
```

**FETCh:DPOWer:ICount?**

Function	Queries the intermediate count of burst measurements completed.
Query	Range: 0 to 999

## Programming Example

```
OUTPUT 714; "FETCh:DPOWer:ICOUNT?"
```

**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 <a href="#">“SETup:DPOWer:COUNT:NUMBER[:SElected][:DIGital136]”</a> on page 439.
Query	<p>Range: 0 to 16</p> <p>Resolution: 1</p>

## Programming Example

```
OUTPUT 714; "FETCh:DPOWer:INTEGRITY?"
```

**FETCh:DPOWer:POWer?**

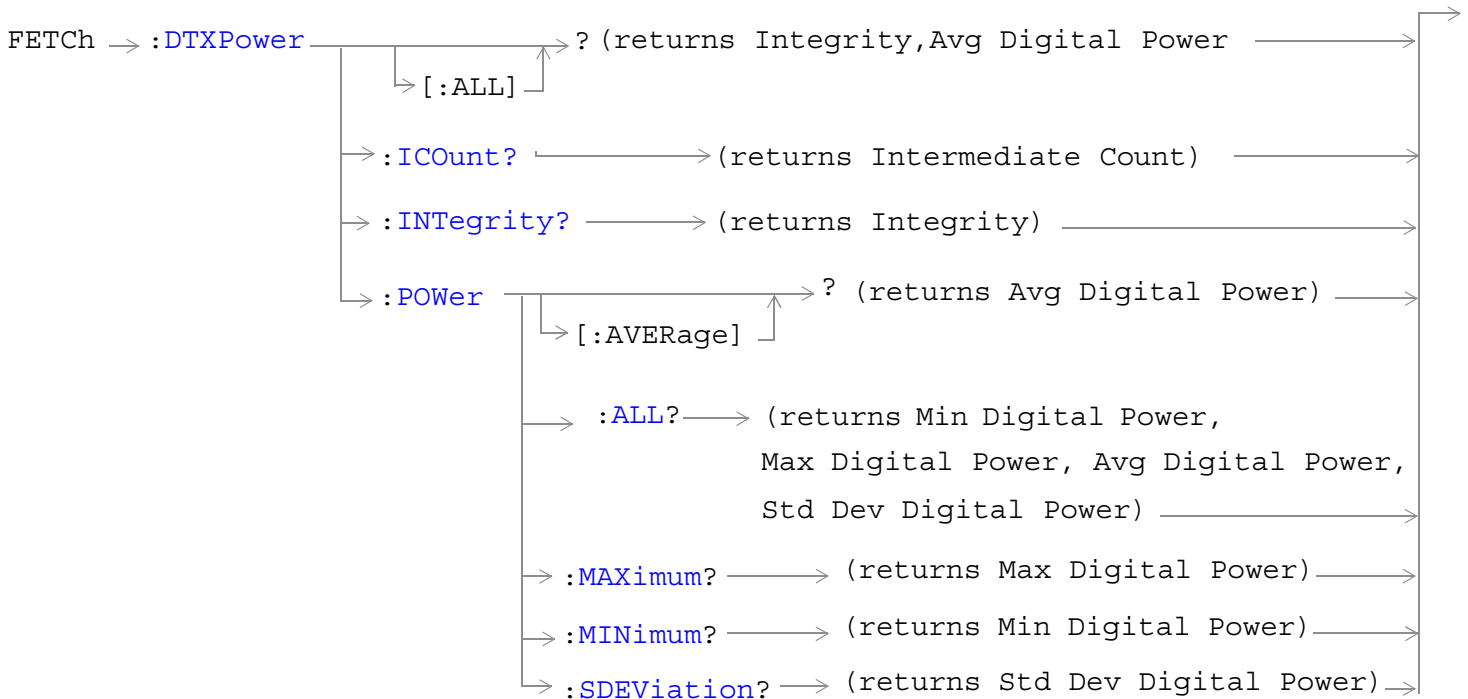
Function	Queries the average TX power levels for the Dynamic Power measurement. Returns N average power levels (where N is the number of bursts measured). To set the number of bursts you want to measure, see <a href="#">“SETup:DPOWer:COUNT:NUMBER[:SElected][:DIGital136]”</a> on page 439.
Query	<p>Range: -100 to +100 dB and 9.91 E+37 (NAN)</p> <p>Resolution: 0.01 dB</p>

## Programming Example

```
OUTPUT 714; "FETCh:DPOWer:POWer?"
```



## FETCh:DTXPower



“Diagram Conventions” on page 267

### FETCh:DTXPower[:ALL]?

Function	Queries the average digital transmitter power measurement. Returns integrity and average digital transmitter power.
Query	Range: <ul style="list-style-type: none"> <li>Integrity = 1 through 16</li> <li>Power = -100 dBm to 100 dBm</li> </ul> Power Resolution: 0.01 dB

#### Programming Example

```
OUTPUT 714;"FETCh DTXPOWER:ALL?" !Returns integrity and average digital transmitter power.
```

**FETCh:DTXPower****FETCh:DTXPower:ICount?**

Function	Queries the intermediate count of measurements completed in a multi-measurement.
Query	Range: 0 to 999

## Programming Example

```
OUTPUT 714;"FETCH:DTXPOWER:ICOUNT?"
```

**FETCh:DTXPower:INTEGRity?**

Function	Queries the measurement integrity indicator for the last digital transmitter power measurement completed.  Zero indicates a normal measurement. See <a href="#">“Integrity Indicator” on page 121</a> for information about non-zero integrity results.
Query	Range: 1 through 16

## Programming Example

```
OUTPUT 714;"FETCH:DTXPower:INTEGRity?"
```

```
!Request the integrity indicator value for the digital TX power measurement.
```

**FETCh:DTXPower:POWER[:AVERage]?**

Function	Queries the average digital transmitter power.
Query	Range: -100 to 100 dBm  Resolution: 0.01 dB

## Programming Example

```
OUTPUT 714;"FETCH:DTXPOWER:POWER:AVERAGE?"
```

**FETCh:DTXPower:POWER:ALL?**

Function	Queries the digital transmitter power measurements.  Measurement results are returned in the following order: minimum digital power, maximum digital power, average digital power, standard deviation digital power.
Query	Minimum, maximum, and average digital power: <ul style="list-style-type: none"> <li>• Range: -100 to 100 dBm</li> <li>• Resolution: 0.01 dB</li> </ul> Standard deviation transmitter power: <ul style="list-style-type: none"> <li>• Range: 0 to 100 dB</li> <li>• Resolution: 0.001 dB</li> </ul>

## Programming Example

```
OUTPUT 714;"FETCH:DTXPOWER:POWER:ALL?"
```

```
!Returns minimum, maximum, average, and standard deviation digital power.
```

**FETCh:DTXPower:POWer:MAXimum?**

Function	Replace
Query	Range: -100 to 100 dBm Resolution: 0.01 dB

## Programming Example

```
OUTPUT 714;"FETCh:DTXPower:POWer:MAXimum?"
```

**FETCh:DTXPower:POWer:MINimum?**

Function	Replace
Query	Range: -100 to 100 dBm Resolution: 0.01 dB

## Programming Example

```
OUTPUT 714;"FETCh:DTXPower:POWer:MINimum?"
```

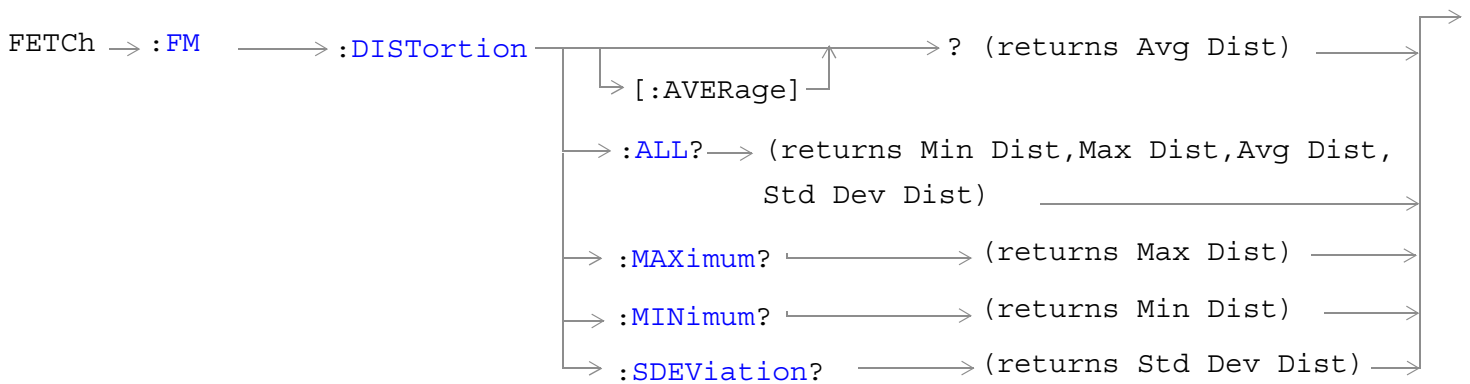
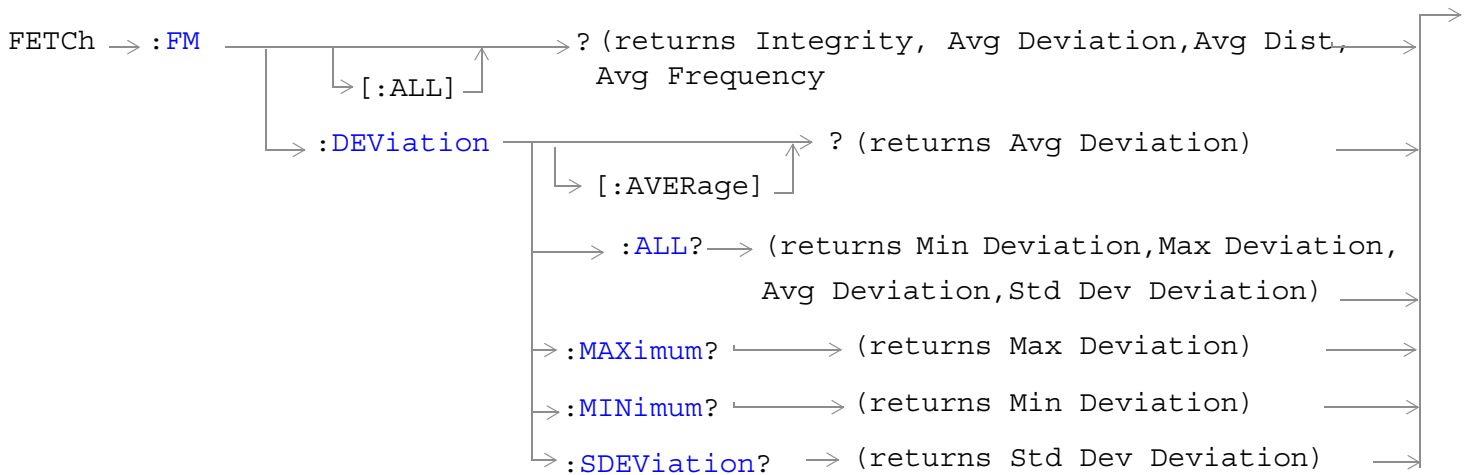
**FETCh:DTXPower:POWer:SDEVIation?**

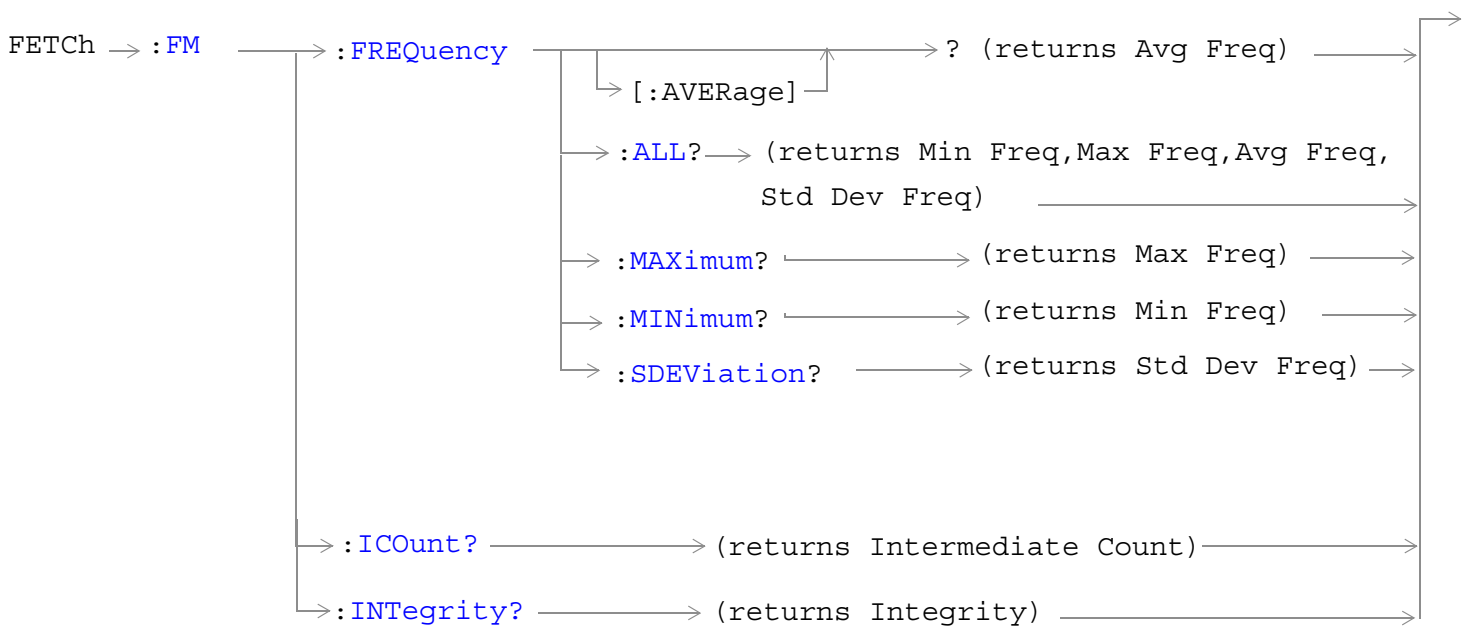
Function	Replace
Query	Range: 0 to 100 dB Resolution: 0.001 dB

## Programming Example

```
OUTPUT 714;"FETCh:DTXPower:POWer:SDEVIation?"
```

## FETCh:FM





“Diagram Conventions” on page 267

### FETCh:FM[:ALL]?

Function	Queries the FM measurement. Returns integrity, average FM deviation, and average FM distortion.
Query	FM deviation <ul style="list-style-type: none"> <li>• Range: 0 to 99 kHz, 9.91 E+37</li> <li>• Resolution: 0.001 kHz</li> </ul> FM distortion <ul style="list-style-type: none"> <li>• Range: 0 to 100%, 9.91 E+37</li> <li>• Resolution: 0.1%</li> </ul>

#### Programming Example

```
OUTPUT 714;"FETCh:FM:ALL?" !Returns integrity, average FM deviation and average FM distortion.
```

### FETCh:FM:DEVIation[:AVERAge]?

Function	Queries the average FM deviation.
Query	Range: 0 to 99 kHz, 9.91 E+37 Resolution: 0.001 kHz

#### Programming Example

```
OUTPUT 714;"FETCh:FM:DEVIATION:AVERAGE?"
```

**FETCh:FM****FETCh:FM:DEVIation:ALL?**

Function	Queries the FM deviation measurements. Measurement results are returned in the following order: minimum deviation, maximum deviation, average deviation, standard deviation deviation.
Query	Minimum, maximum, average FM deviation <ul style="list-style-type: none"> <li>• Range: 0 to 99 kHz, 9.91 E+37</li> <li>• Resolution: 0.001 kHz</li> </ul> Standard deviation FM deviation <ul style="list-style-type: none"> <li>• Range: 0 to 99 kHz, 9.91 E+37</li> <li>• Resolution: 0.0001 kHz</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCh:FM:DEVIation:ALL?"
```

```
!Returns minimum, maximum, average, and standard deviation FM deviation.
```

**FETCh:FM:DEVIation:MAXimum?**

Function	Queries the maximum FM deviation measurement.
Query	Range: 0 to 99 kHz, 9.91 E+37 Resolution: 0.001 kHz

**Programming Example**

```
OUTPUT 714;"FETCh:FM:DEVIation:MAXimum?"
```

**FETCh:FM:DEVIation:MINimum?**

Function	Queries the minimum FM deviation measurement.
Query	Range: 0 to 99 kHz, 9.91 E+37 Resolution: 0.001 kHz

**Programming Example**

```
OUTPUT 714;"FETCh:FM:DEVIation:MINimum?"
```

**FETCh:FM:DEVIation:SDEVIation?**

Function	Queries the standard deviation FM deviation measurement.
Query	Range: 0 to 99 kHz, 9.91 E+37 Resolution: 0.0001

**Programming Example**

```
OUTPUT 714;"FETCh:FM:DEVIation:SDEVIation?"
```

**FETCh:FM:DISToRtion[:AVERAge]?**

Function	Queries the average FM distortion measurement.
Query	Range: 0 to 100%, 9.91 E+37 Resolution: 0.1%

## Programming Example

```
OUTPUT 714;"FETCh:FM:DISToRtion:AVERAge?"
```

**FETCh:FM:DISToRtion:ALL?**

Function	Queries the FM distortion measurements. Measurement results are returned in the following order: minimum distortion, maximum distortion, average distortion, standard deviation distortion.
Query	Minimum, maximum, average FM distortion <ul style="list-style-type: none"> <li>• Range: 0 to 100%, 9.91 E+37</li> <li>• Resolution: 0.1%</li> </ul> Standard deviation FM distortion <ul style="list-style-type: none"> <li>• Range: 0 to 100%, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul>

## Programming Example

```
OUTPUT 714;"FETCh:FM:DISToRtion:ALL?"
!Returns minimum, maximum, average, and standard deviation FM distortion.
```

**FETCh:FM:DISToRtion:MAXimum?**

Function	Queries the maximum FM distortion measurement.
Query	Range: 0 to 100%, 9.91 E+37 Resolution: 0.1%

## Programming Example

```
OUTPUT 714;"FETCh:FM:DISToRtion:MAXimum?"
```

**FETCh:FM:DISToRtion:MINimum?**

Function	Queries the minimum FM distortion measurement.
Query	Range: 0 to 100%, 9.91 E+37 Resolution: 0.1%

## Programming Example

```
OUTPUT 714;"FETCh:FM:DISToRtion:MINimum?"
```

**FETCh:FM****FETCh:FM:DISTortion:SDEVIation?**

Function	Queries the standard deviation FM distortion measurement.
Query	Range: 0 to 100%, 9.91 E+37 Resolution: 0.01%

## Programming Example

```
OUTPUT 714;"FETCH:FM:DISTORTION:SDEVIATION?"
```

**FETCh:FM:FREQuency[:AVERAge]?**

Function	Queries the average audio frequency measurement.
Query	Average audio frequency <ul style="list-style-type: none"> <li>• Range: 0 to 99999 Hz, 9.91 E+37</li> <li>• Resolution: 0.1 Hz</li> </ul>

## Programming Example

```
OUTPUT 714;"FETCH:FM:FREQUENCY:AVERAGE?"
```

**FETCh:FM:FREQuency:ALL?**

Function	Queries the audio frequency measurements. The measurement results are returned in the following order: minimum frequency, maximum frequency, average frequency, standard deviation frequency.
Query	Minimum, maximum, and average audio frequency: <ul style="list-style-type: none"> <li>• Range: 0 to 99999 Hz, 9.91 E+37</li> <li>• Resolution: 0.1 Hz</li> </ul> Standard deviation audio frequency: <ul style="list-style-type: none"> <li>• Range: 0 to 99999 Hz, 9.91 E+37</li> <li>• Resolution: 0.01 Hz</li> </ul>

## Programming Example

```
OUTPUT 714;"FETCH:FM:FREQUENCY:ALL?"
!Returns minimum, maximum, average, and standard deviation audio frequency.
```

**FETCh:FM:FREQuency:MAXimum?**

Function	Queries the maximum audio frequency.
Query	Range: 0 to 99999 Hz, 9.91 E+37 Resolution: 0.1 Hz

## Programming Example

```
OUTPUT 714;"FETCH:FM:FREQUENCY:MAXIMUM?"
```



**FETCh:FM:FREQuency:MINinum?**

Function	Queries the minimum audio frequency.
Query	Range: 0 to 99999 Hz, 9.91 E+37 Resolution: 0.1 Hz

## Programming Example

```
OUTPUT 714;"FETCh:FM:FREQuency:MINinum?"
```

**FETCh:FM:FREQuency:SDEVIation?**

Function	Queries the standard deviation audio frequency.
Query	Range: 0 to 99999 Hz, 9.91 E+37 Resolution: 0.01 Hz

## Programming Example

```
OUTPUT 714;"FETCh:FM:FREQuency:SDEVIation?"
```

**FETCh:FM:ICount?**

Function	Queries the intermediate count of measurements completed in a multi-measurement.
Query	Range: 0 to 99

## Programming Example

```
OUTPUT 714;"FETCh:FM:ICount?"
```

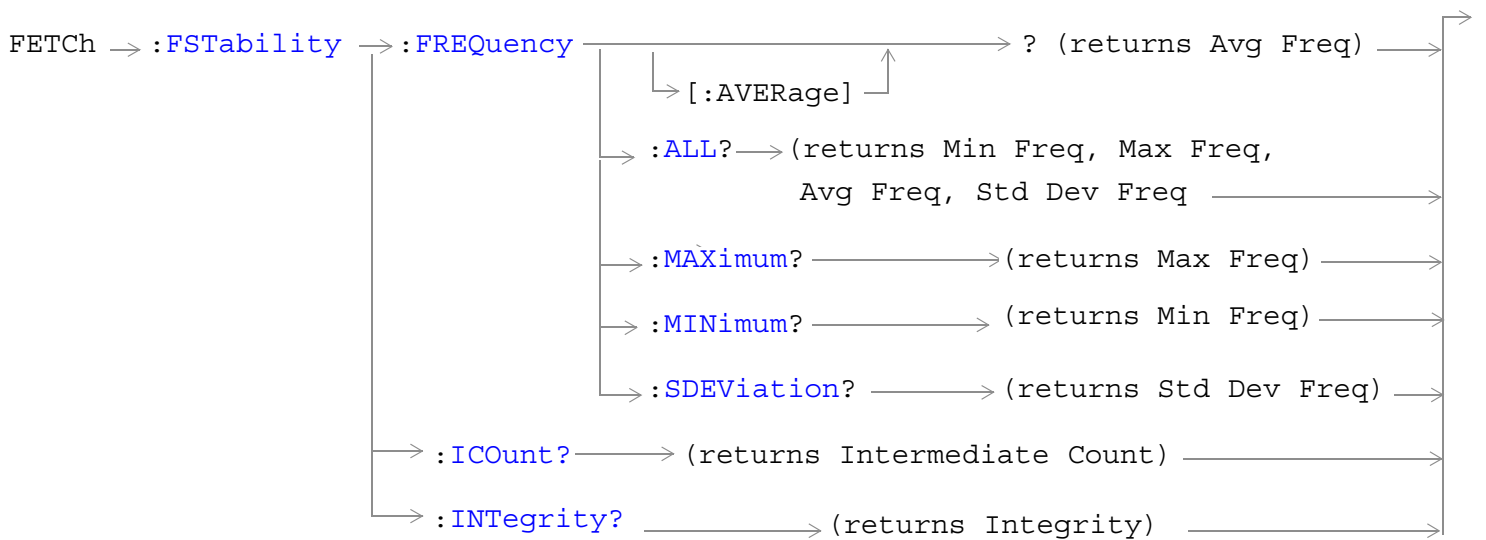
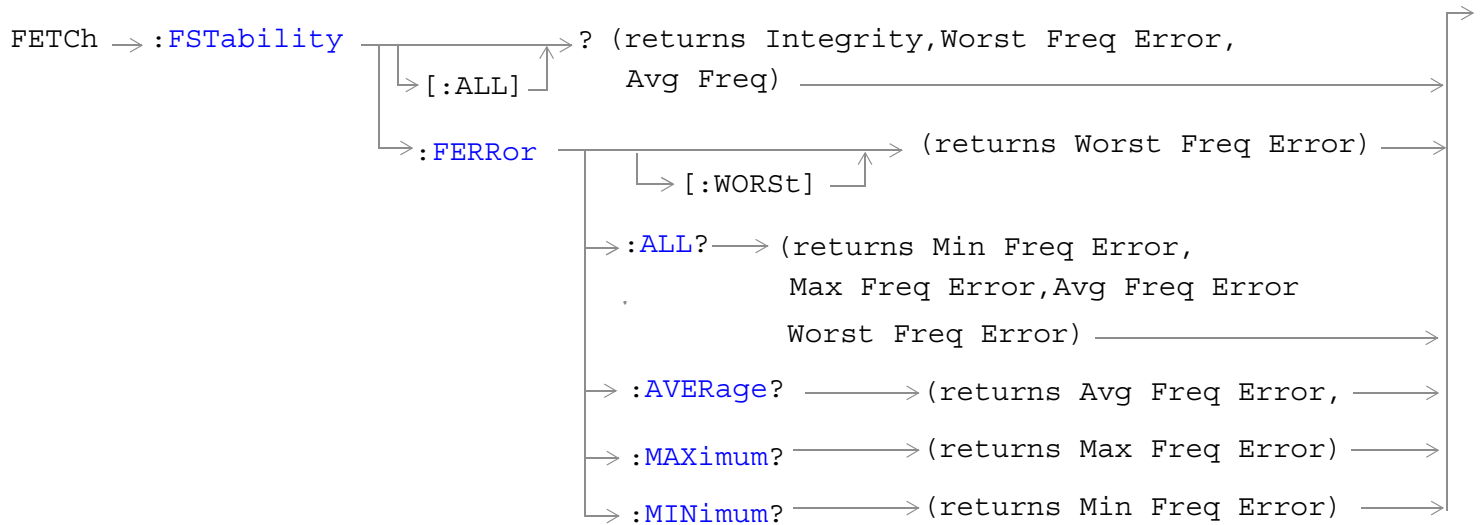
**FETCh:FM:INTegrity?**

Function	Queries the measurement integrity indicator for the last FM measurement completed. Zero indicates a normal measurement. See <a href="#">“Integrity Indicator” on page 121</a> for information about non-zero integrity results.
Query	Range: 1 through 16

## Programming Example

```
OUTPUT 714;"INITiate:FM" !Start FM measurement.
OUTPUT 714;"FETCh:FM?" !Request measurement results.
ENTER 714;Integrity,Fm_dev_dist !Read measurement results.
IF Integrity = 0 THEN !If 0 then measurement was successful.
PRINT "FM =";Fm_dev_dist !Measurement results printed if measurement is successful.
ELSE
PRINT "Measurement integrity questionable, integrity value = ";Integrity
END IF
END
```

## FETCh:FSTability



“Diagram Conventions” on page 267

### FETCh:FSTability[:ALL]?

Function	Queries the frequency stability measurement. Returns integrity, worst-case frequency error, and average frequency.
Query	<p>Worst-case frequency error:</p> <ul style="list-style-type: none"> <li>• Range: -500 to 500 parts per million (ppm)</li> <li>• Resolution: 0.01 ppm</li> </ul> <p>Average frequency:</p> <ul style="list-style-type: none"> <li>• Range: 100 E+6 to 3 E+9 Hz</li> <li>• Resolution: 0.01 ppm</li> </ul>

#### Programming Example

```
OUTPUT 714;"FETCh:FSTABILITY:ALL?"
!Returns integrity, worst-case frequency error, and average frequency.
```

### FETCh:FSTability:FERRor[:WORSt]?

Function	Queries the frequency stability frequency error measurement.
Query	<p>Range: -500 to 500 parts per million (ppm)</p> <p>Resolution: 0.01 ppm</p>

#### Programming Example

```
OUTPUT 714;"FETCh:FSTABILITY:FERRor:WORSt?"
```

### FETCh:FSTability:FERRor:ALL?

Function	<p>Queries the frequency stability frequency error measurements.</p> <p>Measurement results are returned in the following order: minimum frequency error, maximum frequency error, average frequency error, worst-case frequency error.</p>
Query	<p>Maximum, minimum frequency error:</p> <ul style="list-style-type: none"> <li>• Range: -500 E+3 to 500 E+3 Hz</li> <li>• Resolution: 1 Hz</li> </ul> <p>Average frequency error:</p> <ul style="list-style-type: none"> <li>• Range: -500 E+3 to 500 E+3 Hz</li> <li>• Resolution: 1 Hz</li> </ul> <p>Worst-case frequency error:</p> <ul style="list-style-type: none"> <li>• Range: -500 to 500 parts per million (ppm)</li> <li>• Resolution: 0.01</li> </ul>

**FETCh:FSTability****Programming Example**

```
OUTPUT 714;"FETCH:FSTABILITY:FERROR:ALL?"
```

```
!Returns minimum, maximum, average, and worst-case frequency error.
```

**FETCh:FSTability:FERRor:AVERage?**

Function	Queries the average frequency error measurement.
Query	Range: -500 E+3 to 500 E+3 Hz Resolution: 1 Hz

**Programming Example**

```
OUTPUT 714;"FETCH:FSTABILITY:FERROR:AVERAGE?"
```

**FETCh:FSTability:FERRor:MAXimum?**

Function	Queries the maximum frequency error measurement.
Query	Range: -500 E+3 to 500 E+3 Hz Resolution: 1 Hz

**Programming Example**

```
OUTPUT 714;"FETCH:FSTABILITY:FERROR:MAXIMUM?"
```

**FETCh:FSTability:FERRor:MINimum?**

Function	Replace
Query	Range: -500 E+3 to 500 E+3 Hz Resolution: 1 Hz

**Programming Example**

```
OUTPUT 714;" " !.
```

**FETCh:FSTability:FREQuency[:AVERage]?**

Function	Queries the frequency stability average frequency measurement.
Query	Range: 100 E+6 to 3 E+9 Hz Resolution: 1 Hz

**Programming Example**

```
OUTPUT 714;"FETCH:FSTABILITY:FREQUENCY:AVERAGE?"
```

**FETCh:FSTability:FREQUENCY:ALL?**

Function	Queries the frequency stability frequency measurement. Measurement results are returned in the following order: minimum frequency, maximum frequency, average frequency, and standard deviation frequency.
Query	Minimum, maximum, average frequency: <ul style="list-style-type: none"> <li>• Range: 100 E+6 to 3 E+9</li> <li>• Resolution: 1 Hz</li> </ul> Standard deviation frequency: <ul style="list-style-type: none"> <li>• Range: 0 to 500 E+3 Hz</li> <li>• Resolution: 0.1 Hz</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCH:FSTABILITY:FREQUENCY:ALL?"
!Returns minimum, maximum, average, and standard deviation frequency.
```

**FETCh:FSTability:FREQUENCY:MAXimum?**

Function	Queries the maximum frequency stability frequency.
Query	Range: 100 E+6 to 3 E+9 Resolution: 1 Hz

**Programming Example**

```
OUTPUT 714;"FETCH:FSTABILITY:FREQUENCY:MAXIMUM?"
```

**FETCh:FSTability:FREQUENCY:MINimum?**

Function	Queries the minimum frequency stability frequency.
Query	Range: 100 E+6 to 3 E+9 Resolution: 1 Hz

**Programming Example**

```
OUTPUT 714;"FETCH:FSTABILITY:FREQUENCY:MINIMUM?"
```

**FETCh:FSTability:FREQUENCY:SDEVIATION?**

Function	Queries the standard deviation frequency stability frequency.
Query	Range: 0 to 500 E+3 Hz Resolution: 0.1 Hz

**Programming Example**

```
OUTPUT 714;"FETCH:FSTABILITY:FREQUENCY:SDEVIATION?"
```

**FETCh:FSTability****FETCh:FSTability:ICount?**

Function	Queries the intermediate count of measurements completed in a multi-measurement.
Query	Range: 0 to 999

## Programming Example

```
OUTPUT 714;"FETCh:FSTABILITY:ICOUNT?"
```

**FETCh:FSTability:INTEgrity?**

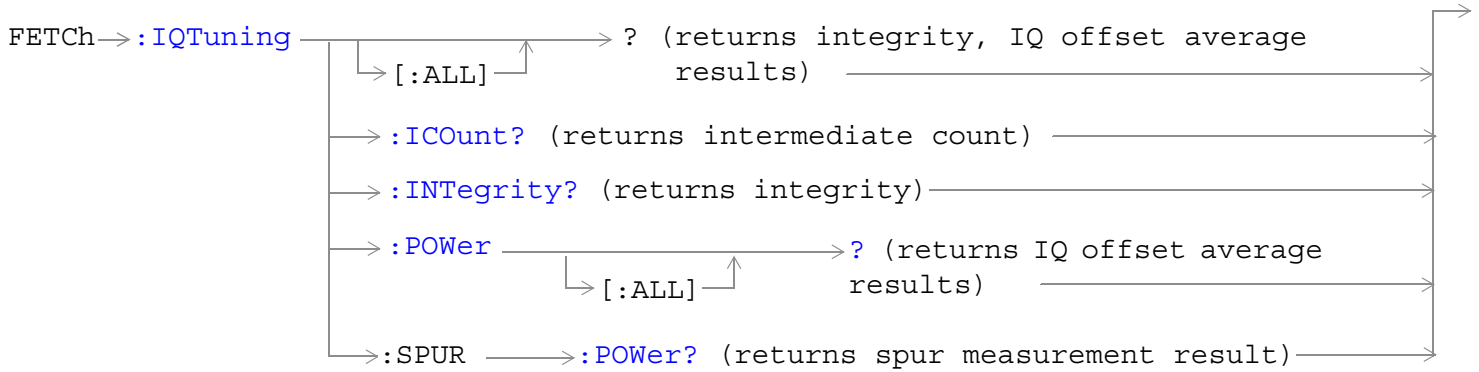
Function	Queries the measurement integrity indicator for the last frequency stability measurement completed.  Zero indicates a normal measurement. See <a href="#">“Integrity Indicator” on page 121</a> for information about non-zero integrity results.
Query	Range: 1 through 16

## Programming Example

```
OUTPUT 714;"FETCh:FSTABILITY:INTEGRITY"
```

```
!Returns the integrity indicator for the frequency stability measurement.
```

## FETCh:IQTuning



[“Diagram Conventions” on page 267](#)

**FETCh:IQTuning****FETCh:IQTuning[:ALL]?**

Function	<p>Queries the IQ tuning measurement results. Query returns integrity indicator and any IQ tuning offset average results. One result is returned for each of the enabled entries in the TX digital IQ tuning offset frequency list. Up to four entries can be made in the list. If no offsets are specified, 9.91E+37 is returned for the measurement result.</p> <p>See <a href="#">“SETup:IQTuning:OFFSet[:FREQuency][:SELEcted][:DIGital136]”</a> on page 460.</p> <p>The number of IQ tuning offsets that are enabled can be queried using the <a href="#">“SETup:IQTuning:OFFSet:POINts[:SELEcted][:DIGital136]?”</a> query.</p>
Query	<p>Range:</p> <ul style="list-style-type: none"> <li>• Integrity: 0 to 16</li> <li>• IQ Offset results: -100 to +100 dB, 9.91 E+37; Resolution: 0.1 dB</li> </ul>

**Programming Example**

```
OUTPUT 714 ; "FETCH:IQTUNING:ALL?"
```

**FETCh:IQTuning:ICount?**

Function	Queries the intermediate count of measurements completed in a multi-measurement.
Query	Range: 0 to 999

**Programming Example**

```
OUTPUT 714 ; "FETCH:IQTUNING:ICOUNT?"
```

**FETCh:IQTuning:INTEgrity?**

Function	<p>Returns the integrity indicator value for the last IQ tuning measurement performed. Zero indicates a normal result.</p> <p>See <a href="#">“Integrity Indicator”</a> on page 121 for descriptions of non-zero integrity indicators.</p>
Query	Range: 0 to 16

**Programming Example**

```
OUTPUT 714 ; "FETCH:IQTUNING:INTEGRITY?"
```



**FETCh:IQTuning:POWer[:ALL]?**

Function	<p>Queries the IQ tuning measurement results. Query returns IQ tuning offset average results for all enabled IQ tuning offsets. One result is returned for each of the enabled entries in the TX digital IQ tuning offset frequency list. Up to four entries can be made in the list. If no offsets are specified, 9.91E+37 is returned for the measurement result.</p> <p>See “SETup:IQTuning:OFFSet[:FREQuency][:SELEcted][:DIGital136]” on page 460.</p> <p>The number of IQ tuning offsets that are enabled can be queried using the “SETup:IQTuning:OFFSet:POINts[:SELEcted][:DIGital136]?” query.</p>
Query	<p>Range: -100 to +100 dB, 9.91 E+37</p> <p>Resolution: 0.1 dB</p>

**Programming Example**

```
OUTPUT 714; "FETCh:IQTuning:POWer:ALL?"
```

**FETCh:IQTuning:SPUR:POWer?**

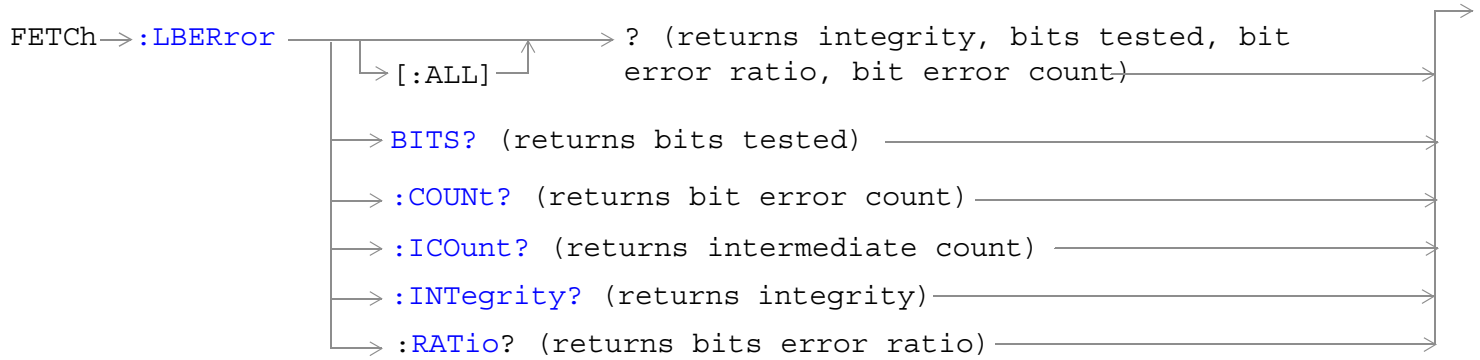
Function	<p>Queries the TX digital IQ tuning spur measurement. The measurement value is referenced to the power level at the TX digital IQ tuning reference offset frequency.</p>
Query	<p>Range: -100 to +100 dB, 9.91 E+37</p> <p>Resolution: 0.1 dB</p>

**Programming Example**

```
OUTPUT 714; "FETCh:IQTuning:SPUR:POWer?"
```

---

## FETCh:LBError



“Diagram Conventions” on page 267

**FETCh:LBError[:ALL]?**

Function	Queries the loopback bit error measurement. Query returns integrity indicator, bits tested, bit error ratio, and bit error count. See <a href="#">“Loopback Bit Error Ratio Measurement Description” on page 97</a> . Bits to test is determined by the SETup:LBError:COUNT command.
Query	Bits tested <ul style="list-style-type: none"> <li>• Range: 0 to “bits to test” +259, 9.91 E+37</li> </ul> Bit error ratio <ul style="list-style-type: none"> <li>• Range: 0 to 100%, 9.91 E+37</li> <li>• Resolution: 0.01</li> </ul> Bit error count <ul style="list-style-type: none"> <li>• Range: 0 to “bits tested”</li> </ul>

**Programming Example**

```
OUTPUT 714; "FETCh:LBError:ALL?"
```

**FETCh:LBError:BITS?**

Function	Queries the number of bits actually tested. The number of bits tested will always be a multiple of 260. See <a href="#">“Loopback Bit Error Ratio Measurement Description” on page 97</a> . Bits to test is determined by the SETup:LBError:COUNT command.
Query	Bits tested <ul style="list-style-type: none"> <li>• Range: 0 to “bits to test” +259, 9.91 E+37</li> </ul>
*RST Setting	10000

**Programming Example**

```
OUTPUT 714; "FETCh:LBError:BITS?"
```

**FETCh:LBError:COUNT?**

Function	Queries the number of bits that were in error during the last bit error test. See <a href="#">“Loopback Bit Error Ratio Measurement Description” on page 97</a>
Query	Range: 0 to “bits tested”

**Programming Example**

```
OUTPUT 714; "FETCh:LBError:COUNT?"
```

**FETCh:LBError****FETCh:LBError:ICount?**

Function	Queries the intermediate count of bits tested in a mult-measurement.
Query	Range: 0 to “bits tested”, 9.91 E+37

## Programming Example

```
OUTPUT 714 ; "FETCH:LBERROR:ICOUNT?"
```

**FETCh:LBError:INTEGRity?**

Function	Returns the integrity indicator value for the last bit error measurement performed. Zero indicates a normal result.  See <a href="#">“Integrity Indicator” on page 121</a> for descriptions of non-zero integrity indicators.
Query	Range: 0 to 16

## Programming Example

```
OUTPUT 714 ; "FETCH:LBERROR:INTEGRITY?"
```

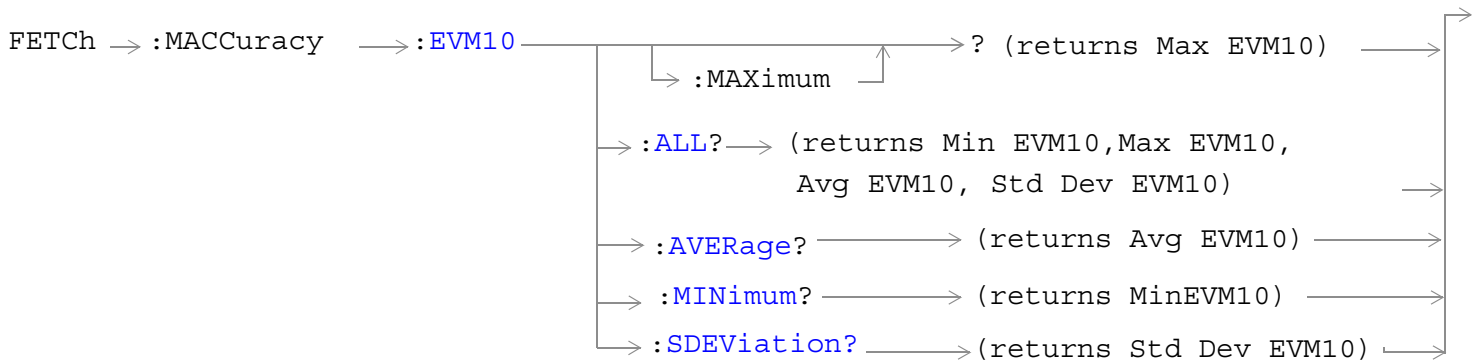
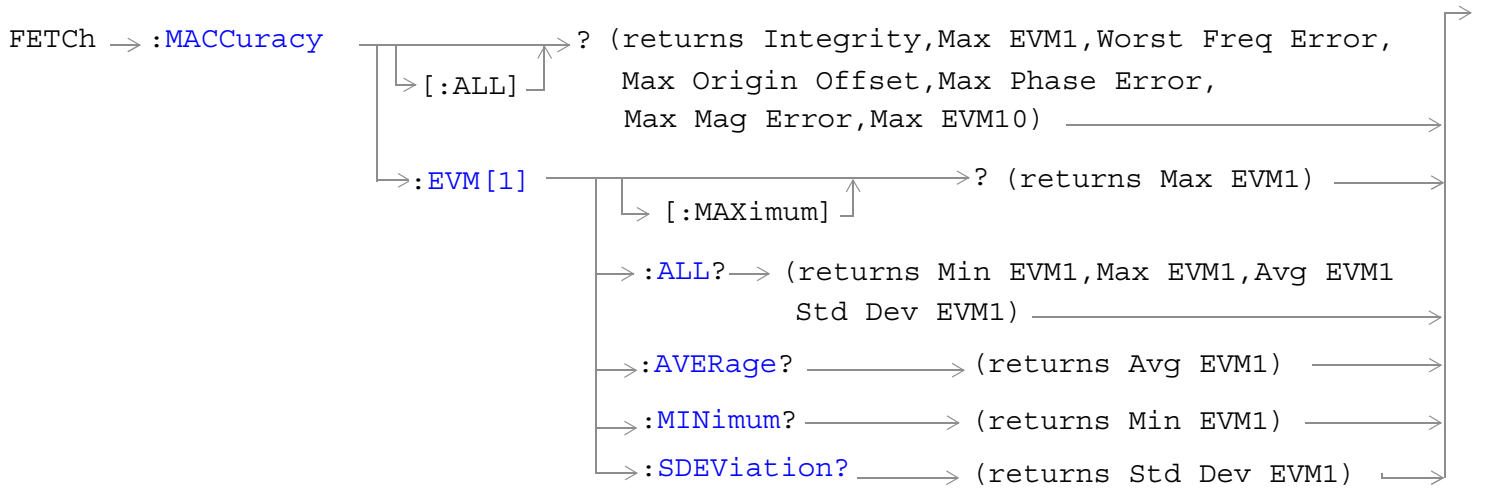
**FETCh:LBError:RATio?**

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 <a href="#">“Loopback Bit Error Ratio Measurement Description” on page 97</a>
Query	Range: 0 to 100%, 9.91 E+37  Resolution: 0.01

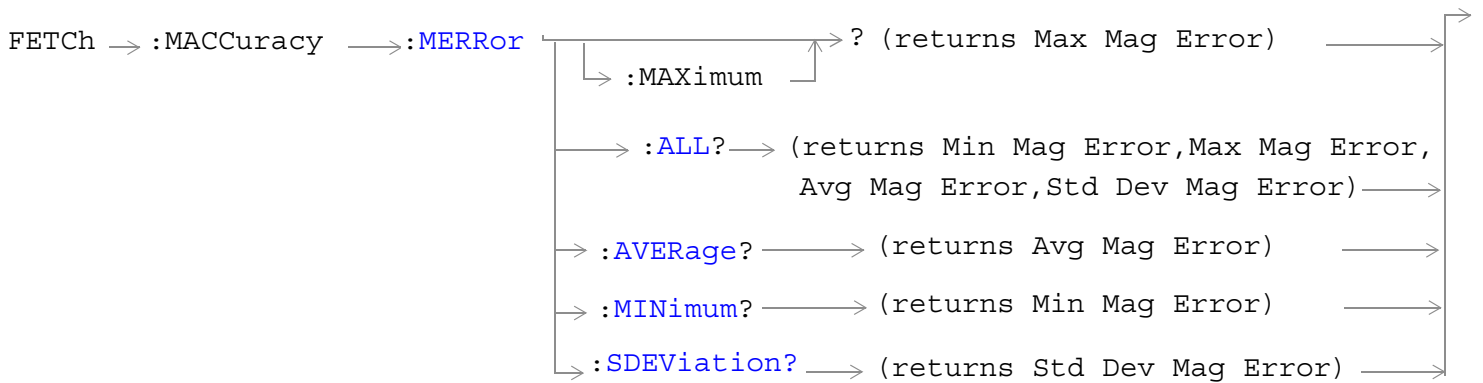
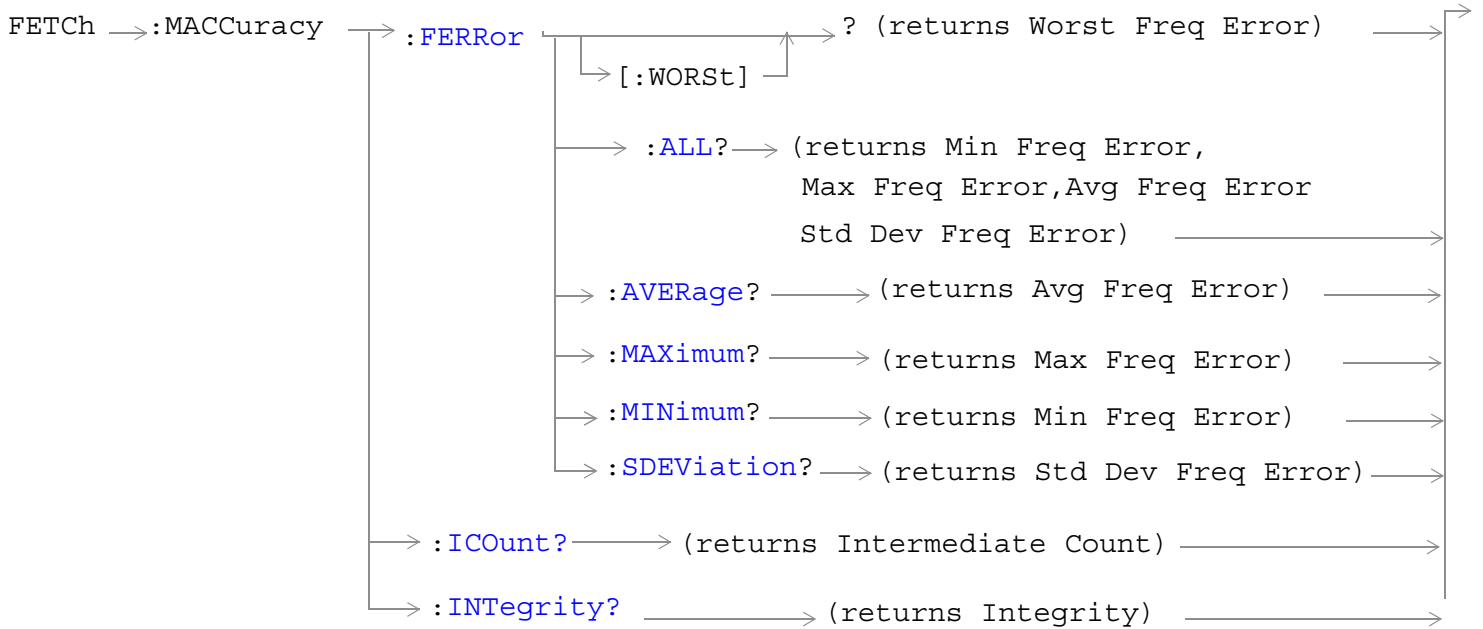
## Programming Example

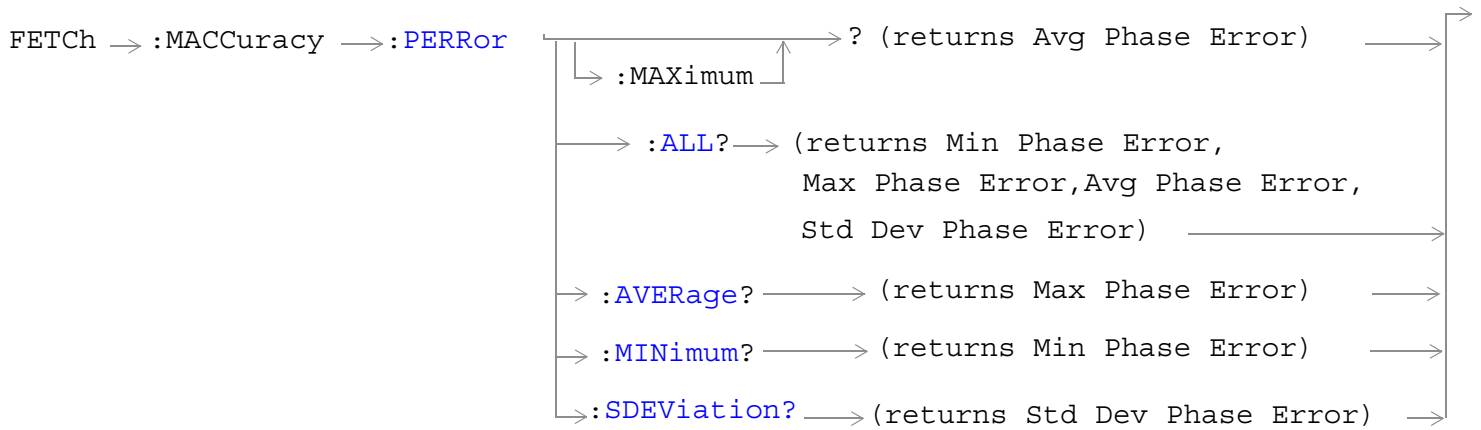
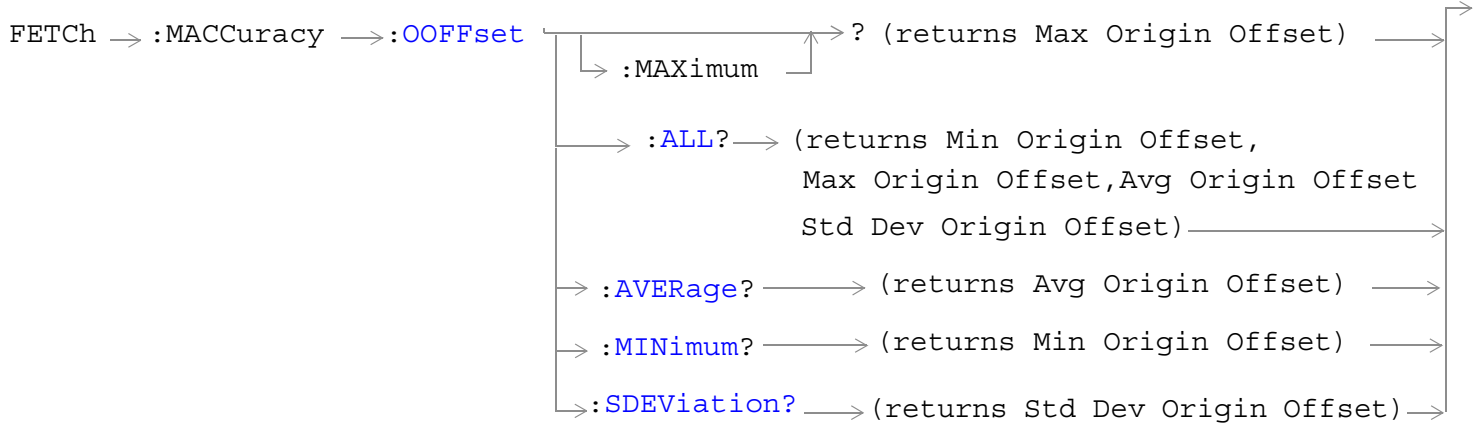
```
OUTPUT 714 ; "FETCH:LBERROR:RATIO?"
```

## FETCh:MACCuracy



**FETCh:MACCuracy**





“Diagram Conventions” on page 267

**FETCh:MACCuracy[:ALL]?**

Function	Queries the modulation accuracy measurements.  Measurement results are returned in the following order: integrity, maximum EVM1, worst-case frequency error, maximum origin offset, maximum phase error, maximum magnitude error, and maximum EVM 10.
Query	<p>Maximum EVM:</p> <ul style="list-style-type: none"> <li>• Range: 0 to 100.0% rms, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul> <p>Worst-case frequency error:</p> <ul style="list-style-type: none"> <li>• Range: -1 E+4 to 1 E+4 Hz, 9.91 E+37</li> <li>• Resolution: 1 Hz</li> </ul> <p>Maximum origin offset:</p> <ul style="list-style-type: none"> <li>• Range: -100 to 0 dBc, 9.91 E+37</li> <li>• Resolution: -1 dB</li> </ul> <p>Maximum phase error:</p> <ul style="list-style-type: none"> <li>• Range: 0 to 22.0 degrees rms, 9.91 E+37</li> <li>• Resolution: 0.01 degrees</li> </ul> <p>Maximum magnitude error:</p> <ul style="list-style-type: none"> <li>• Range: 0 to 100.0% rms, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul> <p>Maximum EVM 10:</p> <ul style="list-style-type: none"> <li>• Range: 0 to 100.0% rms, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:ALL"
```

```
!Returns integrity, maximum EVM, worst-case frequency error, maximum origin offset, maximum phase error,  
!maximum magnitude error, and maximum EVM 10.
```

**FETCh:MACCuracy:EVM[1][:MAXimum]?**

Function	Queries the modulation accuracy measurement's maximum error vector magnitude for a single burst.
Query	<p>Range: 0 to 100.0% rms, 9.91 E+37</p> <p>Resolution: 0.01%</p>

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:EVM1:MAXIMUM"
```



**FETCh:MACCuracy:EVM[1]:ALL?**

Function	Queries the modulation accuracy measurement's error vector magnitude for a single burst. Measurement results are returned in the following order minimum EVM1, maximum EVM1, average EVM1, standard deviation EVM1.
Query	Minimum, maximum, average EVM1: <ul style="list-style-type: none"> <li>• Range: 0 to 100% rms, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul> Standard deviation EVM1: <ul style="list-style-type: none"> <li>• Range: 0 to 100% rms, 9.91 E+37</li> <li>• Resolution: 0.001%</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:EVM1:ALL?"
!Returns EVM1, maximum EVM1, average EVM1, standard deviation EVM1.
```

**FETCh:MACCuracy:EVM[1]:AVERAge?**

Function	Queries the modulation accuracy measurement's average error vector magnitude the for a single burst.
Query	Range: 0 to 100% rms, 9.91 E+37 Resolution: 0.01%

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:EVM1:AVERAGE?"
```

**FETCh:MACCuracy:EVM[1]:MINimum?**

Function	Queries the modulation accuracy measurement's minimum error vector magnitude the for a single burst.
Query	Range: 0 to 100% rms, 9.91 E+37 Resolution: 0.01%

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:EVM1:MINIMUM?"
```

**FETCh:MACCuracy:EVM[1]:SDEVIation?**

Function	Queries the modulation accuracy measurement's standard deviation error vector magnitude the for a single burst.
Query	Range: 0 to 100%, 9.91 E+37 Resolution: 0.001%

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:EVM1:SDEVIATION"
```

**FETCh:MACCuracy****FETCh:MACCuracy:EVM10[:MAXimum]?**

Function	Queries the modulation accuracy measurement's average maximum error vector magnitude over 10 bursts.
Query	Range: 0 to 100.0% rms, 9.91 E+37 Resolution: 0.01%

## Programming Example

```
OUTPUT 714;"FETCH:MACCURITY:EVM10:MAXIMUM?"
```

**FETCh:MACCuracy:EVM10:ALL?**

Function	Queries the modulation accuracy measurement's error vector magnitude (EVM) over 10 bursts. Measurement results are returned in the following order: minimum EVM10, maximum EVM10, average EVM10, standard deviation EVM10.
Query	Minimum, maximum, average EVM10: <ul style="list-style-type: none"> <li>• Range: 0 to 100.0% rms, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul> Standard deviation EVM10: <ul style="list-style-type: none"> <li>• Range: 0 to 100.0%, 9.91 E+37</li> <li>• Resolution: 0.001%</li> </ul>

## Programming Example

```
OUTPUT 714;"FETCH:MACCURITY:EVM10:ALL?"
!Returns minimum EVM10, maximum EVM10, average EVM10, standard deviation EVM10.
```

**FETCh:MACCuracy:EVM10:AVERAge?**

Function	Queries the modulation accuracy measurement's average error vector magnitude over 10 bursts.
Query	Range: 0 to 100.0% rms, 9.91 E+37 Resolution: 0.01%

## Programming Example

```
OUTPUT 714;"FETCH:MACCURITY:EVM10:AVERAGE?"
```

**FETCh:MACCuracy:EVM10:MINimum?**

Function	Queries the modulation accuracy measurement's minimum error vector magnitude over 10 bursts.
Query	Range: 0 to 100.0% rms, 9.91 E+37 Resolution: 0.01%

## Programming Example

```
OUTPUT 714;"FETCH:MACCURITY:EVM10:MINIMUM?"
```

**FETCh:MACCuracy:EVM10:SDEVIation?**

Function	Queries the modulation accuracy measurement's standard deviation error vector magnitude over 10 bursts.
Query	Range: 0 to 100.0%, 9.91 E+37 Resolution: 0.001%

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:EVM10:SDEVIation?"
```

**FETCh:MACCuracy:FERRor[:WORSt]?**

Function	Queries the modulation accuracy measurement's worst-case frequency error.
Query	Range: -1 E+4 to 1 E+4 Hz, 9.91 E+37 Resolution: 1 Hz

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:FERRor:WORSt?"
```

**FETCh:MACCuracy:FERRor:ALL?**

Function	Queries the modulation accuracy measurement's frequency error. Measurement results are returned in the following order: minimum frequency error, maximum frequency error, average frequency error, standard deviation frequency error.
Query	Minimum, maximum, average frequency error: <ul style="list-style-type: none"> <li>• Range: -1 E+4 to 1 E+4 Hz, 9.91 E+37</li> <li>• Resolution: 1 Hz</li> </ul> Standard deviation frequency error: <ul style="list-style-type: none"> <li>• Range: 0 to 1 E+4 Hz, 9.91 E+37</li> <li>• Resolution: 0.1 Hz</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:FERRor:ALL?"
!Returns minimum, maximum, average, and standard deviation frequency error.
```

**FETCh:MACCuracy:FERRor:AVERage?**

Function	Queries the modulation accuracy measurement's average frequency error.
Query	Range: -1 E+4 to 1 E+4 Hz, 9.91 E+37 Resolution: 1 Hz

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:FERRor:AVERage?"
```

**FETCh:MACCuracy****FETCh:MACCuracy:FERRor:MAXimum?**

Function	Queries the modulation accuracy measurement's maximum frequency error.
Query	Range: -1 E+4 to 1 E+4 Hz, 9.91 E+37 Resolution: 1 Hz

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:FERRor:MAXimum?"
```

**FETCh:MACCuracy:FERRor:MINimum?**

Function	Queries the modulation accuracy measurement's minimum frequency error.
Query	Range: -1 E+4 to 1 E+4 Hz, 9.91 E+37 Resolution: 1 Hz

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:FERRor:MINimum?"
```

**FETCh:MACCuracy:FERRor:SDEviation?**

Function	Queries the modulation accuracy measurement's standard deviation frequency error.
Query	Range: 0 to 1 E+4 Hz, 9.91 E+37 Resolution: 0.1 Hz

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:FERRor:SDEviation?"
```

**FETCh:MACCuracy:ICount?**

Function	Queries the intermediate count of measurements completed in a multi-measurement.
Query	Range: 0 to 99

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:ICount?"
```

**FETCh:MACCuracy:INTEgrity?**

Function	Queries the measurement integrity indicator for the last modulation accuracy measurement completed.  Zero indicates a normal measurement. See <a href="#">“Integrity Indicator” on page 121</a> for information about non-zero integrity results.
Query	Range: 1 through 16

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:INTEGRITY"  
!Query the integrity indicator for the modulation accuracy measurement.
```

**FETCh:MACCuracy:MERRor[:MAXimum]?**

Function	Queries the modulation accuracy measurement's maximum magnitude error.
Query	Range: 0 to 100.0% rms, 9.91 E+37 Resolution: 0.01%

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:MERRor:MAXIMUM?"
```

**FETCh:MACCuracy:MERRor:ALL?**

Function	Queries the modulation accuracy measurement's magnitude error.  Measurement results are returned in the following order: minimum magnitude error, maximum magnitude error, average magnitude error, standard deviation magnitude error.
Query	Minimum, maximum, standard deviation magnitude error: <ul style="list-style-type: none"> <li>• Range: 0 to 100.0% rms, 9.91 E+37</li> <li>• Resolution: 0.01 %</li> </ul> Standard deviation magnitude error: <ul style="list-style-type: none"> <li>• Range: 0 to 100%, 9.91 E+37</li> <li>• Resolution: 0.001 %</li> </ul>

**Programming Example**

```
OUTPUT 714;"FETCh:MACCuracy:MERRor:ALL?"  
!Returns minimum, maximum, average, standard deviation magnitude error.
```

**FETCh:MACCuracy****FETCh:MACCuracy:MERRor:AVERage?**

Function	Queries the modulation accuracy measurement's average magnitude error.
Query	Range :0 to 100.0% rms, 9.91 E+37 Resolution: 0.01 %

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:MERRor:AVERage?"
```

**FETCh:MACCuracy:MERRor:MINimum?**

Function	Queries the modulation accuracy measurement's minimum magnitude error.
Query	Range : 0 to 100.0% rms, 9.91 E+37 Resolution: 0.01 %

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:MERRor:MINimum?"
```

**FETCh:MACCuracy:MERRor:SDEViation?**

Function	Queries the modulation accuracy measurement's standard deviation magnitude error.
Query	Range : 0 to 100.0%, 9.91 E+37 Resolution: 0.001 %

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:MERRor:SDEViation?"
```

**FETCh:MACCuracy:OOffset[:MAXimum]?**

Function	Queries the modulation accuracy measurement's maximum origin offset.
Query	Range: -100 to 0 dBc, 9.91 E+37 Resolution: 0.1 dB

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:OOffset:MAXimum?"
```

**FETCh:MACCuracy:OOffset:ALL?**

Function	Queries the modulation accuracy measurement's origin offset. Measurement results are returned in the following order: minimum origin offset, maximum origin offset, average origin offset, standard deviation origin offset.
----------	---

Query	<p>Minimum, maximum, average origin offset:</p> <ul style="list-style-type: none"><li>• Range: -100 to 0 dBc, 9.91 E+37</li><li>• Resolution: 0.1 dB</li></ul> <p>Standard deviation origin offset:</p> <ul style="list-style-type: none"><li>• Range: 0 to 100 dB, 9.91 E+37</li><li>• Resolution: 0.01 dB</li></ul>
-------	---

### Programming Example

```
OUTPUT 714;"FETCH:MACCURITY:OFFSET:ALL?"
```

```
!Returns minimum, maximum, average, standard deviation origin offset.
```

**FETCh:MACCuracy****FETCh:MACCuracy:OOffset:AVERage?**

Function	Queries the modulation accuracy measurement's average origin offset.
Query	Range: -100 to 0 dBc, 9.91 E+37 Resolution: 0.1 dB

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:OOffset:AVERage"
```

**FETCh:MACCuracy:OOffset:MINimum?**

Function	Queries the modulation accuracy measurement's minimum origin offset.
Query	Range: -100 to 0 dBc, 9.91 E+37 Resolution: 0.1 dB

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:OOffset:MINimum"
```

**FETCh:MACCuracy:OOffset:SDEviation?**

Function	Queries the modulation accuracy measurement's standard deviation origin offset.
Query	Range: 0 to 100 dB, 9.91 E+37 Resolution: 0.01 dB

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:OOffset:SDEviation?"
```

**FETCh:MACCuracy:PERRor[:MAXimum]?**

Function	Queries the modulation accuracy measurement's maximum phase error.
Query	Range: 0 to 22.0 degrees rms, 9.91 E+37 Resolution: 0.01 degrees

## Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:PERRor:MAXimum?"
```

**FETCh:MACCuracy:PERRor:ALL?**

Function	Queries the modulation accuracy measurement's phase error. Measurement results are returned in the following order: minimum phase error, maximum phase error, average phase error, standard deviation phase error.
----------	---



Query	Mininum, maximum, average phase error: <ul style="list-style-type: none"> <li>• Range: 0 to 22.0 degrees rms, 9.91 E+37</li> <li>• Resolution: 0.01 degrees</li> </ul> Standard deviation phase error: <ul style="list-style-type: none"> <li>• Range: 0 to 22.0 degrees, 9.91 E+37</li> <li>• Resolution: 0.001 degrees</li> </ul>
-------	---

#### Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:PErRor:ALL?"
!Returns minimum, maximum, average, and standard deviation phase error.
```

#### FETCh:MACCuracy:PErRor:AVErAge?

Function	Queries the modulation accuracy measurement's average phase error.
Query	Range: 0 to 22.0 degrees rms, 9.91 E+37 Resolution: 0.01 degrees

#### Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:PErRor:AVErAge?"
```

#### FETCh:MACCuracy:PErRor:MINimum?

Function	Queries the modulation accuracy measurement's minimum phase error.
Query	Range: 0 to 22.0 degrees rms, 9.91 E+37 Resolution: 0.01 degrees

#### Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:PErRor:MINimum?"
```

#### FETCh:MACCuracy:PErRor:SDEviation?

Function	Queries the modulation accuracy measurement's standard deviation phase error.
Query	Range: 0 to 22.0 degrees, 9.91 E+37 Resolution: 0.001 degrees

#### Programming Example

```
OUTPUT 714;"FETCh:MACCuracy:PErRor:SDEviation?"
```

---

## INITiate Subsystem

### Syntax Diagrams and Command Descriptions

[“INITiate” on page 404](#)

### 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. If a timeout is specified, the timeout period begins when a measurement is initiated.

---

**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 Digital Transmit Power and Modulation Accuracy measurements, and then uses the INITiate:DONE? command in a loop to query the status of these measurements, see [“Measurement Event Synchronization” on page 128](#).

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 trigger mode.
20 OUTPUT 714;"INITiate:DTXPower;MACCuracy" ! starts digital TX power and
30                                     !modulation accuracy measurements.
40 LOOP
50 OUTPUT 714;"INITiate:DONE?" !query to find out if any measurements are done.
60 ENTER 714;Meas_complete$
70 SELECT Meas_complete$
80 CASE "DTXP" !tests for the string "DTXP", indicating digital TX power measurement is done.
90 OUTPUT 714;"FETCh:DTXPower:POWer?" !Queries average digital TX power measurement.
100 ENTER 714;Dtxpower
110 CASE "MACC" !tests for the string "MACC", indicating that the modulation accuracy
120                                     !measurement is done.
130 OUTPUT 714;"FETCh:MACCuracy:EVM?" !Queries maximum error vector magnitude over 1 burst.
140 ENTER 714;Max_evml
150 END SELECT
160 EXIT IF Meas_complete$="NONE"
170 END LOOP
180 END

```

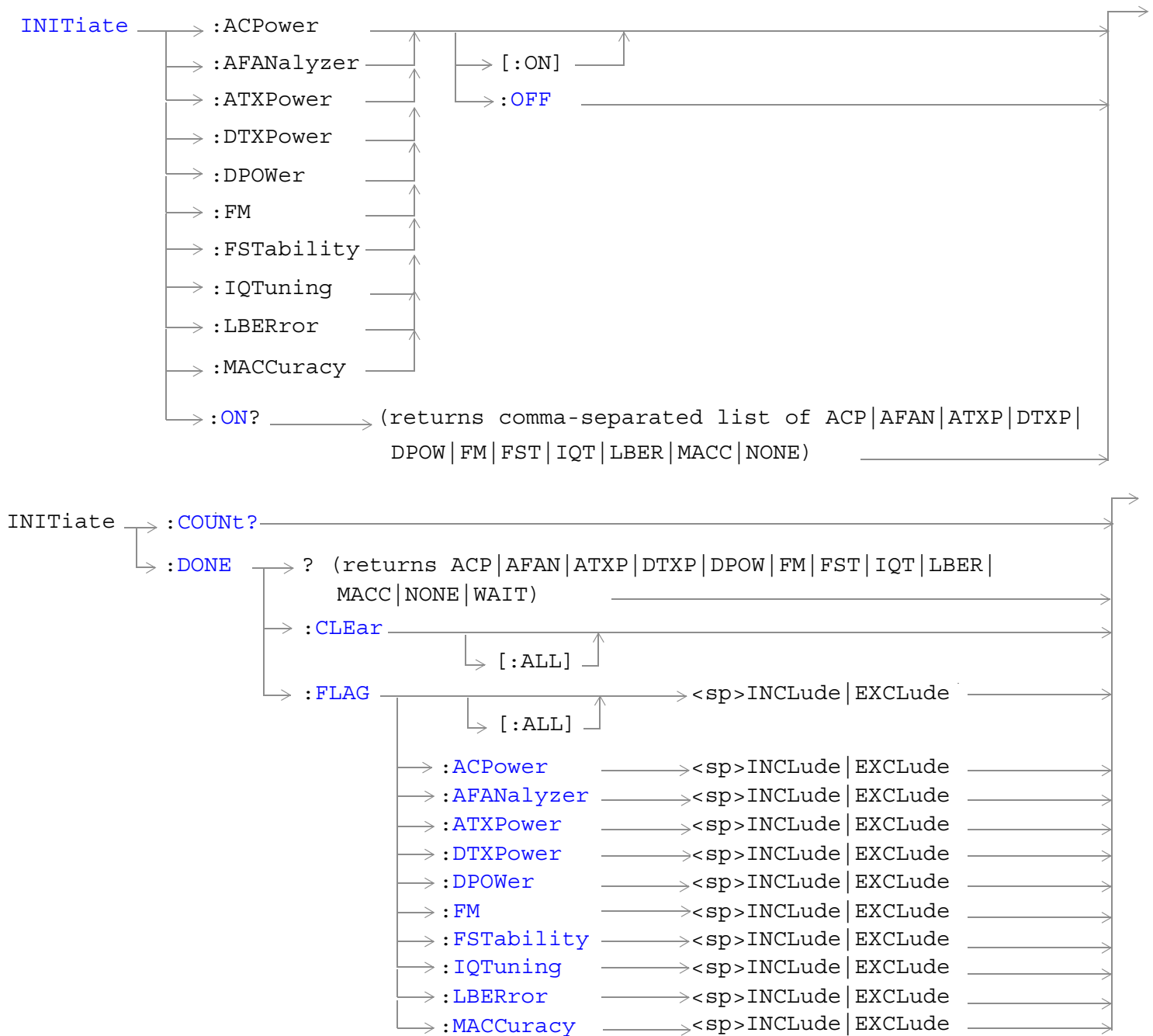
INITiate commands should be sent only when the test set has finished performing any operations, such as handoffs, that require settling. For example, the following code performs a handoff from a digital traffic channel to an analog voice channel (AVC), verifies that the mobile is on an AVC, then initiates an analog TX power measurement.

```

10     !The mobile is on a digital traffic channel up to this point.
20     !Call setup parameters have been configured for handoff to an AVC.
30     OUTPUT 714;"CALL:HANDOFF"
40     LOOP
50     OUTPUT 714;"CALL:STATus:TCHannel:TYPE?" !See if the mobile is on an AVC yet.
60     ENTER 714;Tch_type$
70     SELECT Tch_type$
80     CASE "AVC" !If the mobile is on an AVC, go ahead and measure analog TX power.
90     OUTPUT 714;"INIT:ATXPOWER" !Start the analog TX power measurement.
100    OUTPUT 714;"FETCh:ATXPOWER:POWER?" !Query the analog TX power result.
110    ENTER 714;Atx_power !Enter the returned measurement value into a variable.
120    CASE "DTC" !The mobile is not on an AVC yet, so don't start ATX power yet.
130    END SELECT
140    EXIT IF Tch_type$="AVC" !The measurement was made; continue to next routine.
150    END LOOP
160    End

```

## INITiate



“Diagram Conventions” on page 267

**INITiate:<measurement mnemonic>[:ON]**

Function	<p>Starts measurements.</p> <p>The INITiate command is associated with the SETup “<a href="#">SETup Subsystem</a>” on page 422 and the “<a href="#">FETCh? Subsystem</a>” on page 350.</p> <p>One or more measurements can be initiated with the same program line (see “<a href="#">Concurrent Measurements</a>” on page 119).</p> <p>This command is also used to activate a measurement. See “<a href="#">INITiate Programming Examples (how INIT commands are used)</a>” on page 402.</p>
<p>Programming Example</p> <pre>OUTPUT 714;"INITIATE:ACPOWER;LBERROR:ON" !Initiates an adjacent channel power and a loopback BER measurment.</pre>	

**INITiate:ON?**

Function	Queries the names of the measurements that are on. Returns a comma separated list of measurement mnemonics.
Query	Range: ACP   AFAN   ATXP   DTXP   DPOW   FM   FST   IQT   LBER   MACC   NONE
<p>Programming Example</p> <pre>OUTPUT 714;"INITIATE:ON?"</pre>	

**INITiate:<measurement mnemonic>:OFF**

Function	<p>Deactivates the selected measurement. See “<a href="#">Measurement States</a>” on page 147.</p> <p>Only one measurement can be deactivated at a time. To stop one or more measurements and leave them in the active state, use “<a href="#">ABORT</a>” on page 270.</p>
<p>Programming Example</p> <pre>OUTPUT 714;"INITIATE:ACPOWER:OFF" !Deactivates the adjacent channel power measurement.</pre>	

**INITiate:COUNT?**

Function	Queries the number of measurements that have been initiated (are active). See “ <a href="#">Measurement States</a> ” on page 147.
Query	Range: 0 to 10
<p>Programming Example</p> <pre>OUTPUT 714;"INITIATE:COUNT?"</pre>	

**INITiate****INITiate:DONE?**

Function	<p>Queries (one at a time) which measurements, if any, are finished or have timed-out.</p> <p>See “<a href="#">Measurement Event Synchronization</a>” on page 128 for how to use this command.</p> <p>See “<a href="#">Measurement States</a>” on page 147 to understand the test set’s measurement states.</p> <p>See “<a href="#">INITiate:DONE:FLAG:&lt;measurement mnemonic&gt;</a>” on page 407 for include or exclude commands.</p>
Query	Range: ACP   AFAN   ATXP   DTXP   DPOW   FM   FST   IQT   LBER   MACC   NONE   WAIT

**INITiate:DONE:CLear**

Function	Clears the done flag from all measurements.
<b>Programming Example</b> <pre>OUTPUT 714;"INITIATE:DONE:CLEAR" !Clears the done flag.</pre>	

**INITiate:DONE:FLAG[:ALL]**

Function	<p>Specifies that all measurements are considered (included or excluded) when the INITiate:DONE? query is sent.</p> <p>If a measurement trigger arm is left in continuous mode, the done flag for that measurement will toggle between DONE and WAIT. 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’s triggering must be continuously armed, you should exclude the measurement. Use INITiate:DONE:FLAG:ALL EXCLude to exclude all measurements. Use INITiate:DONE:FLAG:&lt;measurement mnemonic&gt; to exclude specific measurements.</p> <p>Once 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 with any type of preset.</p>
Setting	Range: INCLude   EXCLude
<b>Programming Example</b> <pre>OUTPUT 714;"INITIATE:DONE:FLAG:ALL EXCLUDE" !Excludes all measurements from responding to the INITIATE:DONE? query.</pre>	

**INITiate:DONE:FLAG:<measurement mnemonic>**

Function	<p>Specifies if a specific measurement is considered (included or excluded) when the INITiate:DONE? query is sent.</p> <p>If a measurement trigger arm is left in continuous mode, the done flag for that measurement will toggle between DONE and WAIT. 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's triggering must be continuously armed, you should exclude the measurement. Use INITiate:DONE:FLAG:ALL EXCLude to exclude all measurements. Use INITiate:DONE:FLAG:&lt;measurement mnemonic&gt; to exclude specific measurements.</p> <p>Once 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 with any type of preset.</p>
Setting	Range: INCLude   EXCLude
<p><b>Programming Example</b></p> <pre>OUTPUT 714;"INITIATE:DONE:FLAG:ACP EXCLUDE"</pre> <p>!Excludes the adjacent channel power measurement from responding to the INITIATE:DONE? query.</p>	

---

## READ? Subsystem

### Syntax Diagram and Command Descriptions

[“READ” on page 410](#)

### 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).

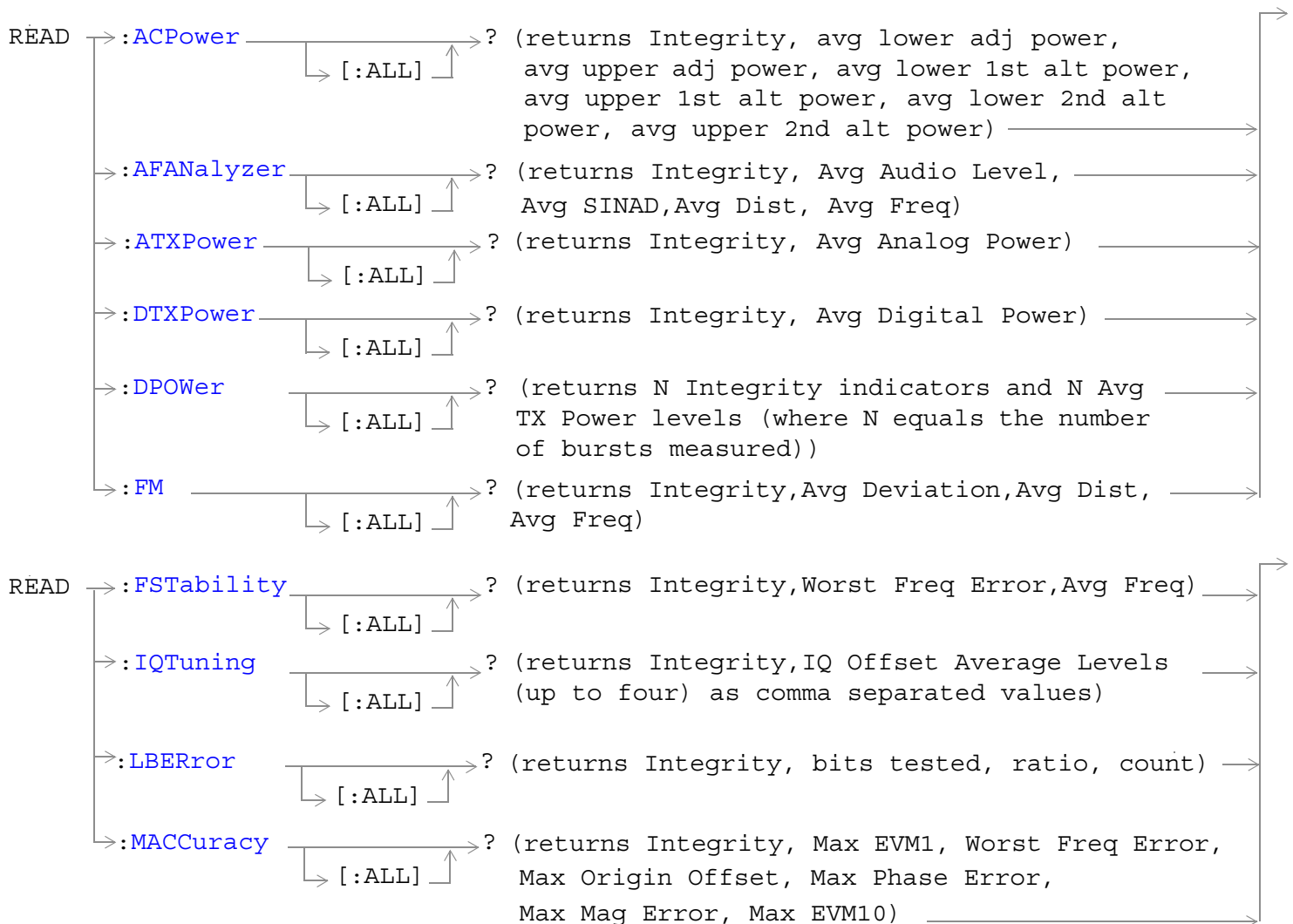
---



## Program Example - READ:DTXPower?

```
OUTPUT 714;"READ:DTXPower?" !Starts digital TX power measurement. As soon as the
!measurement cycle has completed, the test set
!provides the digital TX power measurement results to the
!controlling application.
ENTER 714;Integrity, Digital_power !Enters the integrity indicator and
!digital TX power measurement values into
!controlling application.
```

## READ



“Diagram Conventions” on page 267

**READ:ACPower[:ALL]?**

Function	Initiates and fetches an adjacent channel power measurement as a sequential operation. Measurement results are returned in the following order: integrity, average lower adjacent channel power, average upper adjacent channel power, average lower first alternate channel power, average upper 1st alternate channel power, average lower second alternate channel power, upper second alternate channel power.
Query	Range: -999 to 999 dBc Resolution: 0.1 dB

**READ:AFAnalyzer[:ALL]?**

Function	Initiates and fetches an audio frequency analyzer measurement as a sequential operation. Measurement results are returned in the following order: integrity, average audio level, average SINAD, average audio distortion.
Query	Average audio level <ul style="list-style-type: none"> <li>• Range: 0 to 20 volts, 9.91 E+37</li> <li>• Resolution: the lesser of 4 significant digits or 10 uV.</li> </ul> Average SINAD <ul style="list-style-type: none"> <li>• Range: -99 to 99 dB, 9.91 E+37</li> <li>• Resolution: 0.01 dB</li> </ul> Average audio distortion <ul style="list-style-type: none"> <li>• Range: 0 to 99%, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul>

**READ:ATXPower[:ALL]?**

Function	Initiates and fetches an analog transmitter power measurement as a sequential operation. Measurement results are returned in the following order: integrity, average analog power.
Query	Average analog transmitter power <ul style="list-style-type: none"> <li>• Range: -100 to 100 dBm</li> <li>• Resolution: 0.01 dB</li> </ul>

**READ****READ:DPOWer[:ALL]?**

Function	Initiates and fetches a dynamic power measurement as a sequential operation. Measurement results are returned in the following order: returns $N$ integrity indicators and $N$ Avg TX Power levels (where $N$ equals the number of bursts measured).
Query	Dynamic power <ul style="list-style-type: none"> <li>• Range: -100 to 100 dBm, 9.91 E+37</li> <li>• Resolution: 0.01 dB</li> </ul>

**READ:DTXPower[:ALL]?**

Function	Initiates and fetches a digital transmitter power measurement as a sequential operation. Measurement results are returned in the following order: integrity, average digital power.
Query	Average digital transmitter power <ul style="list-style-type: none"> <li>• Range: -100 to 100 dBm</li> <li>• Resolution: 0.01 dB</li> </ul>

**READ:FM[:ALL]?**

Function	Initiates and fetches an FM measurement as a sequential operation. Measurement results are returned in the following order: integrity, average frequency deviation, average distortion. The distortion measurement must be enabled before a measurement result (other than 9.91E+37) is reported. See <a href="#">“SETup:AFANalyzer:SDISDistortion:STATE” on page 433</a> .
Query	Average FM frequency deviation <ul style="list-style-type: none"> <li>• Range: 0 to 99 kHz, 9.91 E+37</li> <li>• Resolution: 0.001 Hz</li> </ul> Average FM distortion <ul style="list-style-type: none"> <li>• Range :0 to 100%, 9.91 E+37</li> <li>• Resolution: 0.1%</li> </ul>

**READ:FSTability[:ALL]?**

Function	Initiates and fetches a frequency stability measurement as a sequential operation. Measurement results are returned in the following order: integrity, worst-case frequency error, average frequency.
Query	Worst-case frequency error <ul style="list-style-type: none"> <li>• Range: -500 to 500 parts per million (ppm)</li> <li>• Resolution: 0.01</li> </ul> Average frequency <ul style="list-style-type: none"> <li>• Range: 100 E+6 to 3 E+9 Hz</li> <li>• Resolution: 1 Hz</li> </ul>

**READ:IQTuning[:ALL]?**

Function	Initiates and fetches an IQ tuning measurement as a sequential operation. One result is returned for each of the enabled entries in the TX digital IQ tuning offset frequency list. Up to four entries can be made in the list. If no offsets are specified, the measurement will return a single NAN value. See <a href="#">“SETup:IQTuning:OFFSet[:FREQuency][:SELEcted][:DIGital136]”</a> on page 460. The number of results returned are the same as those returned with the <a href="#">“SETup:IQTuning:OFFSet:POINts[:SELEcted][:DIGital136]?”</a> query.
Query	Range: -100 to +100 dB, 9.91 E+37 Resolution: 0.1 dB

**READ:LBError[:ALL]?**

Function	Initiates and fetches a loopback bit errorr measurement as a sequential operation. Measurement results are returned in the following order: integrity, bits tested, bit error ratio, bits counted. Bits to test is determined by the SETup:LBError:COUNT command.
Query	Bits tested <ul style="list-style-type: none"> <li>• Range: 0 to “bits to test” + 259, 9.91 E+37</li> </ul> Bit error ratio <ul style="list-style-type: none"> <li>• Range: 0 100%, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul> Bits counted <ul style="list-style-type: none"> <li>• Range: 0 to “bits tested”, 9.91 E+37</li> </ul>

**READ****READ:MACCuracy[:ALL]?**

Function	<p>Initiates and fetches a modulation accuracy measurement as a sequential operation.</p> <p>Measurement results are returned in the following order: integrity, maximum EVM1, worst-case frequency error, maximum origin offset, maximum phase error, maximum magnitude error, maximum EVM10.</p>
Query	<p>Maximum EVM1</p> <ul style="list-style-type: none"> <li>• Range: 0 to 100.0% rms, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul> <p>Worst-case frequency error</p> <ul style="list-style-type: none"> <li>• Range: -1 E+4 to 1 E+4 Hz, 9.91 E+37</li> <li>• Resolution: 1 Hz</li> </ul> <p>Maximum origin offset</p> <ul style="list-style-type: none"> <li>• Range: -100.0 to 0 dBc, 9.91E+37</li> <li>• Resolution: 0.1 dB</li> </ul> <p>Maximum phase error</p> <ul style="list-style-type: none"> <li>• Range: 0 to 22.0 degrees rms, 9.91 E+37</li> <li>• Resolution: 0.01 degrees</li> </ul> <p>Maximum magnitude error</p> <ul style="list-style-type: none"> <li>• Range: 0 to 100.0% rms, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul> <p>Maximum EVM10</p> <ul style="list-style-type: none"> <li>• Range: 0 to 100.0% rms, 9.91 E+37</li> <li>• Resolution: 0.01%</li> </ul>

## RFANalyzer Subsystem

### Description

The RFANalyzer command subsystem performs “lower-level” functions that control the Test Set's measuring receiver and demodulation receiver. Most of these functions are normally controlled indirectly by commands in other subsystems, such as CALL subsystem commands to change the current traffic or control channel frequency or MS TX level.

### Syntax Diagrams and Command Descriptions

[“RFANalyzer” on page 416](#)





**RFAnalyzer:CONTROL:MEASurement:FREQuency:AUTO**

Function	Sets/queries the whether the test set's receiver is set to automatic (AUTO ON) or manual (AUTO OFF) measurement frequency control. See <a href="#">"Receiver Control" on page 561</a> .
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST setting	1 (on)
Programming Example	
<pre>OUTPUT 714;"RFAnalyzer:CONTROL:MEASurement:FREQuency:AUTO OFF" !Enables manual control of the measurement receiver's frequency.</pre>	

**RFAnalyzer:CONTROL:POWer:AUTO**

Function	Sets/queries the whether the test set receiver's expected power setting is set to automatic (AUTO ON) or manual (AUTO OFF) power control. See <a href="#">"Receiver Control" on page 561</a> .
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST setting	1 (on)
Programming Example	
<pre>OUTPUT 714;"RFANALYZER:CONTROL:POWER:AUTO OFF"</pre>	

**RFAnalyzer:CONTROL:UPLink:FREQuency:AUTO**

Function	Sets/queries the whether the test set's demodulation receiver is set to automatic (AUTO ON) or manual (AUTO OFF) uplink frequency control. See <a href="#">"Receiver Control" on page 561</a> .
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST setting	1 (on)
Programming Example	
<pre>OUTPUT 714;"RFANALYZER:CONTROL:UPLINK:FREQUENCY:AUTO OFF"</pre>	

**RFANalyzer****RFANalyzer:CW:EXPEcted:POWer**

Function	Sets/queries the expected power for analog carriers when operating in the CW mode. This value is used with manual and auto receiver control.
Setting	Range: -25 to +43 dBm (interacts with the Amplitude Offset setting to determine the available range) Resolution: 0.01 dBm
Query	Range: Same as setting.
*RST setting	13 dBm
Programming Example OUTPUT 714;"RFANalyzer:CW:EXPEcted:POWer 24 DBM"	

**RFANalyzer:MANual:ANALog:POWer[:SELEcted]**

Function	Sets/queries the expected power when the mobile is on an analog voice channel. The selected band is currently limited to the cellular band (800 MHz).
Setting	Range: -60 dBm to +53 dBm (interacts with the Amplitude Offset setting to determine the available range) Resolution: 0.01 dB
Query	Range: -60 dBm to +53 dBm Resolution: 0.01 dBm
*RST setting	13 dBm
Programming Example OUTPUT 714;"RFANalyzer:MANual:ANALog:POWer:SELEcted 24 DBM"	

**RFANalyzer:MANual:ANALog:POWer:CELLular**

Function	Sets/queries the expected power when the mobile is on a cellular band (800 MHz) analog voice channel.
Setting	Range: -60 dBm to +53 dBm (interacts with the Amplitude Offset setting to determine the available range) Resolution: 0.01 dBm
Query	Range: -60 dBm to +53 dBm
*RST setting	13 dBm
Programming Example OUTPUT 714;"RFANalyzer:MANual:ANALog:POWer:CELLular 24 DBM"	

**RFAnalyzer:MANual:DIGital:POWer[:SElected]**

Function	Sets/queries the expected power from the mobile station while on a digital traffic channel operating in the selected band.
Setting	Range: -60 dBm to +53 dBm (interacts with the Amplitude Offset setting to determine the available range) Resolution: 0.01 dBm
Query	Range: -60 dBm to +53 dBm
*RST setting	13 dBm
Programming Example OUTPUT 714;"RFANALYZER:MANUAL:DIGITAL:POWER:SELECTED 24 DBM"	

**RFAnalyzer:MANual:DIGital:POWer:CELLular**

Function	Sets/queries the expected power from the mobile station while on a digital traffic channel operating in the cellular (800 MHz) band.
Setting	Range: -60 dBm to +53 dBm (interacts with the Amplitude Offset setting to determine the available range) Resolution: 0.01 dBm
Query	Range: -60 dBm to +53 dBm
*RST setting	13 dBm
Programming Example OUTPUT 714;"RFANalyzer:MANual:DIGital:POWer:CELLular 24 DBM"	

**RFAnalyzer:MANual:DIGital:POWer:PCS**

Function	Sets/queries the expected power from the mobile station while on a digital traffic channel operating in the PCS (1900 MHz) band.
Setting	Range:-60 dBm to +53 dBm (interacts with the Amplitude Offset setting to determine the available range) Resolution: 0.01 dB
Query	Range: -60 dBm to +53 dBm
*RST setting	13 dBm
Programming Example OUTPUT 714;"RFANalyzer:MANual:DIGital:POWer:PCS 24 DBM"	

**RFANalyzer****RFANalyzer:MANual:MEASurement[:MFRequency]**

Function	Sets/queries the frequency used to tune the test set's measuring receiver for all mobile carriers: analog (including CW) or digital systems (cellular or PCS band).  This command automatically sets the receiver to manual mode and changes the measurement frequency.
Setting	Range: 292.5 MHz to 2700 MHz  Resolution: 1 Hz
Query	Range: 292.5 MHz to 2700 MHz
*RST setting	896.000 MHz
<b>Programming Example</b>  OUTPUT 714;"RFANalyzer:MANual:MEASurement:MFRequency 942.6 MHz" !Enables manual receiver control and sets the test set's receiver frequency to 942.6 MHz.	

**RFANalyzer:MANual:MEASurement:FREquency**

Function	Sets/queries the frequency used to tune the test set's measuring receiver for all mobile carriers: analog (including CW) or digital systems (cellular or PCS band), when manual mode is selected (RFANalyzer:CONTRol:MEASurement:FREquency:AUTO OFF).
Setting	Range: 292.5 MHz to 2700 MHz  Resolution: 1 Hz
Query	Range: 292.5 MHz to 2700 MHz
*RST setting	896.000 MHz
<b>Programming Example</b>  OUTPUT 714;"RFANalyzer:MANual:MEASurement:FREquency 942.6 MHz" !Sets the test set's receiver frequency to 942.6 MHz when manual control is used.	

**RFANalyzer:MANual:UPLink[:MFRequency]**

Function	Sets/queries the test set's demodulation receiver frequency, used to demodulate information from the mobile's reverse channel transmission.  This command automatically sets the test set to manual mode and changes the uplink frequency.
Setting	Range: 292.5 MHz to 2700 MHz  Resolution: 1 Hz
Query	Range: 292.5 MHz to 2700 MHz
*RST setting	896.000 MHz
<b>Programming Example</b>  OUTPUT 714;"RFANalyzer:MANual:UPLink:MFRequency 1955.030 MHz" !Enables manual demodulation receiver control and sets the test set's demodulation receiver frequency to 1955.030 MHz.	

**RFAnalyzer:MANual:UPLink:FREQUENCY**

Function	Sets/queries the test set's demodulation receiver frequency used to demodulate information from the mobile's reverse channel transmission when manual mode is selected (RFAnalyzer:CONTRol:MEASurement:FREQuency:AUTO:OFF).
Setting	Range: 292.5 MHz to 2700 MHz Resolution: 1 Hz
Query	Range: 292.5 MHz to 2700 MHz
*RST setting	896.000 MHz
<b>Programming Example</b> OUTPUT 714;"RFAnalyzer:MANual:UPLink:FREQuency 942.6 MHZ" !Sets the test set's demodulation receiver frequency to 942.6 MHz.	

---

## SETup Subsystem

### Description

The SETup subsystem is used to configure the test set for each measurement. Typical settings include:

- Multi-Measurement Count, how many measurements will be made each time a measurement is initiated.
- 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).
- Trigger Source, how a measurement is triggered.
- Trigger Delay, controls the delay time between the trigger and the start of sampling.
- Measurement Timeout, length of time before a measurement times out.

---

**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:ACPower” on page 424](#)

[“SETup:AFANalyzer” on page 428](#)

[“SETup:ATXPower” on page 435](#)

[“SETup:DPOWER” on page 439](#)

[“SETup:DTXPower” on page 443](#)

[“SETup:FM” on page 447](#)

[“SETup:FSTability” on page 453](#)

[“SETup:IQTuning” on page 457](#)

[“SETup:LBError” on page 464](#)

[“SETup:MACCuracy” on page 467](#)

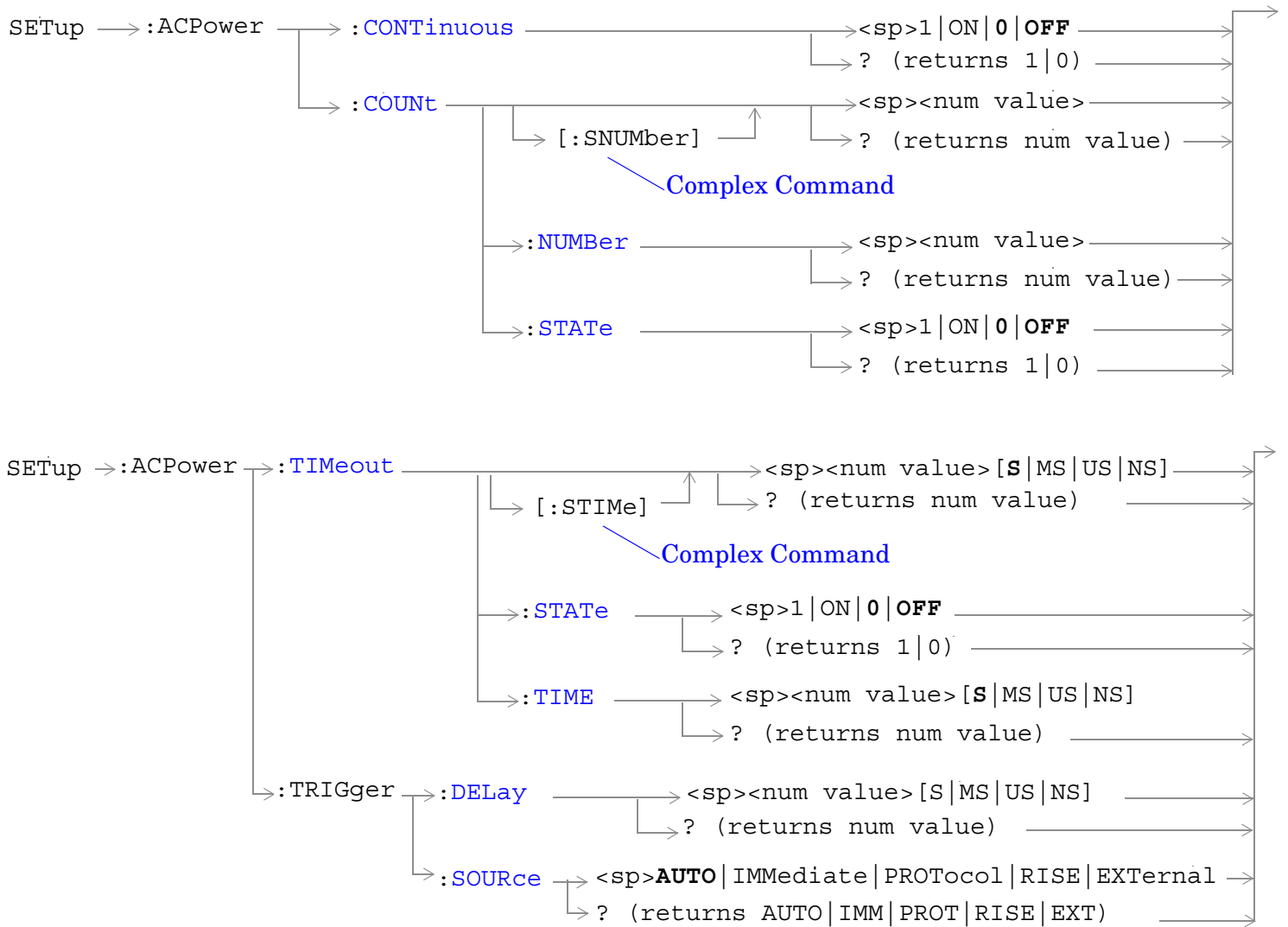
**SETup[:ALL]:CONTInuous**

[“Diagram Conventions” on page 267](#)

**SETup[:ALL]:CONTInuous**

Function	Sets/queries the trigger arm state for all measurements. Determines whether all measurements will make one measurement then stop (OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (ON (continuous)).  This setting overrides previously set trigger arm settings for individual measurements.
Setting	Range: ON, OFF
Programming Example	
OUTPUT 714;"SETup:ALL:CONTInuous:OFF" !Sets all measurements to single trigger mode.	

## SETup:ACPower



“Diagram Conventions” on page 267



**SETup:ACPower:CONTInuous**

Function	Sets/queries the trigger arm state for the adjacent channel power measurement. Determines whether measurement will make one measurement then stop (0   OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (1   ON (continuous)).
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714; "SETUP:ACPOWER:CONTINUOUS ON" !Sets measurement to continuous trigger mode.	

**SETup:ACPower:COUNT[:SNUMBER]**

Function	Sets/queries the number of adjacent channel power measurements to be made in a multi-measurement setup. This command sets the count, and automatically sets the multi-measurement STATE command to 1 (on).
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	Off, (10 when STATE = On)
Programming Example	
OUTPUT 714; "SETUP:ACPOWER:COUNT:SNUMBER 5" !Turns on multi-measurements and sets the number of measurements to 5.	

**SETup:ACPower:COUNT:NUMBER**

Function	Sets/queries the number of adjacent channel power measurements to be made when multi-measurement state is ON.
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	Off, (10 when STATE = On)
Programming Example	
OUTPUT 714; "SETUP:ACPOWER:COUNT:NUMBER 5" !Sets the number of measurements to 5 when the multi-measurement state is set to ON.	

**SETup:ACPower****SETup:ACPower:COUNT:STATE**

Function	Sets/queries the multi-measurement state of the adjacent channel power measurement.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714; "SETUP:ACPOWER:COUNT:STATE ON" !Turns on multi-measurements.	

**SETup:ACPower:TIMEout[:STIME]**

Function	Sets/queries the adjacent channel power measurement's timeout setting and automatically sets the timeout state to ON.
Setting	Range: 0.1 to 999 seconds Resolution: 0.1 second
Query	Range: 0.1 to 999
*RST Setting	Off (10 seconds when STATE = On)
Programming Example	
OUTPUT 714; "SETUP:ACPOWER:TIMEOUT:STIME 5S" !Sets timeout state to ON and sets the timeout time to 5 seconds.	

**SETup:ACPower:TIMEout:STATE**

Function	Sets/queries the adjacent channel power measurement's timeout state.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714; "SETUP:ACPOWER:TIMEOUT:STATE ON" !Enables measurement timeouts.	

### SETup:ACPower:TIMEout:TIME

Function	Sets/queries the adjacent channel power measurement's timeout setting to be used when the timeout state is set to ON.
Setting	Range: 0.1 to 999 seconds Resolution: 0.1 second
Query	Range: 0.1 to 999
*RST Setting	Off, (10 when STATE = On)
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:ACPOWER:TIMEOUT:TIME 5S" !Enables a measurement timeout of 5 seconds when the timeout state is set to ON.</pre>	

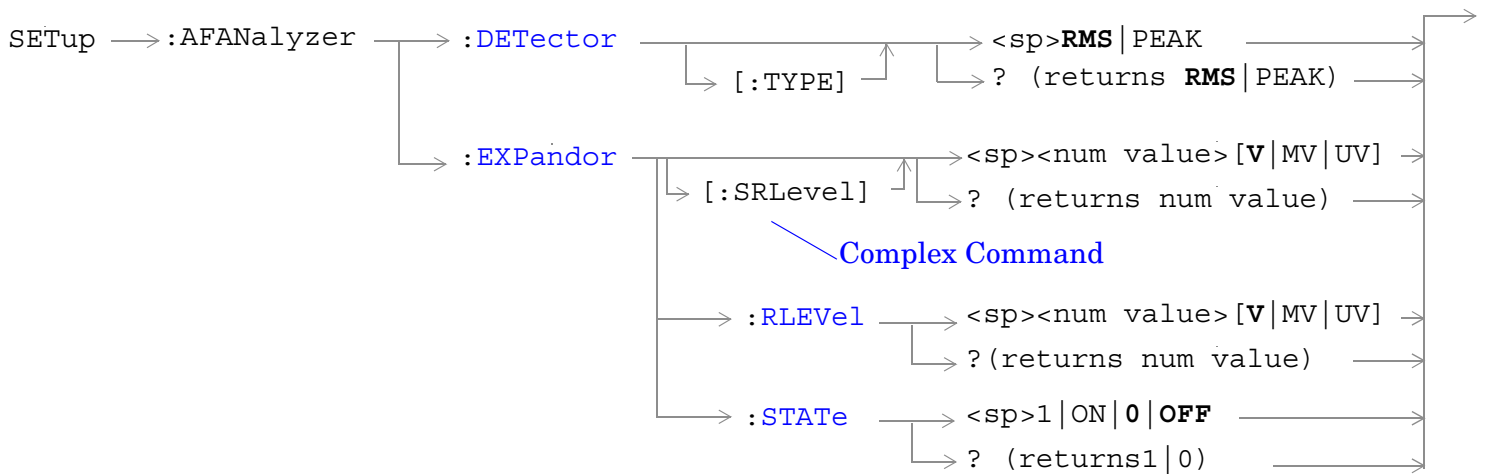
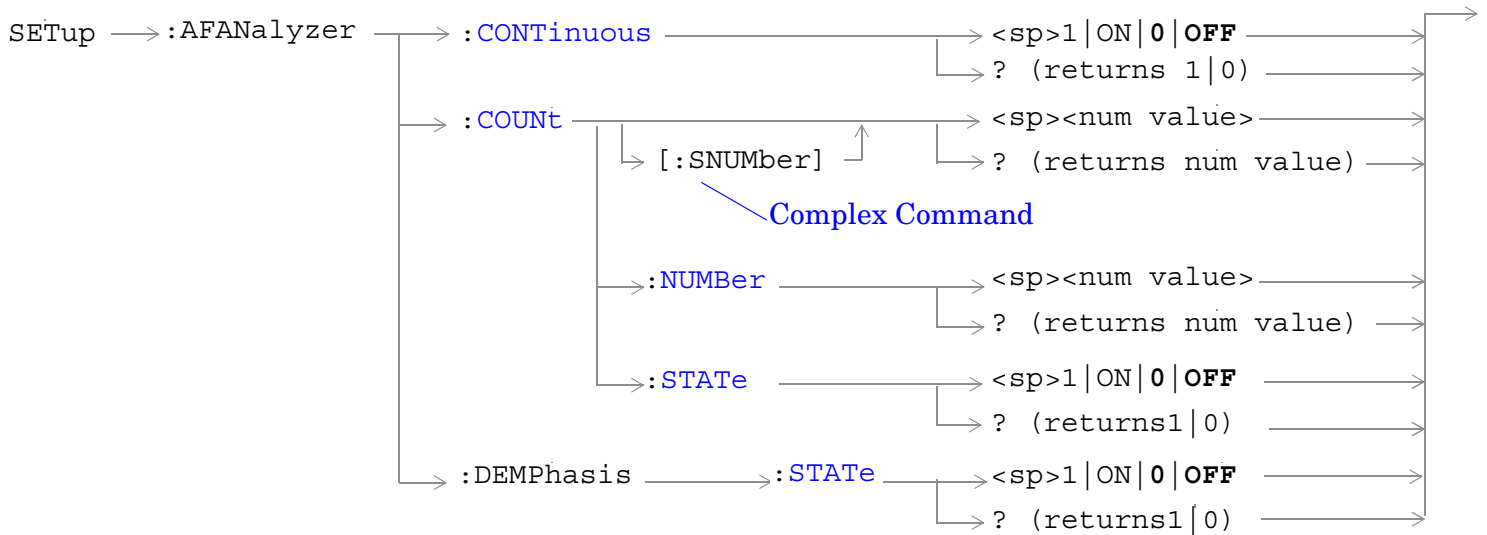
### SETup:ACPower:TRIGger:DELay

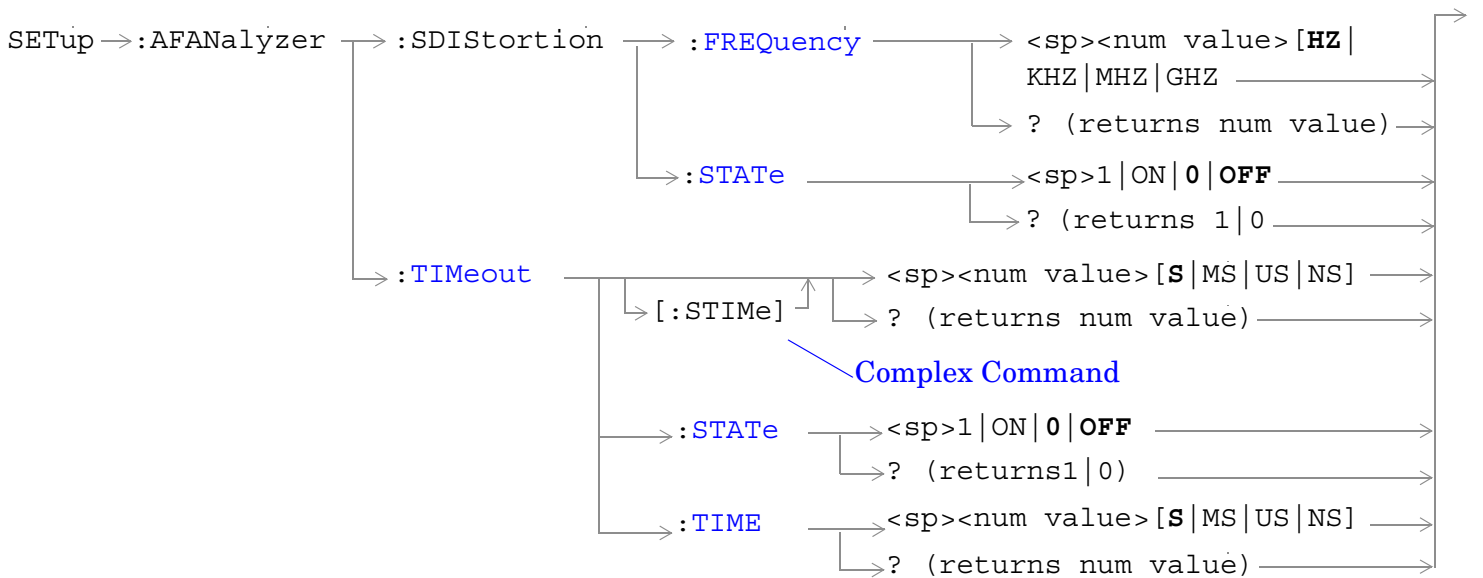
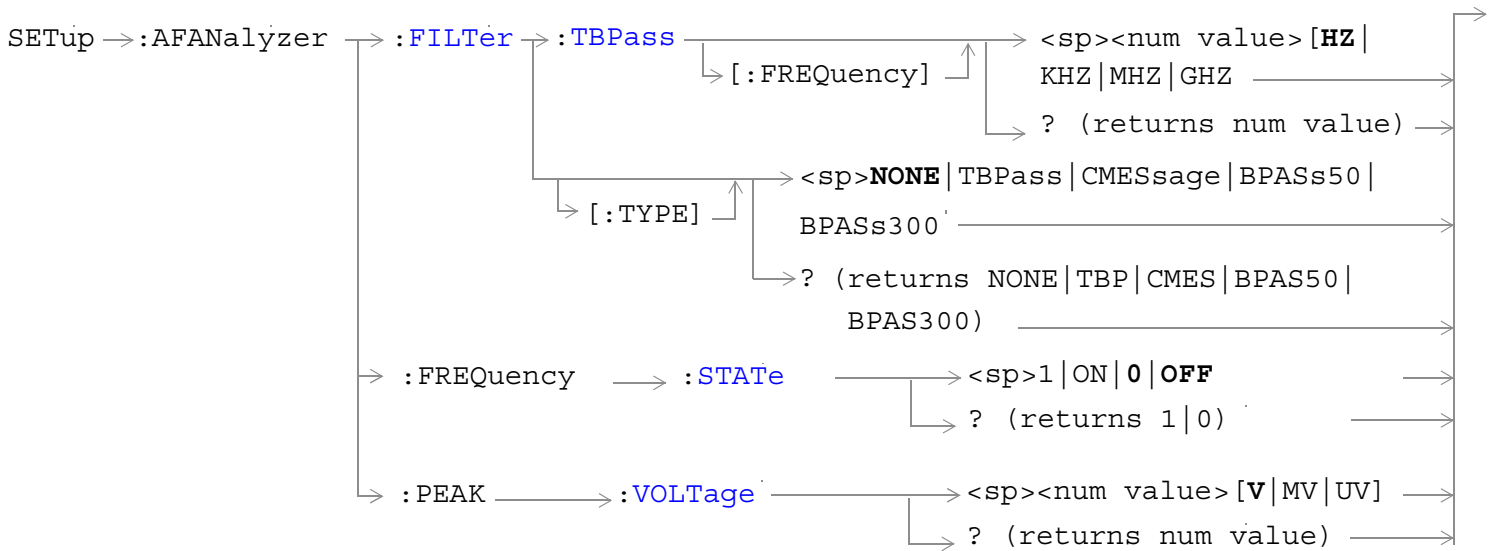
Function	Sets/queries the trigger delay for the adjacent channel power measurement.
Setting	Range: -20 to 20 ms Resolution: 10 us
Query	Range: -20 to 20 ms
*RST Setting	0 seconds
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:ACPOWER:TRIGGER:DELAY 1S"</pre>	

### SETup:ACPower:TRIGger:SOURce

Function	Sets/queries the trigger source for the adjacent channel power measurement.
Setting	Range: AUTO   IMMEDIATE   PROTOCOL   RISE   EXTERNAL
Query	Range: AUTO   IMM   PROT   RISE   EXT
*RST Setting	AUTO
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:ACPOWER:TRIGGER:SOURCE RISE"</pre>	

## SETup:AFANalyzer





“Diagram Conventions” on page 267

**SETup:AFANalyzer****SETup:AFANalyzer:CONTInuous**

Function	Sets/queries the trigger arm state for the AF analyzer measurement. Determines whether measurement will make one measurement then stop (0   OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (1   ON (continuous)).
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:AFANALYZER:CONTINUOUS OFF" !Sets measurement to single trigger mode.</pre>	

**SETup:AFANalyzer:COUNT[:SNUMBER]**

Function	Sets/queries the number of AF analyzer measurements to be made in a multi-measurement setup. This command sets the count, and automatically sets the multi-measurement STATE command to 1 (on).
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	Off (10 when STATE = On)
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:AFANALYZER:COUNT:SNUMBER 5" !Turns on multi-measurements and sets the number of measurements to 5.</pre>	

**SETup:AFANalyzer:COUNT:NUMBER**

Function	Sets/queries the number of AF analyzer measurements to be made when multi-measurement state is ON.
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:AFANALYZER:COUNT:NUMBER 5" !Sets the number of measurements to 5 when the multi-measurement state is set to ON.</pre>	

**SETup:AFANalyzer:COUNT:STATE**

Function	Sets/queries the multi-measurement state of the AF analyzer measurement.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714 ; "SETUP:AFANALYZER:COUNT:STATE ON" !Turns on multi-measurements.	

**SETup:AFANalyzer:DEMPHasis:STATE**

Function	Sets/queries whether 750 us de-emphasis is enabled.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714 ; "SETUP:AFANALYZER:DEMPHESIS:STATE ON"	

**SETup:AFANalyzer:DETECTOR[:TYPE]**

Function	Sets/queries the detector type for audio level measurements.
Setting	Range: RMS   PEAK
Query	Range: RMS   PEAK
*RST setting	RMS
Programming Example	
OUTPUT 714 ; "SETUP:AFANALYZER:DETECTOR:TYPE PEAK"	

**SETup:AFANalyzer:EXPANDOR[:SRLevel]**

Function	Sets/queries the expander's reference level and automatically sets the expander's state to ON.
Setting	Range: 10 mV to 10 V Resolution: 1 mV
Query	Range: 10 mV to 10 V
*RST setting	1 V
Programming Example	
OUTPUT 714 ; "SETUP:AFANALYZER:EXPANDOR:SRLEVEL 5V" !Sets expander state to on and level to 5 V.	

**SETup:AFANalyzer****SETup:AFANalyzer:EXPandor:RLEVel**

Function	Sets/queries the expander's reference level to be used when the expander's state is set to ON.
Setting	Range: 10 mV to 10 V Resolution: 1 mV
Query	Range: 10 mV to 10 V
*RST setting	1 V
Programming Example	
OUTPUT 714;"SETUP:AFANALYZER:EXPANDOR:RLEVEL 5V" !Sets expander reference level to 5 V.	

**SETup:AFANalyzer:EXPandor:STATE**

Function	Sets/queries whether the expander is enabled.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST setting	0 (off)
Programming Example	
OUTPUT 714;"SETUP:AFANALYZER:EXPANDOR:STATE ON"	

**SETup:AFANalyzer:FILTer[:TYPE]**

Function	Sets/queries the filter type for audio measurements.
Setting	Range: NONE   TBPAss   CMESsage   BPASs50   BPASs300
Query	Range: NONE   TBP   CMES   BPAS50   BPAS300
*RST setting	NONE
Programming Example	
OUTPUT 714;"SETUP:AFANALYZER:FILTER:TYPE BPASS50" !Selects the 50 Hz to 15 kHz bandpass filter.	

**SETup:AFANalyzer:FILTer:TBPAss[:FREQuency]**

Function	Sets/queries the center frequency for the 100 Hz tunable bandpass filter (TBPAss).
Setting	Range: 300.0 to 20000 Hz Resolution: 0.1
Query	Range: 300.0 to 20000 Hz
*RST setting	1000
Programming Example	
10 OUTPUT 714;"SETUP:AFANALYZER:FILTER:TBPASS:FREQUENCY 300HZ"	



**SETup:AFANalyzer:FREQuency:STATe**

Function	Sets/queries whether the audio frequency measurement is enabled.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST setting	0 (off)
Programming Example	
OUTPUT 714 ; "SETUP:AFANALYZER:FREQUENCY:STATE ON"	

**SETup:AFANalyzer:PEAK:VOLTage**

Function	Sets/queries the expected peak voltage for audio measurements.
Setting	Range: 0.001 to 20 Vpk Resolution: 0.001
Query	Range: 0.001 to 20 Vpk
*RST setting	20
Programming Example	
10 OUTPUT 714 ; SETUP:AFANALYZER:PEAK:VOLTAGE 10V"	

**SETup:AFANalyzer:SDISTortion:FREQuency**

Function	Sets/queries the fundamental frequency setting for the SINAD/distortion measurement.
Setting	Range: 100.0 to 10000 Hz Resolution: 0.1
Query	Range: 100.0 to 10000 Hz
*RST setting	1000
Programming Example	
10 OUTPUT 714 ; SETUP:AFANALYZER:SDISTORTION:FREQUENCY 300HZ"	

**SETup:AFANalyzer:SDISTortion:STATe**

Function	Sets/queris whether the SINAD/distortion measurement is enabled.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST setting	0 (off)
Programming Example	
10 OUTPUT 714 ; SETUP:AFANALYZER:SDISTORTION:STATE ON"	

**SETup:AFANalyzer****SETup:AFANalyzer:TIMEout[:STIME]**

Function	Sets/queries the AF analyzer measurement's timeout setting and automatically sets the timeout state to ON.
Setting	Range: 1 to 999 seconds Resolution: 1 second
Query	Range: 1 to 999
*RST Setting	10 seconds, on
<b>Programming Example</b> <pre>OUTPUT 714; "SETUP:AFANALYZER:TIMEOUT:STIME 5S" !Sets timeout state to ON and sets the timeout time to 5 seconds.</pre>	

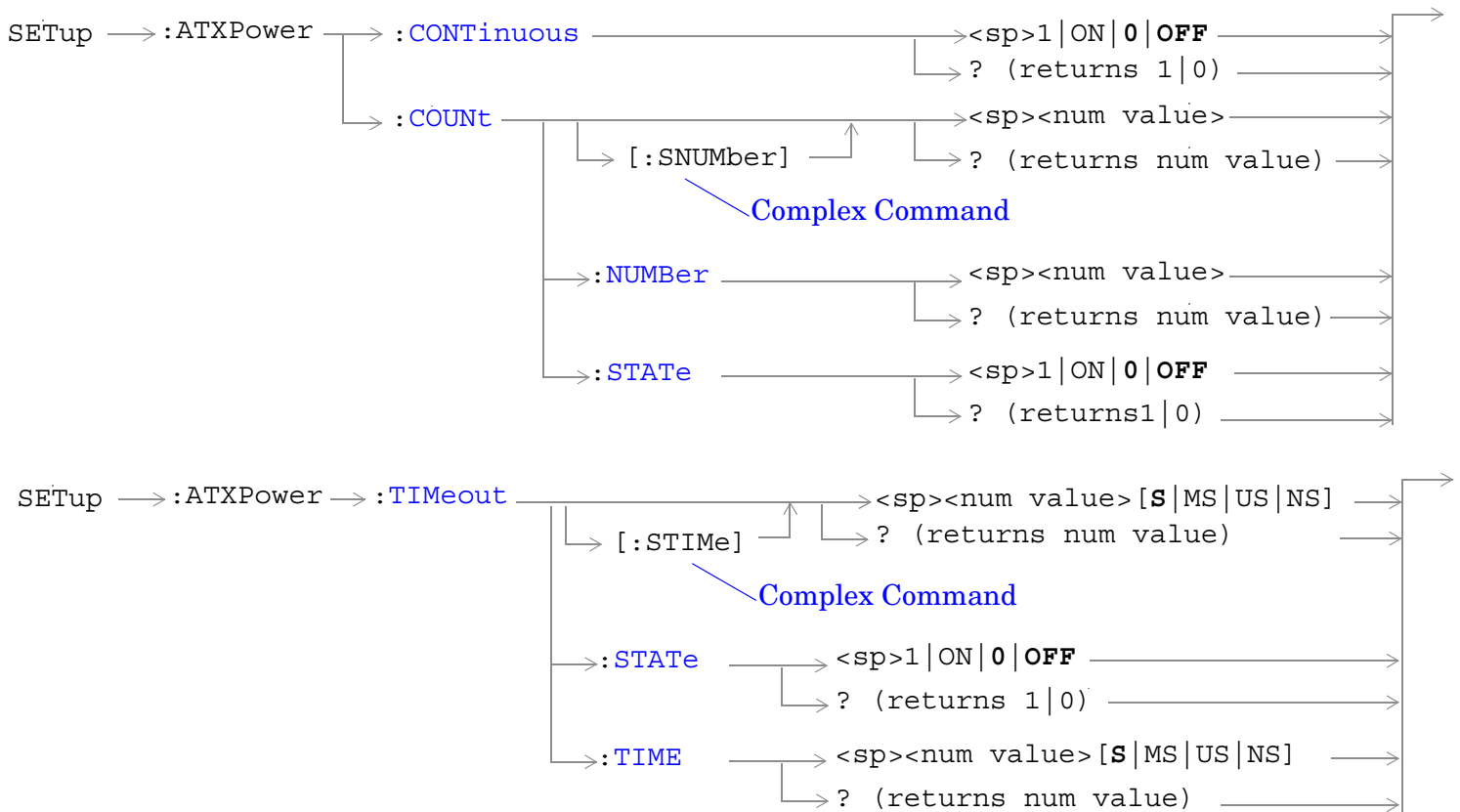
**SETup:AFANalyzer:TIMEout:STATE**

Function	Sets/queries the AF analyzer measurement's timeout state.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> <pre>OUTPUT 714; "SETUP:AFANALYZER:TIMEOUT:STATE ON"</pre>	

**SETup:AFANalyzer:TIMEout:TIME**

Function	Sets/queries the AF analyzer measurement's timeout setting to be used when the timeout state is set to ON.
Setting	Range: 1 to 999 seconds Resolution: 1 second
Query	Range: 1 to 999
*RST Setting	10 seconds
<b>Programming Example</b> <pre>OUTPUT 714; "SETUP:AFANALYZER:TIMEOUT:TIME 5S"</pre>	

## SETup:ATXPower



“Diagram Conventions” on page 267

**SETup:ATXPower****SETup:ATXPower:CONTInuous**

Function	Sets/queries the trigger arm state for the analog transmitter power measurement. Determines whether measurement will make one measurement then stop (0   OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (1   ON (continuous)).
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714; "SETUP:ATXPOWER:CONTINUOUS ON" !Sets measurement to continuous trigger mode.	

**SETup:ATXPower:COUNT[:SNUMber]**

Function	Sets/queries the number of analog transmitter power measurements to be made in a multi-measurement setup. This command sets the count, and automatically sets the multi-measurement STATE command to 1 (on).
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10, on
Programming Example	
OUTPUT 714; "SETUP:ATXPOWER:COUNT:SNUMBER 5" !Turns on multi-measurements and sets the number of measurements to 5.	

**SETup:ATXPower:COUNT:NUMBer**

Function	Sets/queries the number of analog transmitter power measurements to be made when multi-measurement state is ON.
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10
Programming Example	
OUTPUT 714; "SETUP:ATXPOWER:COUNT:NUMBER 5" !Sets the number of measurements to 5 when the multi-measurement state is set to ON.	

**SETup:ATXPower:COUNT:STATE**

Function	Sets/queries the multi-measurement state of the analog transmitter power measurement.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714 ; "SETUP:ATXPOWER:COUNT:STATE ON" !Turns on multi-measurements.	

**SETup:ATXPower:TIMEout[:STIME]**

Function	Sets/queries the analog transmitter power measurement's timeout setting and automatically sets the timeout state to ON.
Setting	Range: .1 to 999 seconds Resolution: .1 second
Query	Range: .1 to 999
*RST Setting	10 seconds, on
<b>Programming Example</b> OUTPUT 714 ; "SETUP:ATXPOWER:TIMEOUT:STIME 5S" !Sets timeout state to ON and sets the timeout time to 5 seconds.	

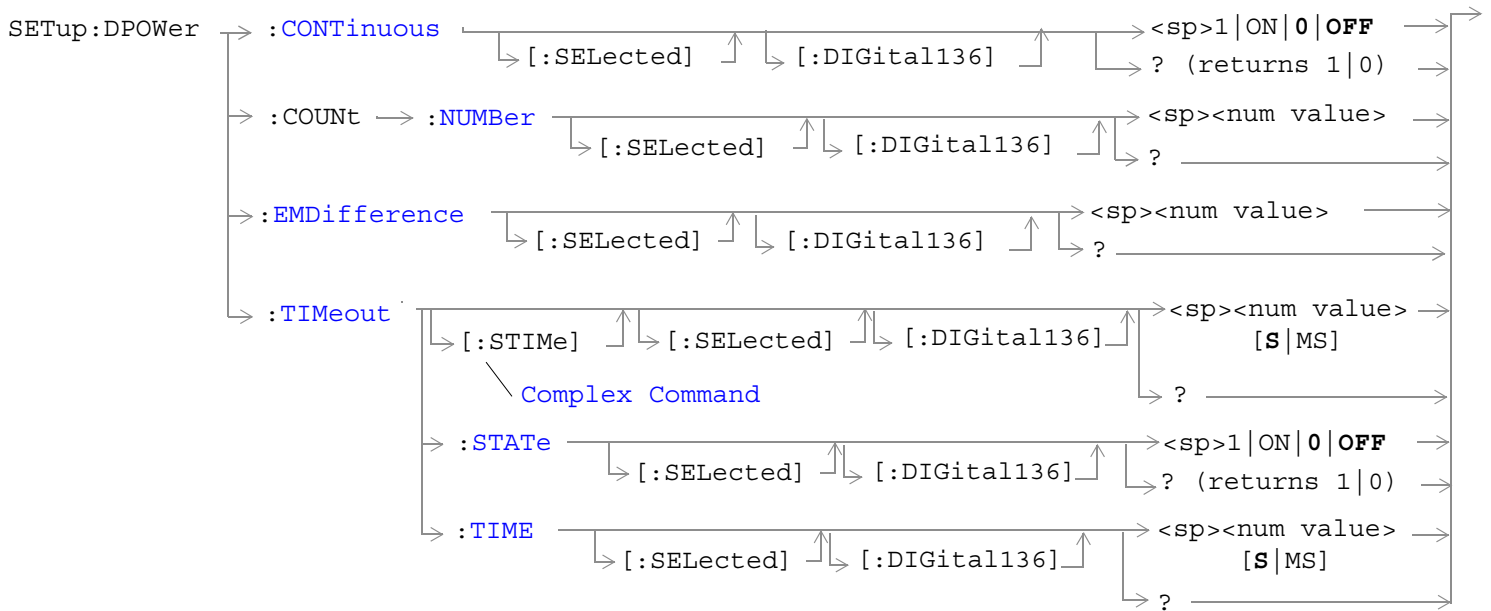
**SETup:ATXPower:TIMEout:STATE**

Function	Sets/queries the analog transmitter power measurement's timeout state.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714 ; "SETUP:ATXPOWER:TIMEOUT:STATE ON"	

**SETup:ATXPower****SETup:ATXPower:TIMEout:TIME**

Function	Sets/queries the analog transmitter power measurement's timeout setting to be used when the timeout state is set to ON.
Setting	Range: .1 to 999 seconds Resolution: .1 second
Query	Range: .1 to 999
*RST Setting	10 seconds
Programming Example	
OUTPUT 714 ; "SETUP:ATXPOWER:TIMEOUT:TIME 5S"	

## SETup:DPOWer



“Diagram Conventions” on page 267

### SETup:DPOWer:CONTInuous[:SElected][:DIGItal136]

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[:SElected][:DIGItal136]

Function	Sets/queries the number of bursts for the Dynamic Power measurement.
Setting	Range: 1 to 999 Resolution: 1
Query	Range: 1 to 999 Resolution: 1
*RST	25

**SETup:DPOWER**

**Programming Example**

```
OUTPUT 714;"SETUP:DPOWER:COUNT:NUMBER 30"
```

```
!Sets the number of bursts for the Dynamic Power measurement to 30.
```



**SETup:DPOwer:EMDifference[:SElected][:DIGital136]**

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 <a href="#">“RFANalyzer:MANual:DIGital:POWer[:SElected]” on page 419.</a>
Setting	Range: -30 dB to +30 dB Resolution: 0.01 dB
Query	Range: -30 dB to +30 dB Resolution: 0.01 dB
*RST	3 dB
<b>Programming Example</b>  <pre> OUTPUT 714;"SETUP:DPOWER:EMDIFFERENCE -3" !Sets the Expected Maximum           ! Difference from previous measurement parameter           ! to -3 dB. (Example: If the previous burst           ! measures 30 dBm and you expect the maximum           ! amplitude of the next burst to be 3 dB lower, set the           ! Expected Maximum Difference parameter to -3). </pre>	

**SETup:DPOwer:TIMEout[:STIME][:SElected][:DIGital136]**

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: 0.1 to 999 Resolution: 0.1
Query	Range: 0.1 to 999 Resolution: 0.1
*RST	10 seconds
<b>Programming Example</b>  <pre> 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. </pre>	

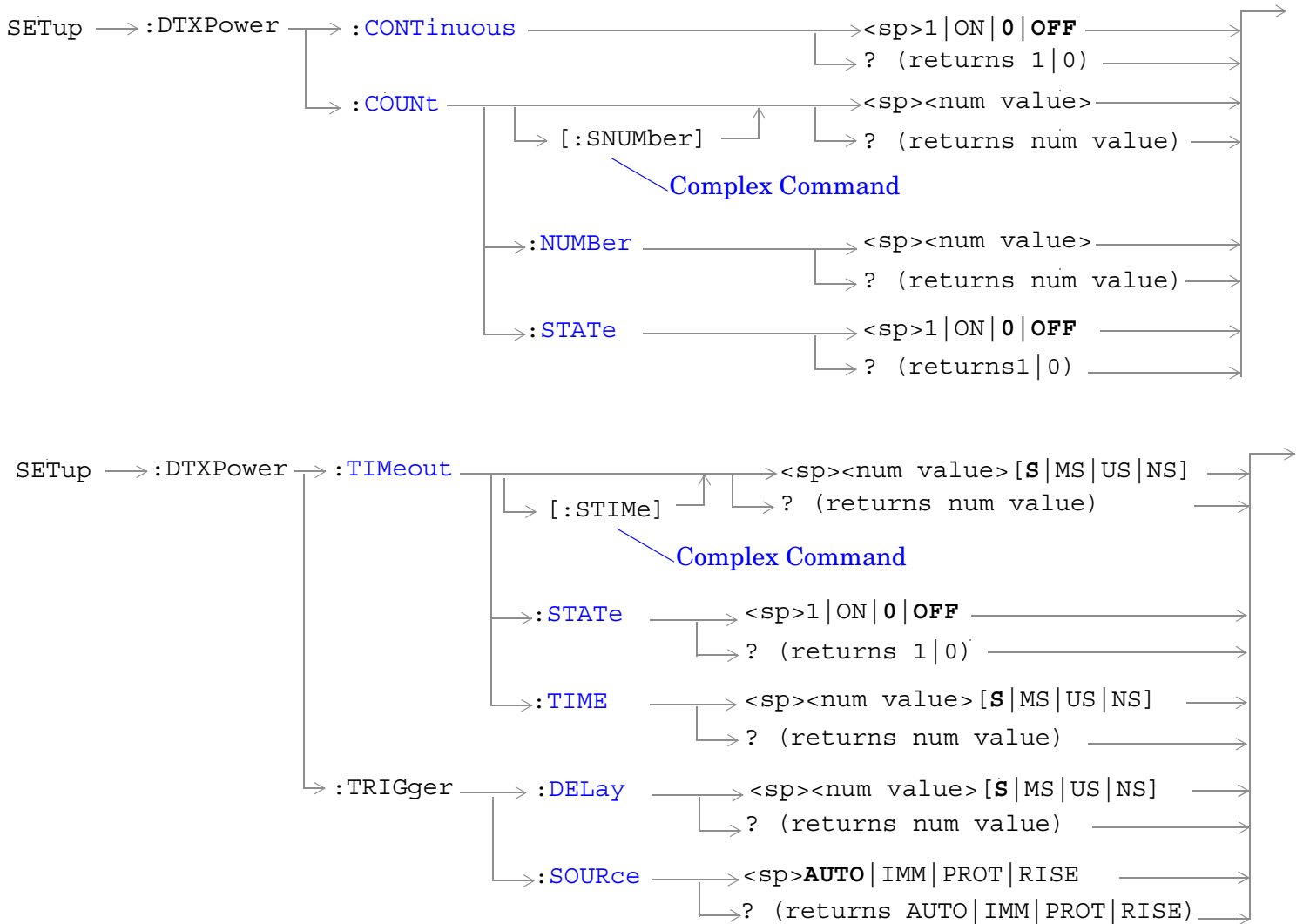
**SETup:DPOWer****SETup:DPOWer:TIMEout:STATE[:SElected][:DIGital136]**

Function	Sets/queries the time-out state for the Dynamic Power measurement.
Setting	0   OFF   1   ON
Query	0   1
*RST	0   OFF
<b>Programming Example</b> OUTPUT 714;"SETUP:DPOWER:TIMEOUT:STATE ON" !Sets the timeout state to on for a Dynamic Power measurement.	

**SETup:DPOWer:TIMEout:TIME[:SElected][:DIGital136]**

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: 0.1 to 999 Resolution: 0.1
Query	Range: 0.1 to 999 Resolution: 0.1
*RST	10 seconds
<b>Programming Example</b> OUTPUT 714;"SETUP:DPOWER:TIMEOUT:TIME 6" !Sets the timeout value to 6 seconds for a dynamic power measurement.	

## SETup:DTXPower



“Diagram Conventions” on page 267

**SETup:DTXPower****SETup:DTXPower:CONTInuous**

Function	Sets/queries the trigger arm state for the digital transmitter power measurement. Determines whether measurement will make one measurement then stop (0   OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (1   ON (continuous)).
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714; "SETUP:DTXPOWER:CONTINUOUS ON" !Sets measurement to continuous trigger mode.	

**SETup:DTXPower:COUNT[:SNUMber]**

Function	Sets/queries the number of digital transmitter power measurements to be made in a multi-measurement setup. This command sets the count, and automatically sets the multi-measurement STATE command to 1 (on).
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10, on
Programming Example	
OUTPUT 714; "SETUP:DTXPOWER:COUNT:SNUMBER 5" !Turns on multi-measurements and sets the number of measurements to 5.	

**SETup:DTXPower:COUNT:NUMBer**

Function	Sets/queries the number of digital transmitter power measurements to be made when multi-measurement state is ON.
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10
Programming Example	
OUTPUT 714; "SETUP:DTXPOWER:COUNT:NUMBER 5" !Sets the number of measurements to 5 when the multi-measurement state is set to ON.	

**SETup:DTXPower:COUNT:STATE**

Function	Sets/queries the multi-measurement state of the digital transmitter power measurement.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714 ; "SETUP:DTXPOWER:COUNT:STATE ON" !Turns on multi-measurements.	

**SETup:DTXPower:TIMEout[:STIME]**

Function	Sets/queries the digital transmitter power measurement's timeout setting and automatically sets the timeout state to ON.
Setting	Range: .1 to 999 seconds Resolution: .1 second
Query	Range: .1 to 999
*RST Setting	10 seconds, on
<b>Programming Example</b> OUTPUT 714 ; "SETUP:DTXPOWER:TIMEOUT:STIME 5S" !Sets timeout state to ON and sets the timeout time to 5 seconds.	

**SETup:DTXPower:TIMEout:STATE**

Function	Sets/queries the digital transmitter power measurement's timeout state.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714 ; "SETUP:DTXPOWER:TIMEOUT:STATE ON"	

**SETup:DTXPower****SETup:DTXPower:TIMEout:TIME**

Function	Sets/queries the digital transmitter power measurement's timeout setting to be used when the timeout state is set to ON.
Setting	Range: .1 to 999 seconds Resolution: .1 second
Query	Range: .1 to 999
*RST Setting	10 seconds, on
Programming Example	
OUTPUT 714 ; "SETUP:DTXPOWER:TIMEOUT:TIME 5S"	

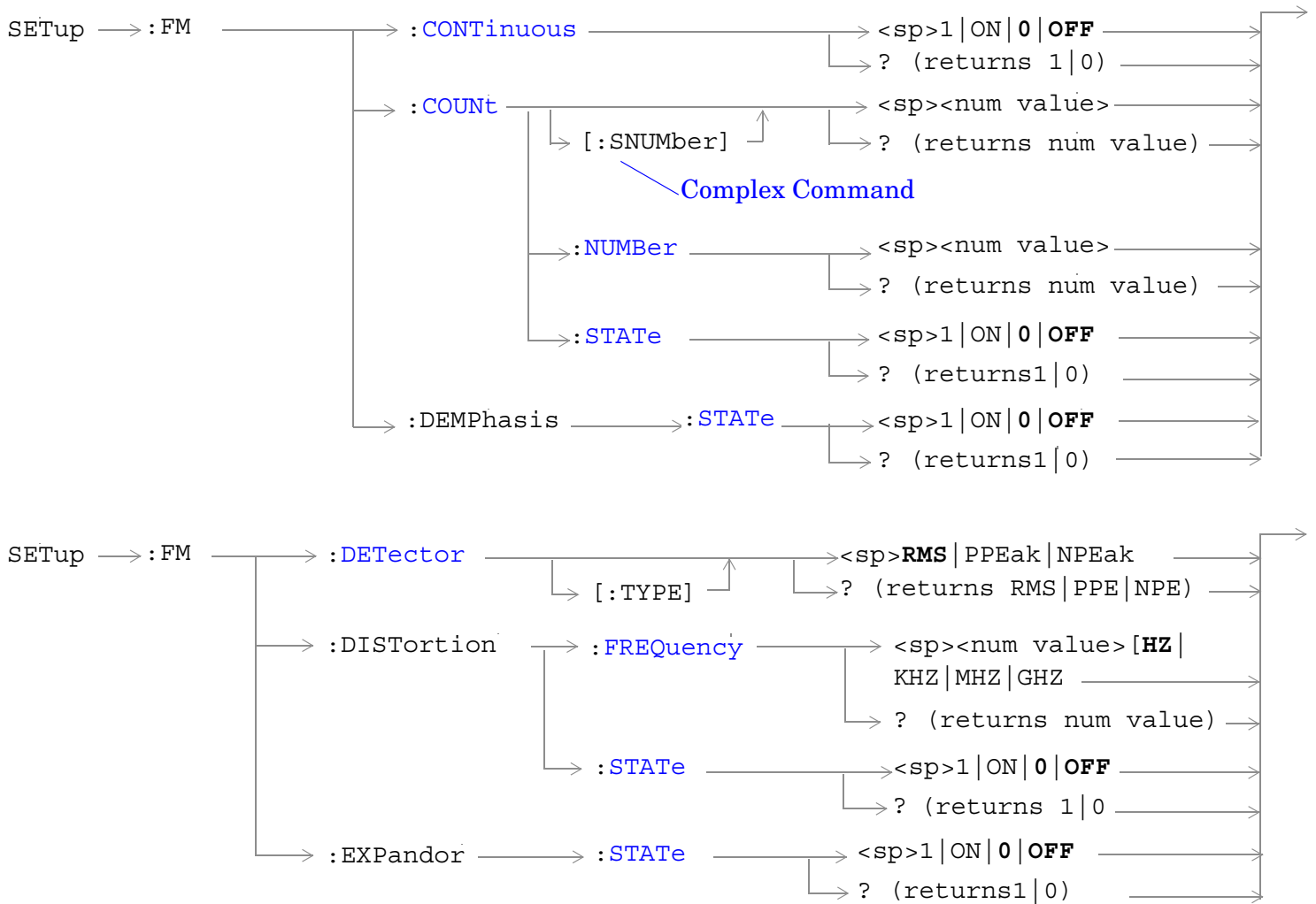
**SETup:DTXPower:TRIGger:DELay**

Function	Sets/queries the trigger delay for the digital transmitter power measurement.
Setting	Range: -20 to 20 ms Resolution: 10 us
Query	Range: -20 to 20 ms
*RST Setting	0 seconds
Programming Example	
OUTPUT 714 ; "SETUP:DTXPOWER:TRIGGER:DELAY 1S"	

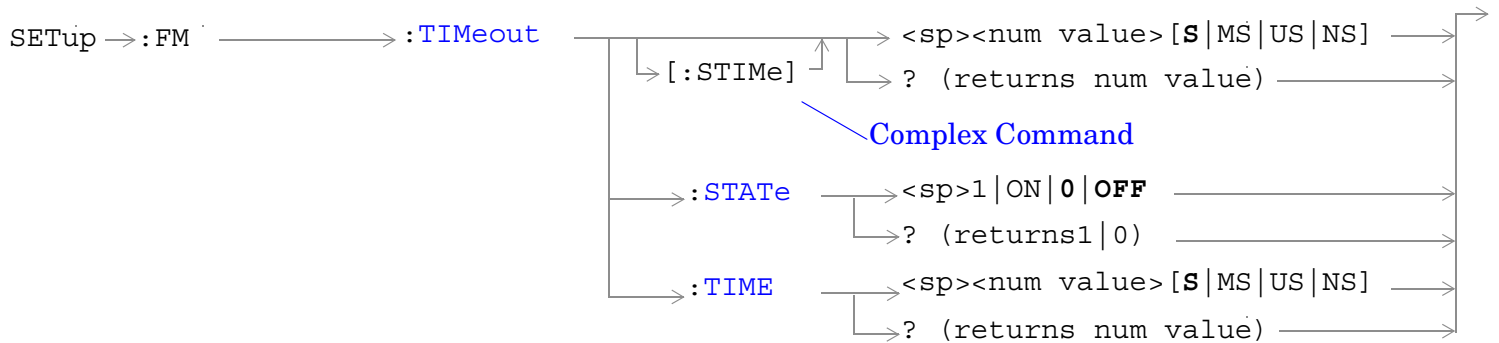
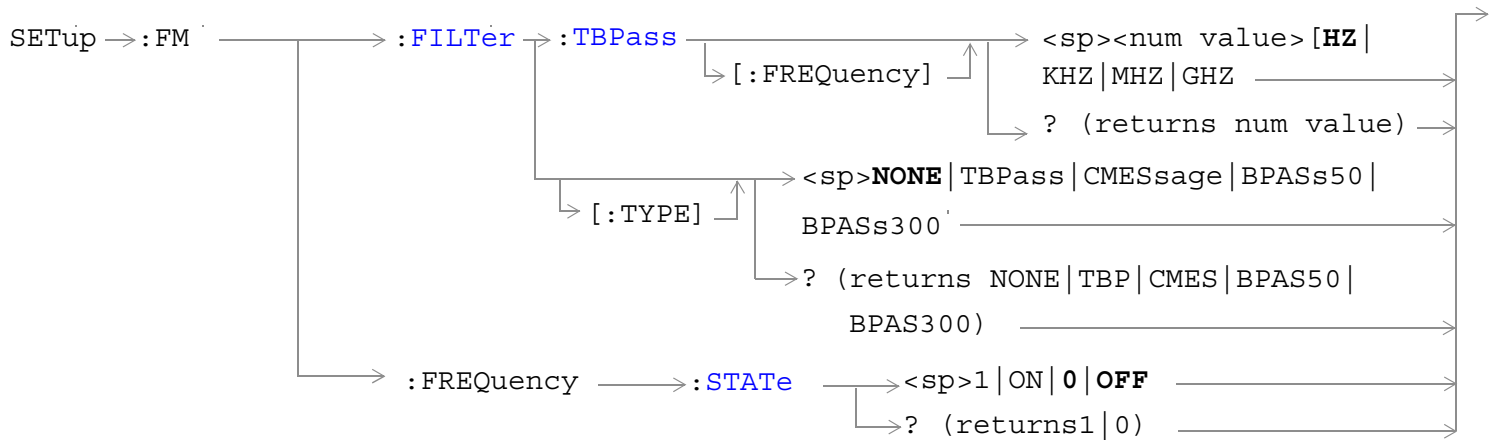
**SETup:DTXPower:TRIGger:SOURce**

Function	Sets/queries the trigger source for the digital transmitter power measurement.
Setting	Range: AUTO   IMMEDIATE   PROTOCOL   RISE   EXTERNAL
Query	Range: AUTO   IMM   PROT   RISE   EXT
*RST Setting	AUTO
Programming Example	
OUTPUT 714 ; "SETUP:DTXPOWER:TRIGGER:SOURCE RISE"	

## SETup:FM



**SETup:FM**



“Diagram Conventions” on page 267

**SETup:FM:CONTInuous**

Function	Sets/queries the trigger arm state for the FM measurement. Determines whether measurement will make one measurement then stop (0   OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (1   ON (continuous)).
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714; "SETUP:FM:CONTINUOUS ON" !Sets measurement to continuous trigger mode.	



**SETup:FM:COUNT[:SNUMBER]**

Function	Sets/queries the number of FM measurements to be made in a multi-measurement setup. This command sets the count, and automatically sets the multi-measurement STATE command to 1 (on).
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10, on
<b>Programming Example</b> OUTPUT 714;"SETUP:FM:COUNT:SNUMBER 5" !Turns on multi-measurements and sets the number of measurements to 5.	

**SETup:FM:COUNT:NUMBER**

Function	Sets/queries the number of FM measurements to be made when multi-measurement state is ON.
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10
<b>Programming Example</b> OUTPUT 714;"SETUP:FM:COUNT:NUMBER 5" !Sets the number of measurements to 5 when the multi-measurement state is set to ON.	

**SETup:FM:COUNT:STATE**

Function	Sets/queries the multi-measurement state of the FM measurement.
Setting	Range: 1 ON 0 OFF
Query	Range: 1 0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714;"SETUP:FM:COUNT:STATE ON" !Turns on multi-measurements.	

**SETup:FM:DEMPHasis:STATE**

Function	Sets/queries whether 750 us de-emphasis is enabled.
Setting	Range: 1 ON 0 OFF
Query	Range: 1 0
*RST Setting	0 (off)
<b>Programming Example</b> 10 OUTPUT 714;"SETUP:FM:DEMPHasis:STATE ON"	

**SETup:FM****SETup:FM:DETECTOR[:TYPE]**

Function	Sets/queries the detector type for FM measurements.
Setting	Range: RMS   PPEak   NPEak
Query	Range: RMS   PPE   NPE
*RST setting	RMS
Programming Example	
10 OUTPUT 714 ; "SETUP:FM:DETECTOR:TYPE PEAK"	

**SETup:FM:DIS TORTION:FREQUENCY**

Function	Sets/queries the FM distortion fundamental frequency.
Setting	Range: 100 to 10000 Hz Resolution: 1 Hz
Query	Range: 100 to 10000 Hz
*RST setting	1004 Hz
Programming Example	
10 OUTPUT 714 ; "SETUP:FM:DIS TORTION:FREQUENCY 300HZ"	

**SETup:FM:DIS TORTION:STATE**

Function	Sets/queris whether the FM distortion measurement is enabled.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST setting	0 (off)
Programming Example	
10 OUTPUT 714 ; "SETUP:FM:SDIS TORTION:STATE ON"	

**SETup:FM:EXPANDOR:STATE**

Function	Sets/queries whether the expander is enabled.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST setting	0 (off)
Programming Example	
10 OUTPUT 714 ; "SETUP:FM:EXPANDOR:STATE ON"	

**SETup:FM:FILTer[:TYPE]**

Function	Sets/queries the filter type for FM measurements.
Setting	Range: NONE   TBPass   CMESsage   BPASs50   BPASs300
Query	Range: NONE   TBP   CMES   BPAS50   BPAS300
*RST setting	NONE
<b>Programming Example</b> 10 OUTPUT 714;"SETUP:FM:FILTER:TYPE BPAS50" !Selects the 50 Hz to 15 kHz bandpass filter.	

**SETup:FM:FILTer:TBPass[:FREQUENCY]**

Function	Sets/queries the center frequency for the 100 Hz tunable bandpass filter (TBPass).
Setting	Range: 300.0 to 15000 Hz Resolution: 0.1 Hz
Query	Range: 300.0 to 15000 Hz
*RST setting	1004 Hz
<b>Programming Example</b> 10 OUTPUT 714;"SETUP:FM:FILTER:TBPASS:FREQUENCY 300HZ"	

**SETup:FM:FREQUENCY:STATE**

Function	Sets/queries whether the FM modulation frequency measurement is enabled.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST setting	0 (off)
<b>Programming Example</b> OUTPUT 714;"SETUP:FM:FREQUENCY:STATE ON"	

**SETup:FM****SETup:FM:TIMEout[:STIME]**

Function	Sets/queries the FM measurement's timeout setting and automatically sets the timeout state to ON.
Setting	Range: .1 to 999 seconds Resolution: .1 second
Query	Range: .1 to 999
*RST Setting	10 seconds, on
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:FM:TIMEOUT:STIME 5S" !Sets timeout state to ON and sets the timeout time to 5 seconds.</pre>	

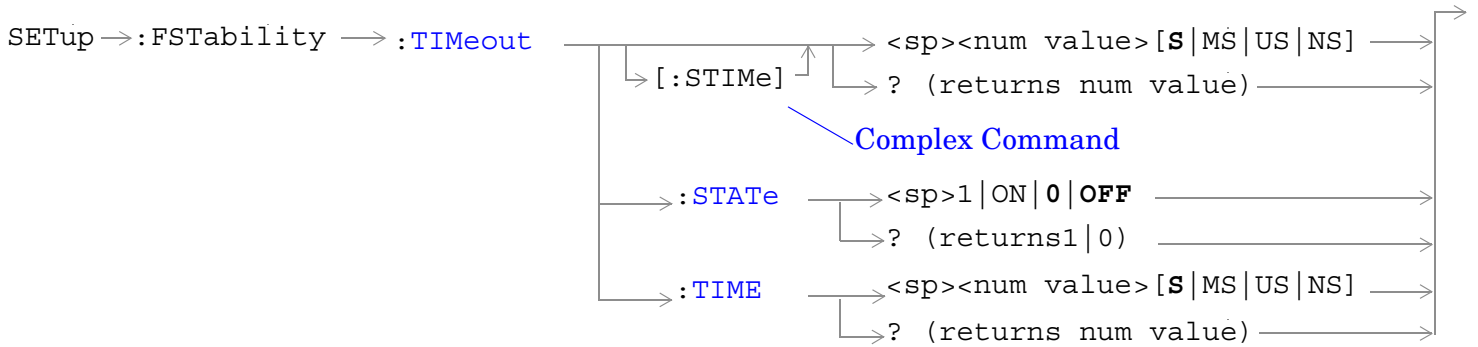
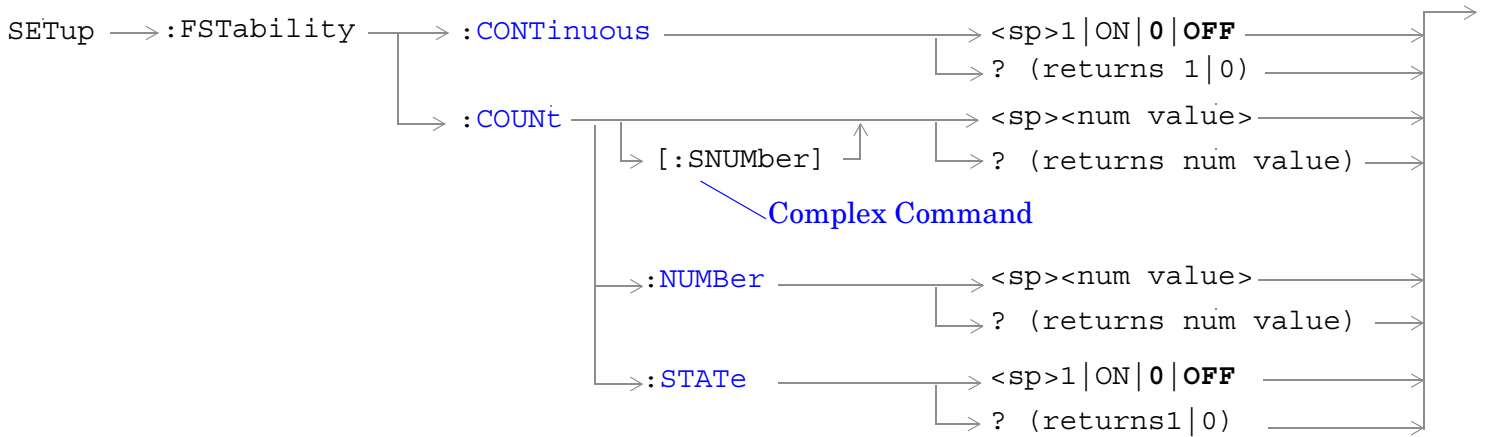
**SETup:FM:TIMEout:STATE**

Function	Sets/queries the FM measurement's timeout state.
Setting	Range: 1 ON 0 OFF
Query	Range: 1 0
*RST Setting	0 (off)
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:FM:TIMEOUT:STATE ON"</pre>	

**SETup:FM:TIMEout:TIME**

Function	Sets/queries the FM measurement's timeout setting to be used when the timeout state is set to ON.
Setting	Range: .1 to 999 seconds Resolution: .1 second
Query	Range: .1 to 999
*RST Setting	10 seconds
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:FM:TIMEOUT:TIME 5S"</pre>	

## SETup:FSTability



“Diagram Conventions” on page 267

**SETup:FSTability****SETup:FSTability:CONTInuous**

Function	Sets/queries the trigger arm state for the frequency stability measurement. Determines whether measurement will make one measurement then stop (0   OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (1   ON (continuous)).
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:FSTABILITY:CONTINUOUS ON" !Sets measurement to continuous trigger mode.</pre>	

**SETup:FSTability:COUNT[:SNUMber]**

Function	Sets/queries the number of frequency stability measurements to be made in a multi-measurement setup. This command sets the count, and automatically sets the multi-measurement STATE command to 1 (on).
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10, on
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:FSTABILITY:COUNT:SNUMBER 5" !Turns on multi-measurements and sets the number of measurements to 5.</pre>	

**SETup:FSTability:COUNT:NUMBer**

Function	Sets/queries the number of frequency stability measurements to be made when multi-measurement state is ON.
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:FSTABILITY:COUNT:NUMBER 5" !Sets the number of measurements to 5 when the multi-measurement state is set to ON.</pre>	

**SETup:FSTability:COUNT:STATE**

Function	Sets/queries the multi-measurement state of the frequency stability measurement.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714; "SETUP:FSTABILITY:COUNT:STATE ON" !Turns on multi-measurements.	

**SETup:FSTability:TIMEout[:STIME]**

Function	Sets/queries the frequency stability measurement's timeout setting and automatically sets the timeout state to ON.
Setting	Range: 0.1 to 999 seconds Resolution: 0.1 second
Query	Range: 0.1 to 999
*RST Setting	10 seconds, on
<b>Programming Example</b> OUTPUT 714; "SETUP:FSTABILITY:TIMEOUT:STIME 5S" !Sets timeout state to ON and sets the timeout time to 5 seconds.	

**SETup:FSTability:TIMEout:STATE**

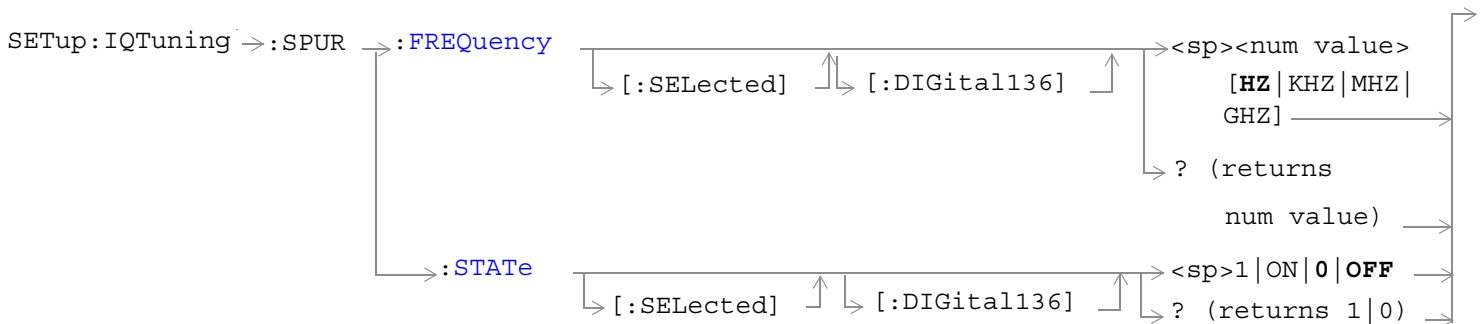
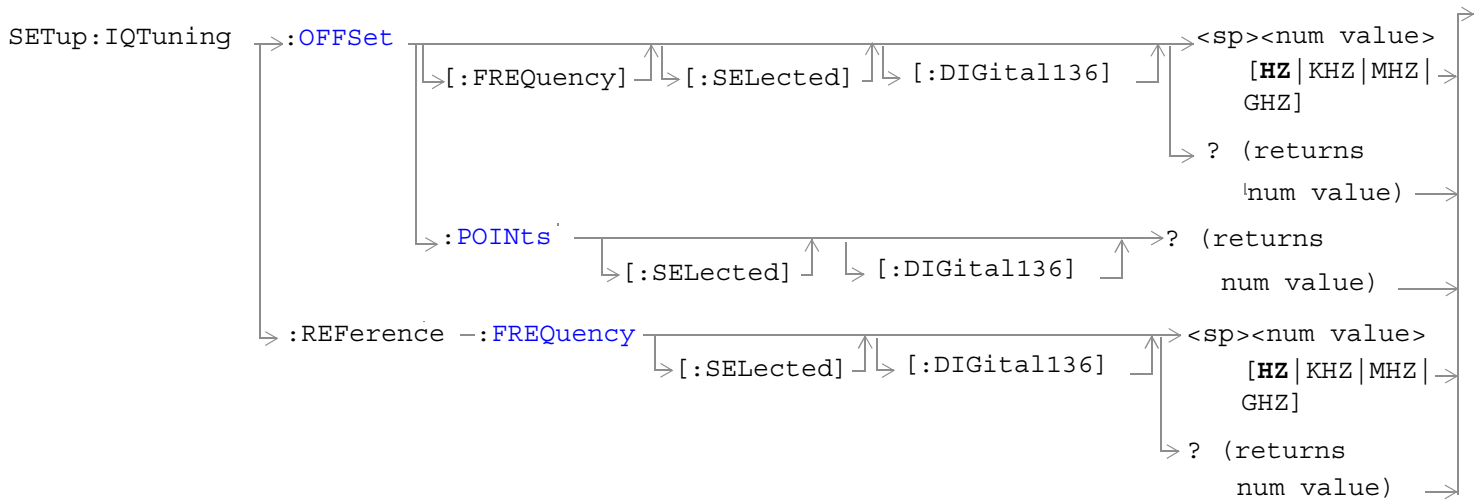
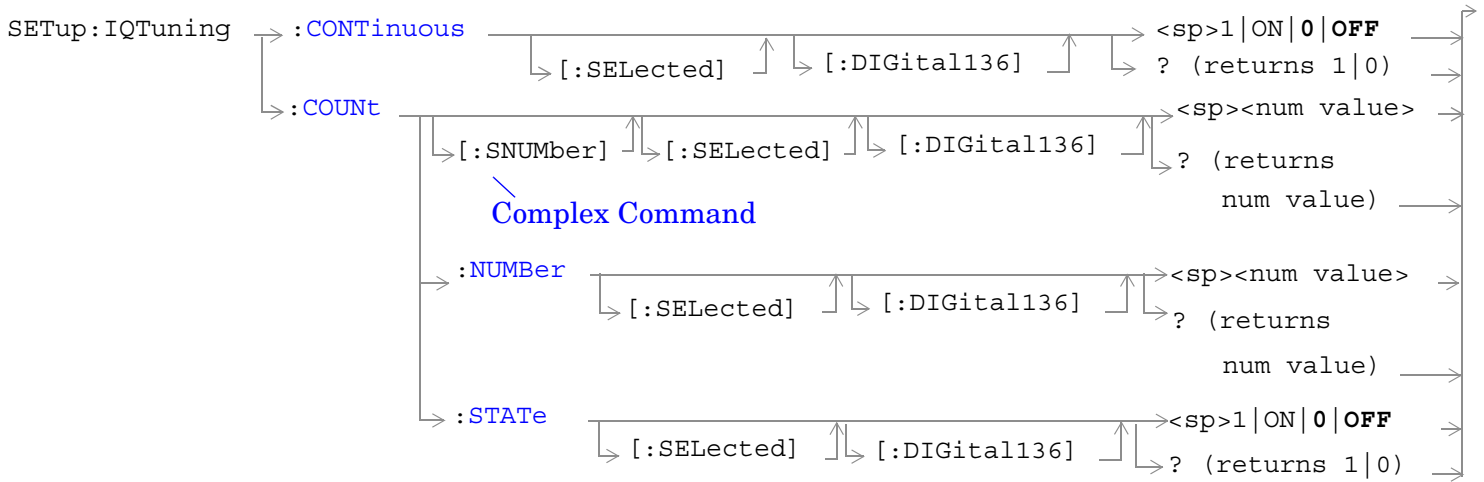
Function	Sets/queries the frequency stability measurement's timeout state.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714; "SETUP:FSTABILITY:TIMEOUT:STATE ON"	

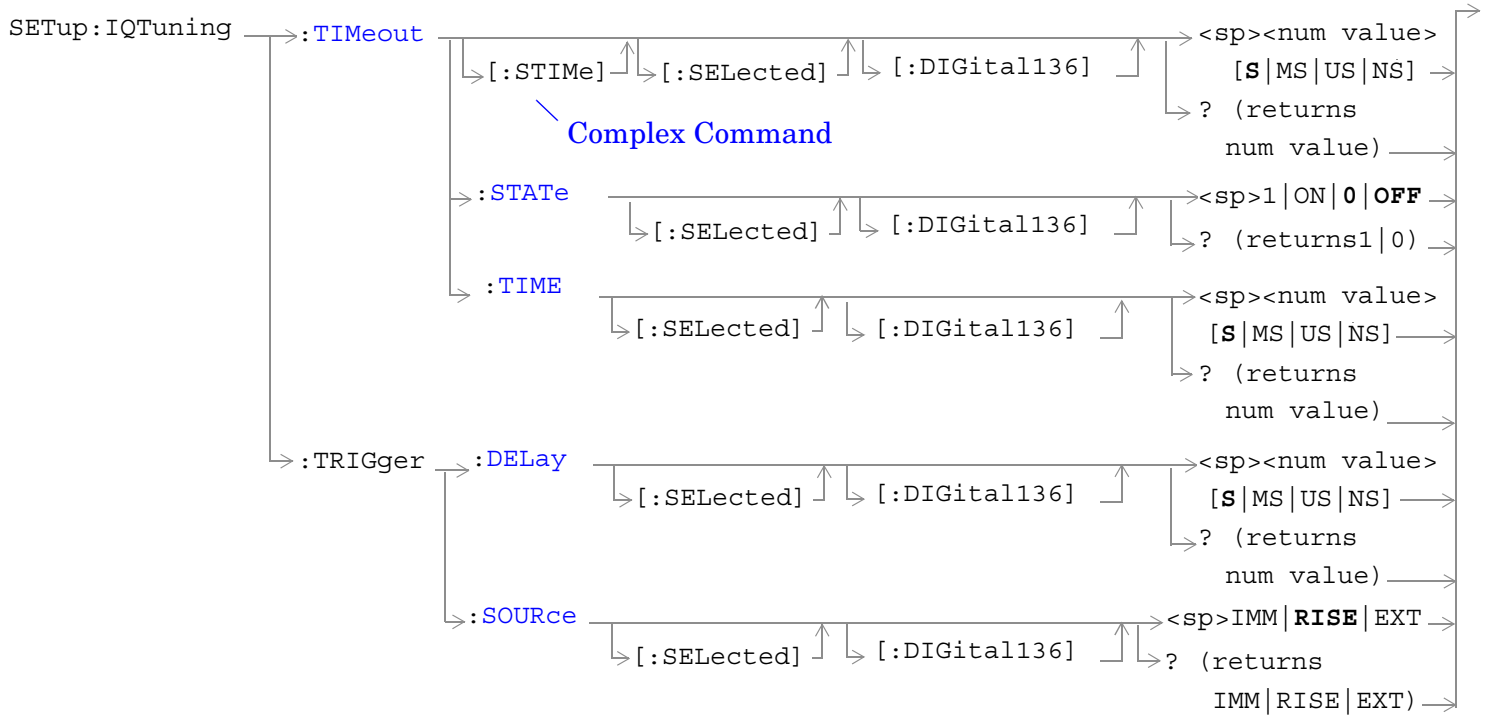
**SETup:FSTability****SETup:FSTability:TIMEout:TIME**

Function	Sets/queries the frequency stability measurement's timeout setting.
Setting	Range: 0.1 to 999 seconds Resolution: 0.1 second
Query	Range: 0.1 to 999 seconds Resolution: 0.1 second
*RST Setting	10 seconds, on
<b>Programming Example</b> OUTPUT 714 ; "SETUP:FSTABILITY:TIMEOUT:TIME 5S"	



## SETup:IQTuning





“Diagram Conventions” on page 267

**SETup:IQTuning:CONTInuous[:SElected][:DIGital136]**

Function	Sets/queries the trigger arm state for the IQ tuning measurement. Determines whether measurement will make one measurement then stop (0   OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (1   ON (continuous)).
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714; "SETUP:IQTUNING:CONTINUOUS ON" !Sets measurement to continuous trigger mode.	

**SETup:IQTuning:COUNT[:SNUMBER][:SElected][:DIGital136]**

Function	Sets/queries the number of IQ tuning measurements to be made in a multi-measurement setup. This command sets the count, and automatically sets the multi-measurement STATE command to 1 (on).
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10, on
<b>Programming Example</b> OUTPUT 714; "SETUP:IQTUNING:COUNT:SNUMBER 5" !Turns on multi-measurements and sets the number of measurements to 5.	

**SETup:IQTuning:COUNT:NUMBER[:SElected][:DIGital136]**

Function	Sets/queries the number of IQ tuning measurements to be made when multi-measurement state is ON.
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10
<b>Programming Example</b> OUTPUT 714; "SETUP:IQTUNING:COUNT:NUMBER 5" !Sets the number of measurements to 5 when the multi-measurement state is set to ON.	

**SETup:IQTuning****SETup:IQTuning:COUNT:STATE[:SElected][:DIGital136]**

Function	Sets/queries the multi-measurement state of the IQ tuning measurement.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714; "SETUP:IQTUNING:COUNT:STATE ON" !Turns on multi-measurements.	

**SETup:IQTuning:OFFSet[:FREQuency][:SElected][:DIGital136]**

Function	Sets/queries the offset frequencies (frequency list) at which the IQ tuning offset measurement is made. Values are set/returned as a comma-separated list.
Setting	Range: -16000 to +16000 Hz Resolution: 0.1 Hz Number of Offsets: 4 (maximum)
Query	Range: The returned comma-separated list contains the current values for each offset that is not turned off. No values are returned for offsets that are off. For example, if offsets 1 and 3 are turned off and offsets 2 and 4 are turned on, values are only returned for offsets 2 and 4.
*RST Setting	Offset 1: 0 Hz (ON) Offset 2 : -3037.5 Hz (OFF) Offset 3: +9112.5 Hz (OFF) Offset 4: -9112.5 Hz (OFF)
<b>Programming Example</b> OUTPUT 714; "SETUP:IQTUNING:OFFSET 0, -3076, 9113, -9113" !Sets offset 1 to 0 Hz, offset 2 to -3.076 kHz, offset 3 to 9.113 kHz, and offset 4 to -9.113 kHz	

**SETup:IQTuning:OFFSet:POINts[:SElected][:DIGital136]?**

Function	Queries the number of frequency offsets enabled in the digital IQ tuning offset frequency list.
Query	Range: 0 to 4
<b>Programming Example</b> OUTPUT 714; "SETUP:IQTUNING:OFFSET:POINTS? !Queries the number of offsets enabled in the IQ tuning offset frequency list.	

**SETup:IQTuning:REFerence:FREQuency[:SElected][:DIGital136]**

Function	Sets/queries the reference offset frequency to use as the reference level for the four IQ tuning offset measurements and the spur measurement.
Setting	Range: -16000 to +16000 Hz Resolution: 0.1 Hz
Query	Range: -16000 to +16000 Hz
*RST Setting	+3037.5 Hz
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:IQTUNING:REFERENCE:FREQUENCY 5000" !Sets the reference offset frequency to 5 kHz</pre>	

**SETup:IQTuning:SPUR:FREQuency[:SElected][:DIGital136]**

Function	Sets/queries the frequency offset from the carrier frequency at which the additional spur measurement will be made when the measurement's state is set to ON.
Setting	Range: -15.0 to -1.0 MHz, +1.0 to +15.0 MHz
Query	Range: -15.0 to -1.0 MHz, +1.0 to +15.0 MHz
*RST Setting	10 MHz
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:IQTUNING:SPUR:FREQUENCY 5MHz" !Sets the reference offset frequency to 5 MHz</pre>	

**SETup:IQTuning:SPUR:STATE[:SElected][:DIGital136]**

Function	Sets/queries whether the IQ tuning spur measurement is on or off.
Setting	Range: 1 ON 0 OFF
Query	Range: 1 0
*RST Setting	0 (off)
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:IQTUNING:SPUR:STATE ON" !Turns the spur measurement on.</pre>	

**SETup:IQTuning****SETup:IQTuning:TIMEout[:STIME][:SElected][:DIGital136]**

Function	Sets/queries the IQ tuning measurement's timeout setting and automatically sets the timeout state to ON.
Setting	Range: 0.1 to 999.9 seconds Resolution: 0.1 second
Query	Range: 0.1 to 999.9
*RST Setting	10 seconds, off
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:IQTUNING:TIMEOUT:STIME 5S" !Sets timeout state to ON and sets the timeout time to 5 seconds.</pre>	

**SETup:IQTuning:TIMEout:STATE[:SElected][:DIGital136]**

Function	Sets/queries the IQ tuning measurement's timeout state.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:IQTUNING:TIMEOUT:STATE ON"</pre>	

**SETup:IQTuning:TIMEout:TIME[:SElected][:DIGital136]**

Function	Sets/queries the IQ tuning measurement's timeout setting to be used when the timeout state is set to ON.
Setting	Range: 0.1 to 999.9 seconds Resolution: 0.1 second
Query	Range: 0.1 to 999.9
*RST Setting	10 seconds
<b>Programming Example</b> <pre>OUTPUT 714;"SETUP:IQTUNING:TIMEOUT:TIME 5S"</pre>	

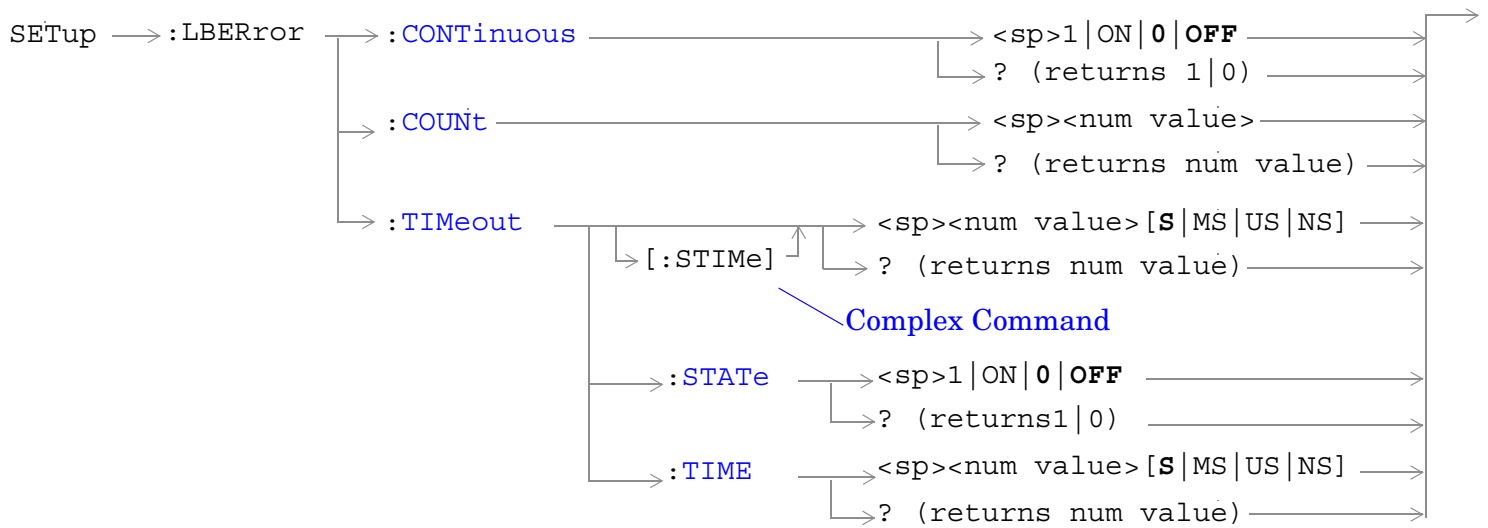
**SETup:IQTuning:TRIGger:DELAy[:SElected][:DIGital136]**

Function	Sets/queries the trigger delay for the IQ tuning measurement.
Setting	Range: -20 to 20 ms Resolution: 0.01 ms
Query	Range: -20 to 20 ms
*RST Setting	0 seconds
<b>Programming Example</b> OUTPUT 714 ; "SETUP:IQTUNING:TRIGGER:DELAY 1S"	

**SETup:IQTuning:TRIGger:SOURce[:SElected][:DIGital136]**

Function	Sets/queries the trigger source for the IQ tuning measurement.
Setting	Range: IMMEDIATE   RISE   EXTERNAL
Query	Range: IMM   RISE   EXT
*RST Setting	RISE
<b>Programming Example</b> OUTPUT 714 ; "SETUP:IQTUNING:TRIGGER:SOURCE RISE"	

## SETup:LBError



“Diagram Conventions” on page 267



**SETup:LBError:CONTInuous**

Function	Sets/queries the trigger arm state for the loopback bit error ratio measurement. Determines whether measurement will make one measurement then stop (0   OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (1   ON (continuous)).
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714; "SETUP:LBERROR:CONTINUOUS ON" !Sets measurement to continuous trigger mode.	

**SETup:LBError:COUNT**

Function	Sets/queries the number of bits to test in a loopback bit error ratio measurement.
Setting	Range: 1000 to 999000
Query	Range: 1000 to 999000
*RST Setting	10000
<b>Programming Example</b> OUTPUT 714; "SETUP:LBERROR:COUNT 5000" !Sets the number of bits to test to 5000.	

**SETup:LBError:TIMEout[:STIME]**

Function	Sets/queries the loopback bit error ratio measurement's timeout setting and automatically sets the timeout state to ON.
Setting	Range: 0.1 to 999 seconds Resolution: 0.1 second
Query	Range: 0.1 to 999
*RST Setting	10 seconds, on
<b>Programming Example</b> OUTPUT 714; "SETUP:LBERROR:TIMEOUT:STIME 5S" !Sets timeout state to ON and sets the timeout time to 5 seconds.	

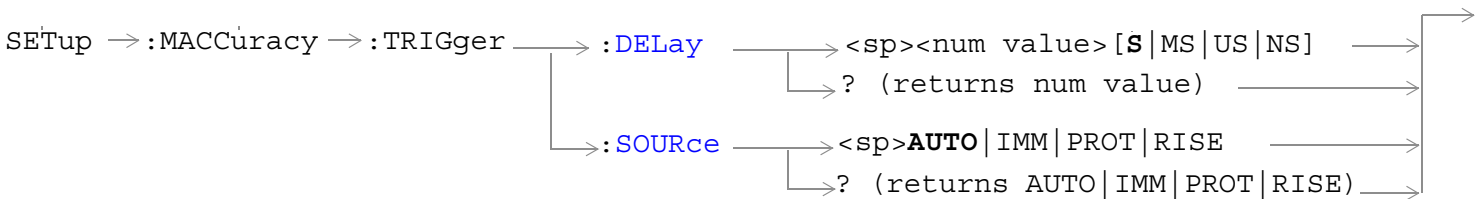
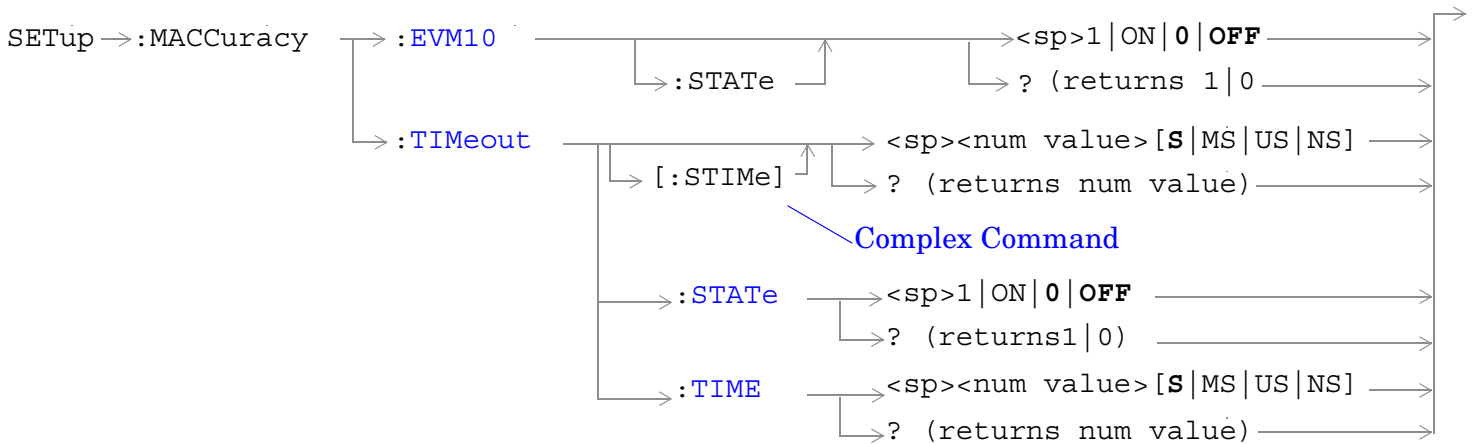
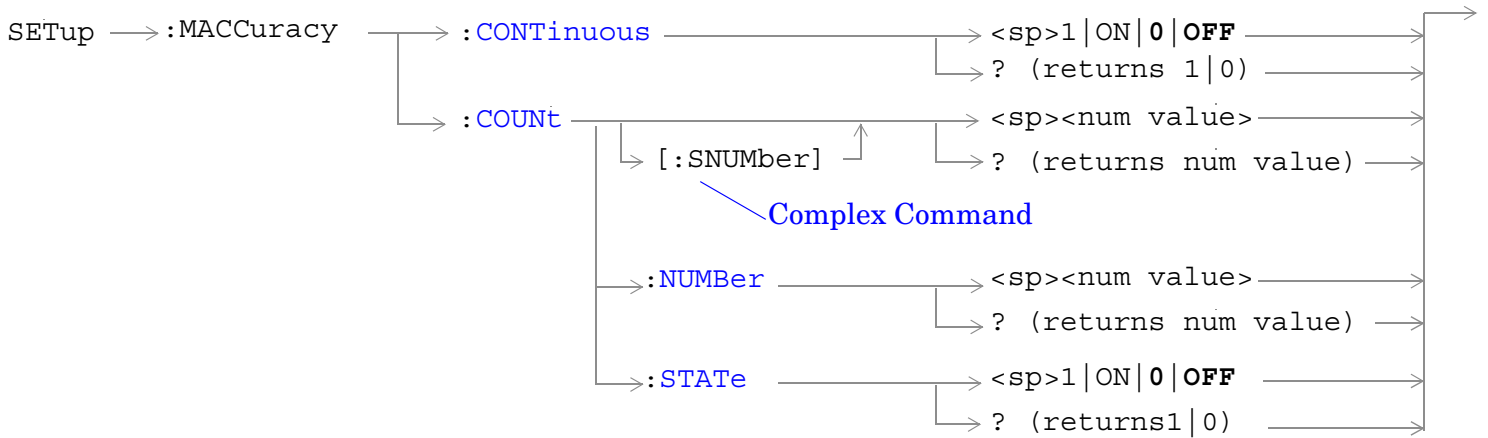
**SETup:LBError****SETup:LBError:TIMEout:STATE**

Function	Sets/queries the loopback bit error ratio measurement's timeout state.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
<b>Programming Example</b> OUTPUT 714 ; "SETUP:LBERROR:TIMEOUT:STATE ON"	

**SETup:LBError:TIMEout:TIME**

Function	Sets/queries the loopback bit error ratio measurement's timeout setting to be used when the timeout state is set to ON.
Setting	Range: 0.1 to 999 seconds Resolution: 0.1 second
Query	Range: 0.1 to 999
*RST Setting	10 seconds
<b>Programming Example</b> OUTPUT 714 ; "SETUP:LBERROR:TIMEOUT:TIME 5S"	

## SETup:MACCuracy



“Diagram Conventions” on page 267

**SETup:MACCuracy****SETup:MACCuracy:CONTInuous**

Function	Sets/queries the trigger arm state for the modulation accuracy measurement. Determines whether measurement will make one measurement then stop (0   OFF (single)), or automatically rearm upon completion of one measurement and repeat the process (1   ON (continuous)).
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714; "SETUP:MACCURITY:CONTINUOUS ON" !Sets measurement to continuous trigger mode.	

**SETup:MACCuracy:COUNT[:SNUMBER]**

Function	Sets/queries the number of modulation accuracy measurements to be made in a multi-measurement setup. This command sets the count, and automatically sets the multi-measurement STATE command to 1 (on).
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10, on
Programming Example	
OUTPUT 714; "SETUP:MACCURITY:COUNT:SNUMBER 5" !Turns on multi-measurements and sets the number of measurements to 5.	

**SETup:MACCuracy:COUNT:NUMBER**

Function	Sets/queries the number of modulation accuracy measurements to be made when multi-measurement state is ON.
Setting	Range: 1 to 999
Query	Range: 1 to 999
*RST Setting	10
Programming Example	
OUTPUT 714; "SETUP:MACCURITY:COUNT:NUMBER 5" !Sets the number of measurements to 5 when the multi-measurement state is set to ON.	

**SETup:MACCuracy:COUNT:STATE**

Function	Sets/queries the multi-measurement state of the modulation accuracy measurement.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714; "SETUP:MACCURITY:COUNT:STATE ON" !Turns on multi-measurements.	

**SETup:MACCuracy:EVM10[:STATE]**

Function	Sets/queries whether the error vector magnitude measurement (10 burst average) is enabled.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714; "SETUP:MACCURITY:EVM10:STATE ON" !Turns on the EVM10 measurement.	

**SETup:MACCuracy:TIMEout[:STIME]**

Function	Sets/queries the modulation accuracy measurement's timeout setting and automatically sets the timeout state to ON.
Setting	Range: .1 to 999 seconds Resolution: .1 second
Query	Range: .1 to 999
*RST Setting	10 seconds, on
Programming Example	
OUTPUT 714; "SETUP:MACCURITY:TIMEOUT:STIME 5S" !Sets timeout state to ON and sets the timeout time to 5 seconds.	

**SETup:MACCuracy:TIMEout:STATE**

Function	Sets/queries the modulation accuracy measurement's timeout state.
Setting	Range: 1   ON   0   OFF
Query	Range: 1   0
*RST Setting	0 (off)
Programming Example	
OUTPUT 714; "SETUP:MACCURITY:TIMEOUT:STATE ON"	

**SETup:MACCuracy****SETup:MACCuracy:TIMEout:TIME**

Function	Sets/queries the modulation accuracy measurement's timeout setting to be used when the timeout state is set to ON.
Setting	Range: .1 to 999 seconds Resolution: .1 second
Query	Range: .1 to 999
*RST Setting	10 seconds
Programming Example	
OUTPUT 714 ; "SETUP:MACCURITY:TIMEOUT:TIME 5S"	

**SETup:MACCuracy:TRIGger:DELay**

Function	Sets/queries the trigger delay for the modulation accuracy measurement.
Setting	Range: -20 to 20 ms Resolution: 10 us
Query	Range: -20 to 20 ms
*RST Setting	0 seconds
Programming Example	
OUTPUT 714 ; "SETUP:MACCURITY:TRIGGER:DELAY 1S"	

**SETup:MACCuracy:TRIGger:SOURce**

Function	Sets/queries the trigger source for the modulation accuracy measurement.
Setting	Range: AUTO   IMMEDIATE   PROTOCOL   RISE   EXTERNAL
Query	Range: AUTO   IMM   PROT   RISE   EXT
*RST Setting	AUTO
Programming Example	
OUTPUT 714 ; "SETUP:MACCURITY:TRIGGER:SOURCE RISE"	

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# STATus Subsystem

## Description

The STATus subsystem is used to communicate current test set status information to the controlling application program.

## Syntax Diagrams and Command Descriptions

[“STATus:OPERation” on page 472](#)

[“STATus:PRESet” on page 489](#)

[“STATus:QUEStionable” on page 490](#)

[“Standard Event Status Register” on page 507](#)

[“Status Byte Register” on page 506](#)

## Status Register Bit Definitions

[“Status Byte Register Bit Assignments” on page 506](#)

[“Standard Event Status Register Bit Assignment” on page 508](#)

[“STATus:QUEStionable Condition Register Bit Assignment” on page 494](#)

[“STATus:QUEStionable:CALL Condition Register Bit Assignment” on page 495](#)

[“STATus:QUEStionable:ERRors Condition Register Bit Assignment” on page 496](#)

[“STATus:QUEStionable:HARDware Condition Register Bit Assignment” on page 505](#)

[“STATus:OPERation Condition Register Bit Assignment” on page 476](#)

[“STATus:OPERation:CALL Condition Register Bit Assignment” on page 477](#)

[“STATus:OPERation:NMRReady Condition Register Bit Assignment” on page 481](#)

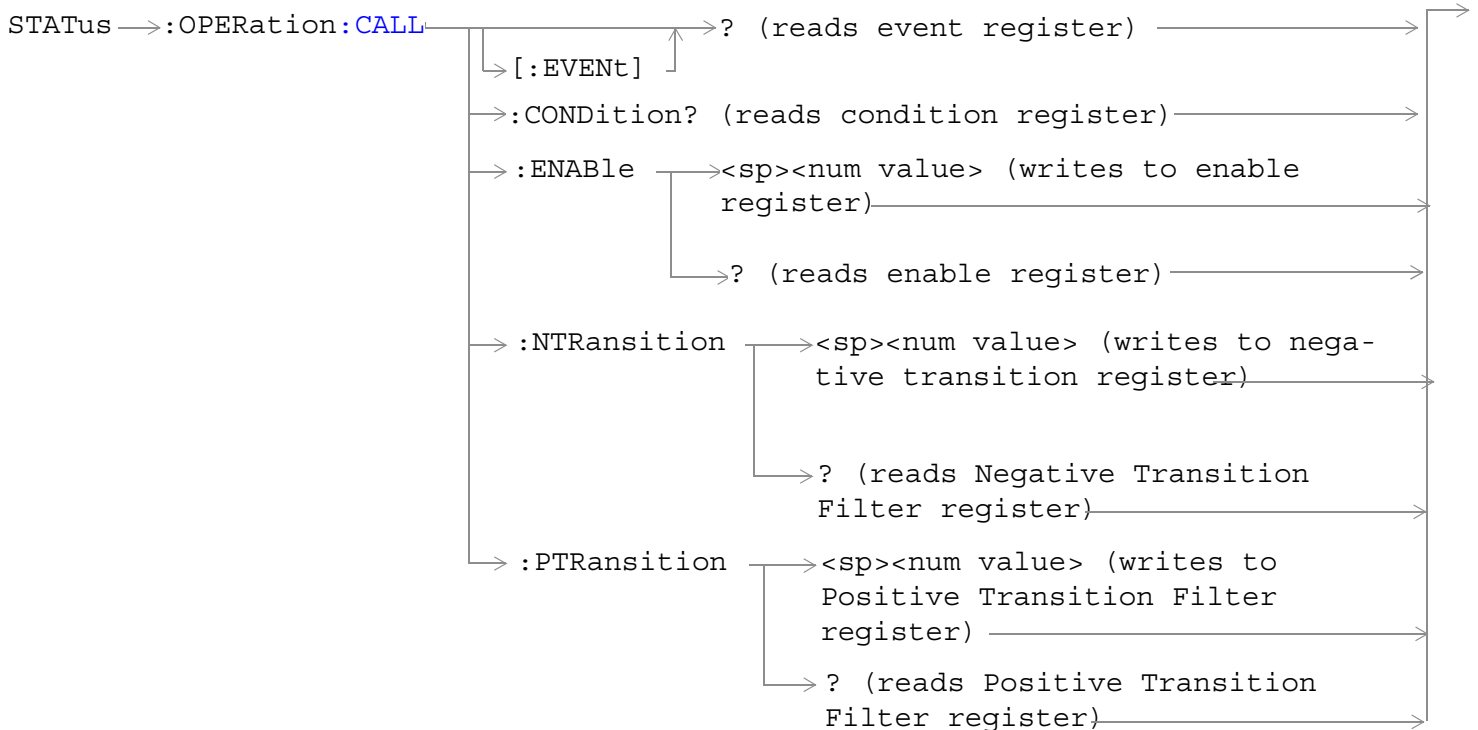
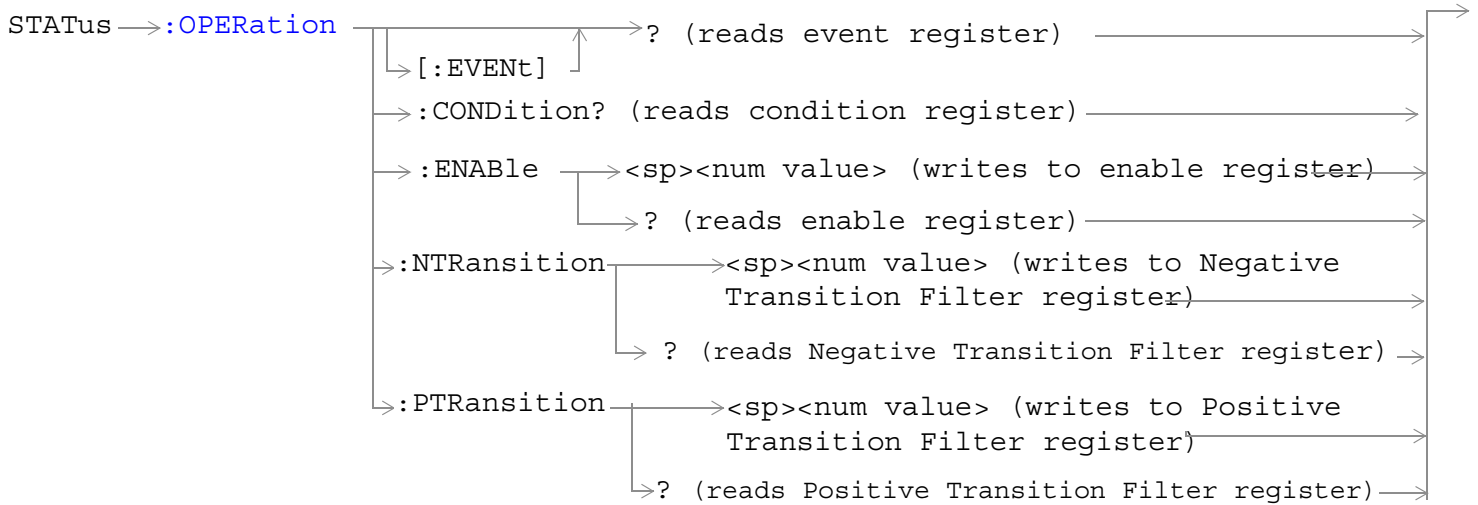
## Related Topics

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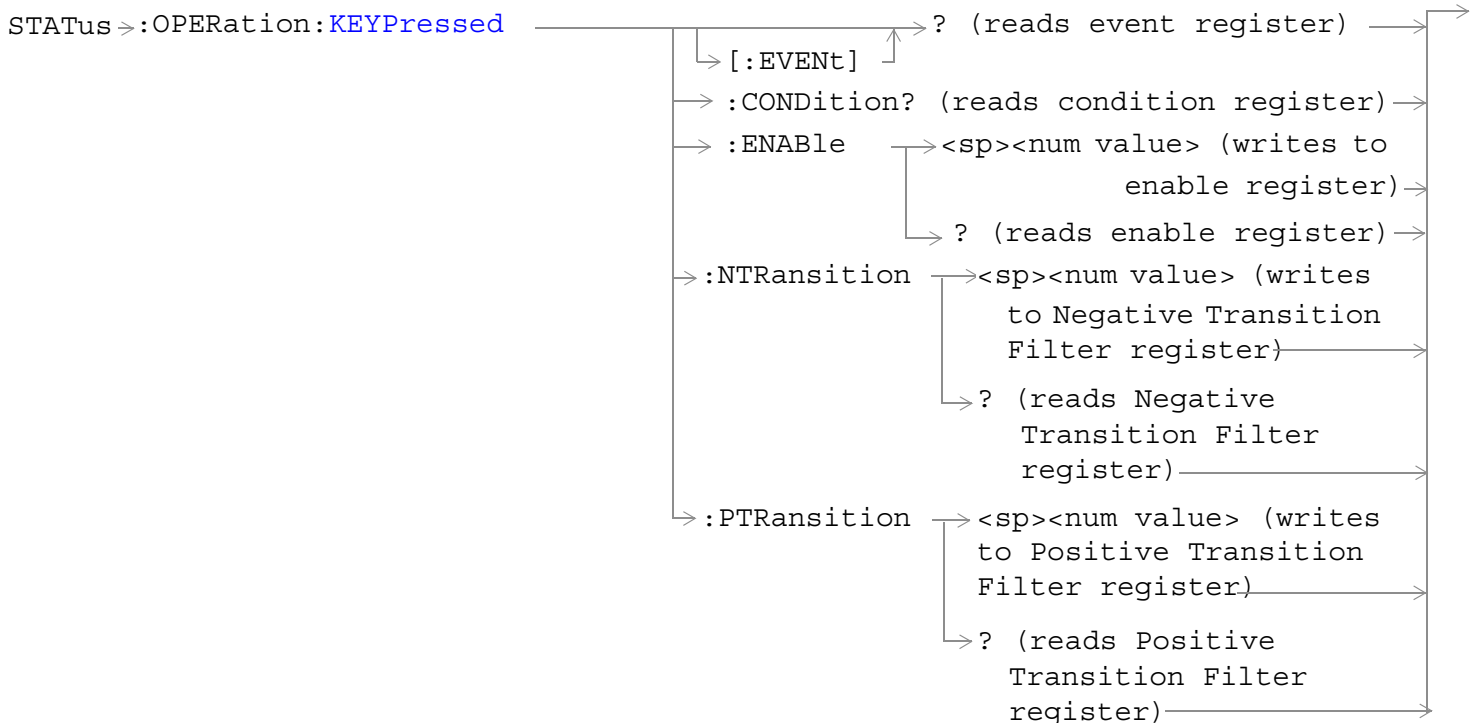
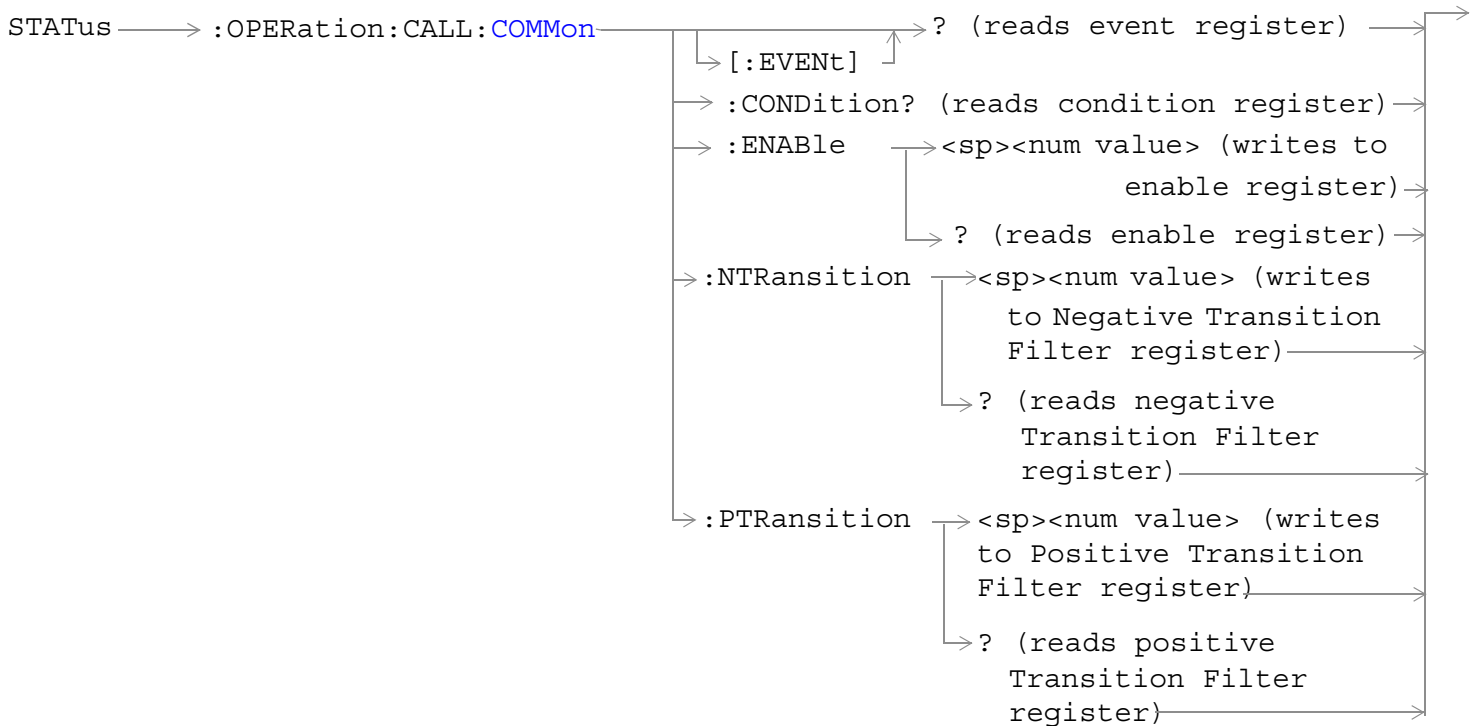
[“Overview of STATus Reporting Structure” on page 135](#)

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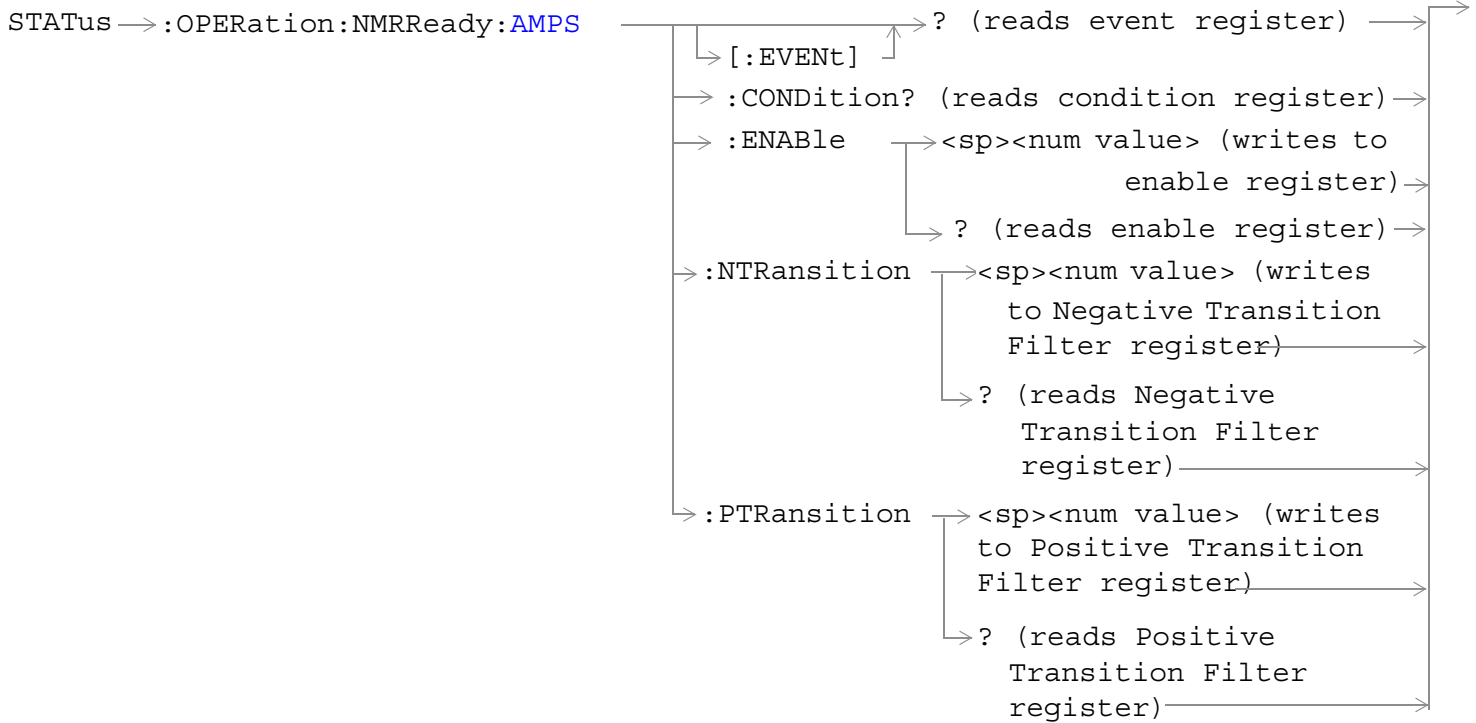
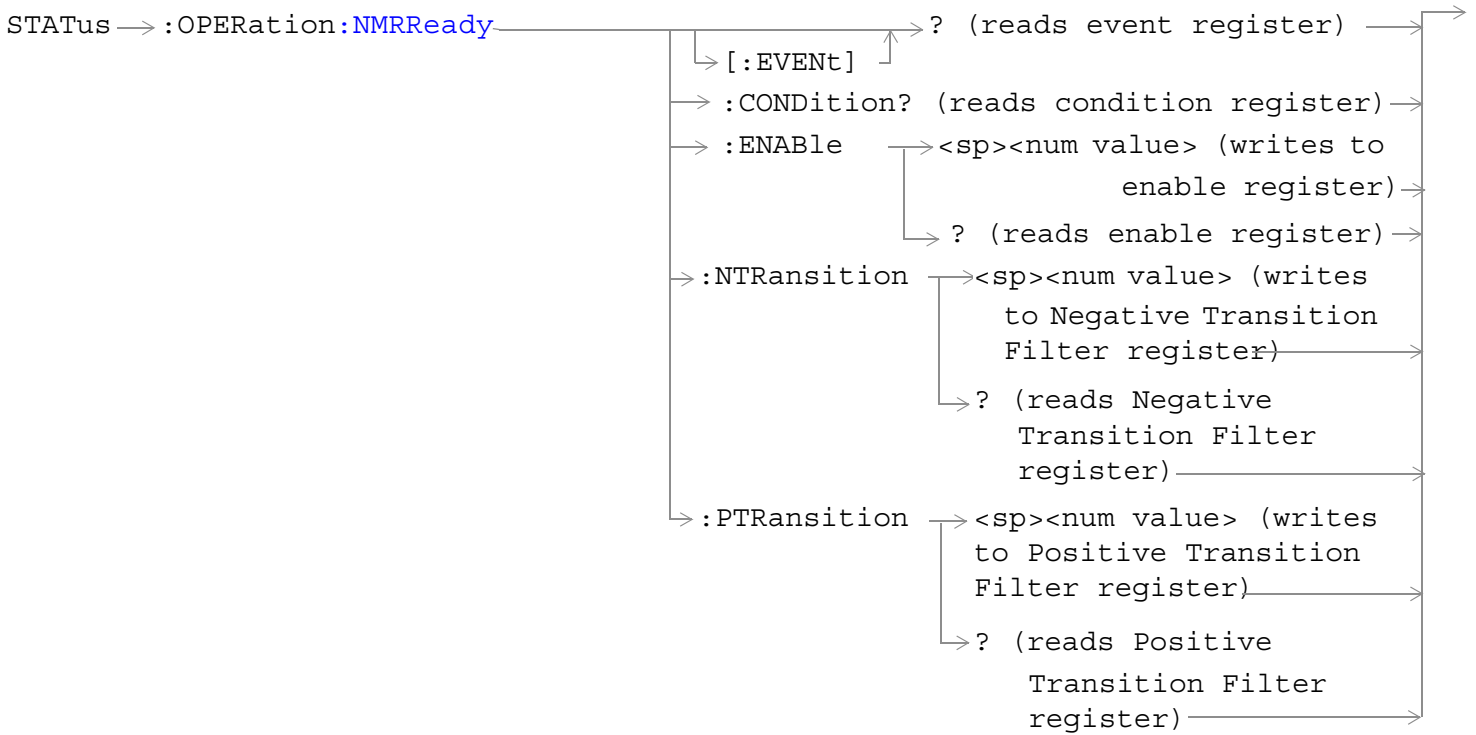
## STATus:OPERation

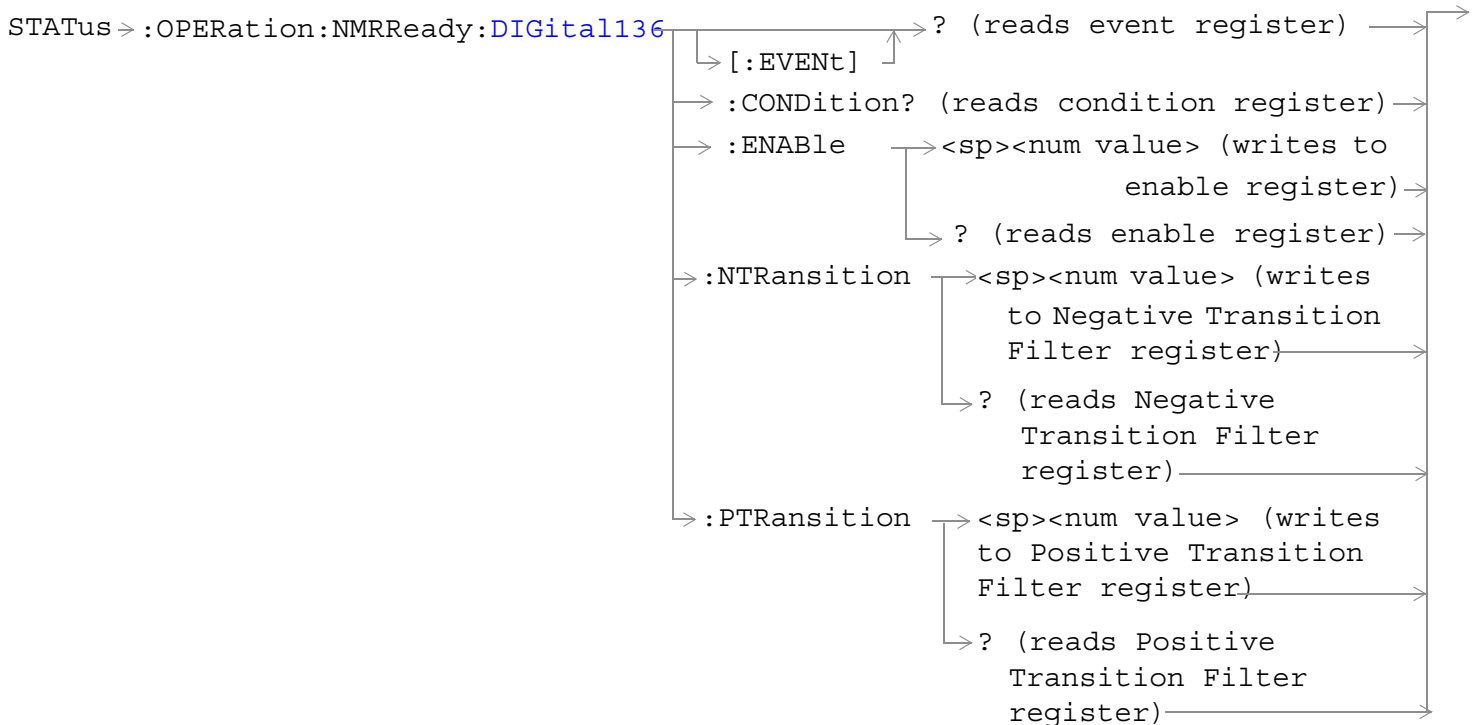
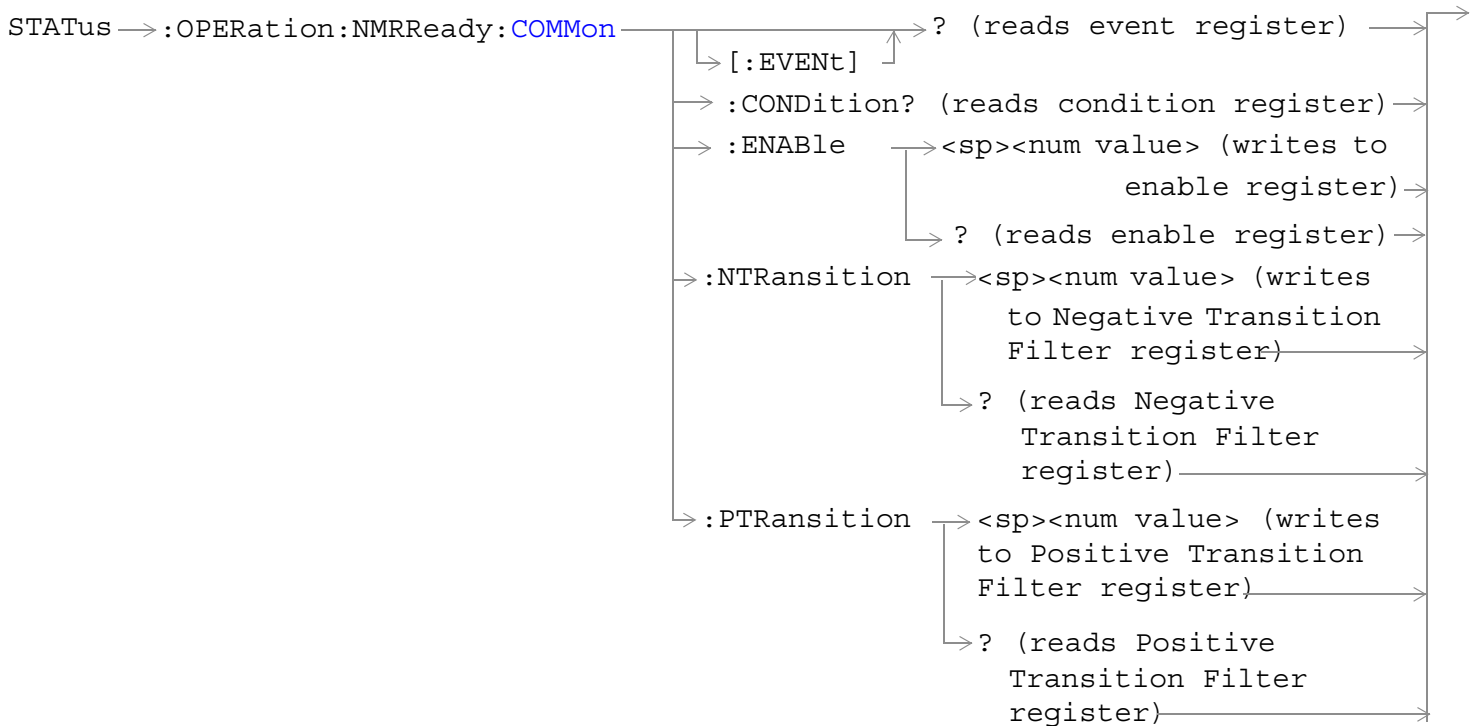






STATUS:OPERation





“Diagram Conventions” on page 267

**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 message bit for the STATus:OPERation:CALL register.
9	512	NMRReady (New Measurement Result Ready) Summary	This bit is the summary message bit for the STATus: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 the Operation Enable
                                !Register for bit 1024.
OUTPUT 714;"STATUS:OPERATION:NTR 1024" !Sets the Operation Negative Transition
                                !Register for bit 1024.
OUTPUT 714;"STATUS:OPERATION:PTR 512" !Sets the Operation Event
                                !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	TA136 Summary bit	This bit is the summary message bit for the STATus:OPERation:CALL:TA136 register.
4	16	DIGital136 Summary bit	This bit is the summary message bit for the STATus:OPERation:CALL:DIGITAL136 register.
3	8	AMPS Summary bit	This bit is the summary message bit for the STATus:OPERation:CALL:AMPS register.
2	4	GSM Summary bit	This bit is the summary message bit for the STATus:OPERation:CALL:GSM register.
1	2	COMMon Summary bit	This bit is the summary message bit for the STATus:OPERation:CALL:COMMon register.
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:COMMON Condition Register Bit Assignment**

The STATus:OPERation:CALL:AMPS:COMMON 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	Registering (BS initiated)	This bit is set to a 1 when the Base Station initiates registration.
8	256	Reserved for future use.	This bit will always be 0.
7	128	BS Originating	This bit will be a 1 when: <ul style="list-style-type: none"> <li>Active Cell mode - the call processing state leaves the idle state</li> <li>Test mode - the test set has noted a base station origination.</li> </ul>
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	Call Control Status Registering	This bit will be a 1 when the test set is in the call control status registering state.
3	8	Call Control Status is "Alerting"	This bit will be a 1 when the test set is in the call alerting state (ringing).
2	4	Call Control Status is "Connected"	This bit will be a 1 when the test set is in the call connected state.
1	2	Call Control Status is "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.

**STATus:OPERation****Program Examples - STATus:OPERation:CALL:COMMOn**

```

OUTPUT 714;"STATUS:OPERATION:CALL:COMMON:EVENT?" !Queries the Operation Call Common Event
            !Register.
OUTPUT 714;"STATUS:OPERATION:CALL:COMMON:CONDITION?" !Queries the Operation Call Common
            !Condition Register.
OUTPUT 714;"STATUS:OPERATION:CALL:COMMON:ENABLE 8" !Sets the Operation Call Common Enable
            !Register for bit 4.
OUTPUT 714;"STATUS:OPERATION:CALL:COMMON:NTR 8" !Sets the Negative Transition
            !Register for bit 4.
OUTPUT 714;"STATUS:OPERATION:CALL:AMPS:PTR 256" !Sets the Positive Transition
            !Register for bit 256.

```

**STATus:OPERation:KEYPressed Register Bit Assignments**

The STATus:OPERation:KEYpressed register bits indicate when a softkey on the test set's front panel has been pressed while the test set is in remote operating mode.

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	F12 softkey	
10	1024	F11 softkey	
9	512	F10 softkey	
8	256	F9 softkey	
7	128	F8 softkey	
6	64	F7 softkey	
5	32	F6 softkey	
4	16	F5 softkey	
3	8	F4 softkey	
2	4	F3 softkey	
1	2	F2 softkey	
0	1	F1 softkey	



**Program Examples - STATus:OPERation:KEYPressed**

OUTPUT 714;"STATUS:OPERATION:KEYPRESSED:EVENT?" !Queries the Keypressed Event Register.

**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	TA136 Summary bit	This bit is the summary message bit for the STATus:OPERation:NMRReady:TA136 register.
4	16	DIGITAL136 Summary bit	This bit is the summary message bit for the STATus:OPERation:NMRReady:DIGITAL136 register.
3	8	AMPS Summary bit	This bit is the summary message bit for the STATus:OPERation:NMRReady:AMPS register.
2	4	GSM Summary bit	STATus:This bit is the summary message bit for the OPERATION:NMRReady:GSM register.
1	2	COMMON Summary bit	This bit is the summary message bit for the STATus:OPERation:NMRReady:COMMON register.
0	1	Extension Bit	This bit will always be 0.

**STATus:OPERation**

**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 Register
!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:AMPS Condition Register Bit Assignment**

The STATus:OPERation:NMRReady:AMPS 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	Frequency Modulation New Measurement Result Ready	This bit will be a 1 if the measurement has been completed and has produced new results.  This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See <a href="#">"Measurement States"</a> .
2	4	Frequency Stability New Measurement Result Ready	This bit will be a 1 if the measurement has been completed and has produced new results.  This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See <a href="#">"Measurement States"</a> .
1	2	Analog Transmit Power New Measurement Result Ready	This bit will be a 1 if the measurement has been completed and has produced new results.  This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See <a href="#">"Measurement States"</a> .
0	1	Extension Bit	This bit will always be 0.

**Program Examples - STATus:OPERation:NMRReady:AMPS**

```
OUTPUT 714;"STATUS:OPERATION:NMRREADY:AMPS:EVENT?" !Queries the New Measurement
!Results Ready AMPS Event Register.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:AMPS:CONDITION?" !Queries the New Measurement
!Results Ready AMPS
!Condition Register.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:AMPS:ENABLE 8" !Sets New Measurement Results
!Ready AMPS Enable Register
!for bit 8.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:AMPS:NTR 2" !Sets the New Measurement Results
!Ready AMPS Negative Transition
!Register for bit 4.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:AMPS:PTR 4" !Sets the New Measurement
!Results Ready AMPS Positive
!Transition Register
!for bit 4
```

**STATus:OPERation:NMRReady:COMMon Condition Register Bit Assignment**

The STATus:OPERation:NMRReady:COMMon 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	Reserved for future use.	This bit will always be 0.
1	2	Audio Analyzer	This is the summary message bit for the STATus:OPERation:NMRReady:COMMon Audio Analyzer register.
0	1	Extension Bit	This bit will always be 0.

**STATus:OPERation**

**Program Examples - STATus:OPERation:NMRReady:COMMON**

```
OUTPUT 714;"STATUS:OPERATION:NMRREADY:COMMON:EVENT?" !Queries the New Measurement
                !Results Ready Common Event Register.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:COMMON:CONDITION?" !Queries the New Measurement
                !Results Ready Common
                !Condition Register.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:COMMON:ENABLE 2" !Sets New Measurement Results
                !Ready Common Enable Register
                !for bit 2.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:COMMON:NTR 2" !Sets the New Measurement Results
                !Ready Common Negative Transition
                !Register for bit 2.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:COMMON:PTR 2" !Sets the New Measurement
                !Results Ready Common Positive
                !Transition Register
                !for bit 2
```

**STATus:OPERation:NMRReady:DIGital136 Condition Register Bit Assignment**

The STATus:OPERation:NMRReady:DIGital136 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	Digital Dynamic Power New Measurement Result Ready	This bit will be a 1 if the measurement has been completed and has produced new results.  This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See <a href="#">"Measurement States"</a> .
5	32	Digital IQ Tuning New Measurement Result Ready	This bit will be a 1 if the measurement has been completed and has produced new results.  This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See <a href="#">"Measurement States"</a> .
4	16	Loopback BER New Measurement Result Ready	This bit will be a 1 if the measurement has been completed and has produced new results.  This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See <a href="#">"Measurement States"</a> .
3	8	Adjacent Channel Power New Measurement Result Ready	This bit will be a 1 if the measurement has been completed and has produced new results.  This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See <a href="#">"Measurement States"</a> .
2	4	Modulation Accuracy New Measurement Result Ready	This bit will be a 1 if the measurement has been completed and has produced new results.  This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See <a href="#">"Measurement States"</a> .

**STATUS:OPERation**

Bit Number	Binary Weighting	Condition	Description
1	2	Digital Transmit Power New Measurement Result Ready	This bit will be a 1 if the measurement has been completed and has produced new results.  This bit will be a zero at power on, after a preset and while a measurement is in Measuring States. See <a href="#">“Measurement States”</a>
0	1	Extension Bit	This bit will always be 0.

**Program Examples - STATUS:OPERation:NMRReady:DIGital136**

```

OUTPUT 714;"STATUS:OPERATION:NMRREADY:DIGITAL136:EVENT?" !Queries the New Measurement
!Results Ready Digital136 Event Register.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:DIGITAL136:CONDITION?" !Queries the New Measurement
!Results Ready Digital136
!Condition Register.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:DIGITAL136:ENABLE 16" !Sets New Measurement Results
!Ready Digital136 Enable Register
!for bit 16.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:DIGITAL136:NTR 2" !Sets the New Measurement Results
!Ready Digital136 Negative Transition
!Register for bit 4.
OUTPUT 714;"STATUS:OPERATION:NMRREADY:DIGITAL136:PTR 4" !Sets the New Measurement
!Results Ready Digital136 Positive
!Transition Register
!for bit 4
    
```

**Related Topics**

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[“Triggering of Measurements” on page 145](#)

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## **STATus:PRESet**

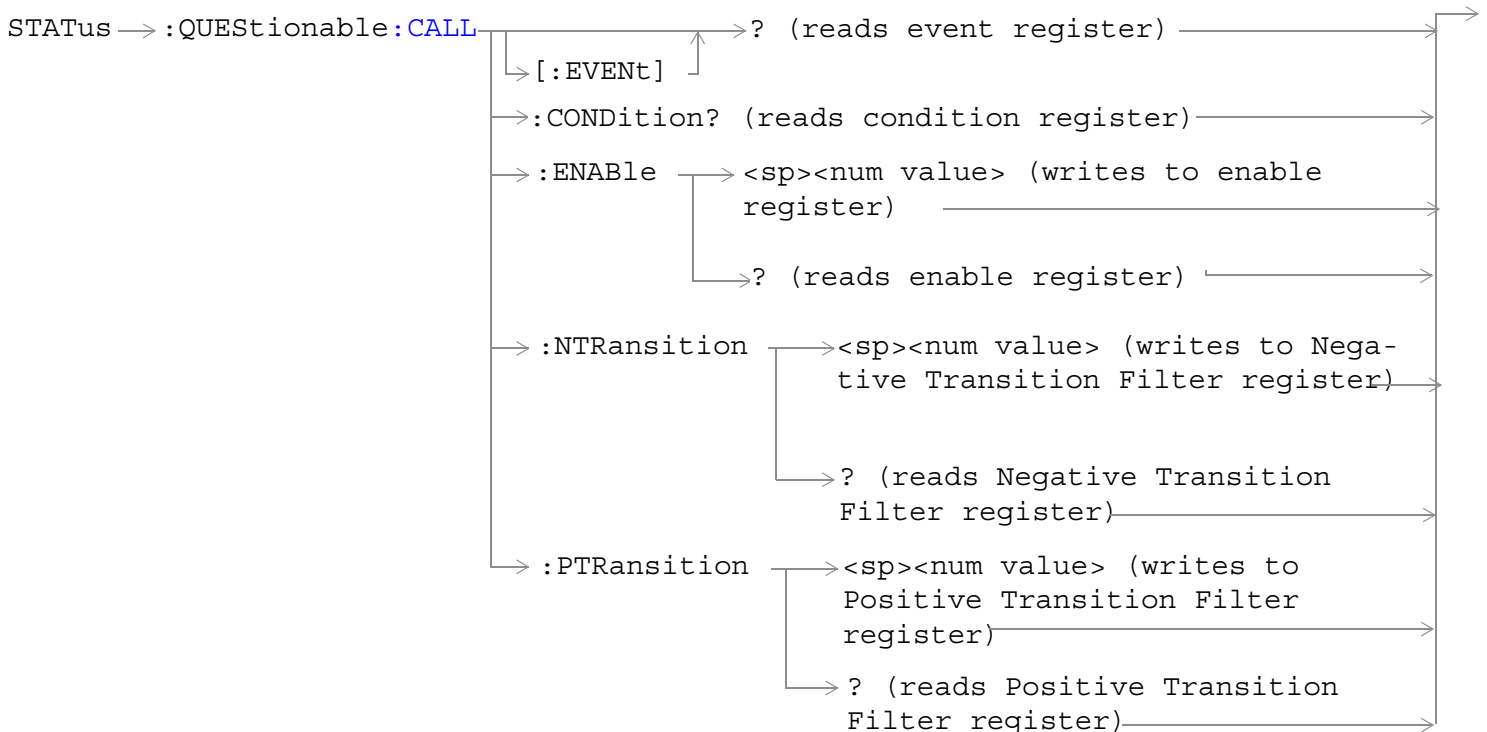
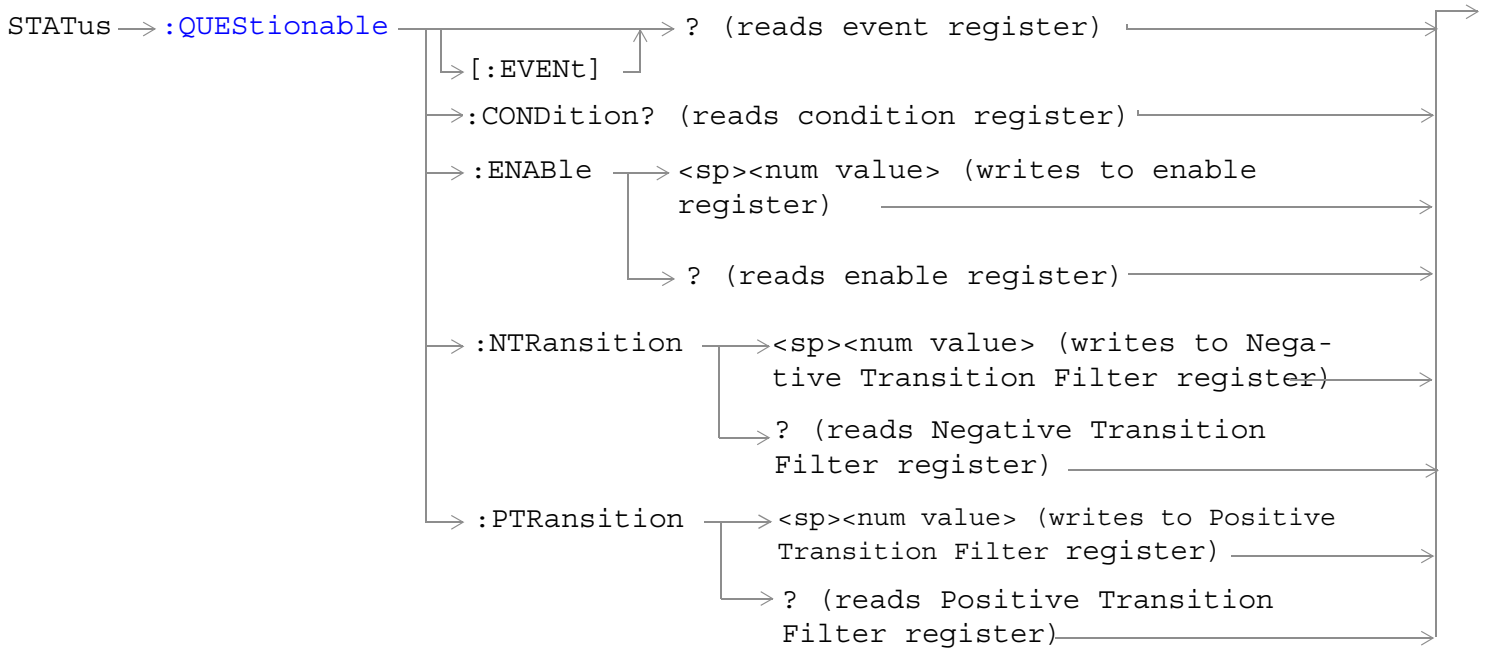
STATus → :PRESet →

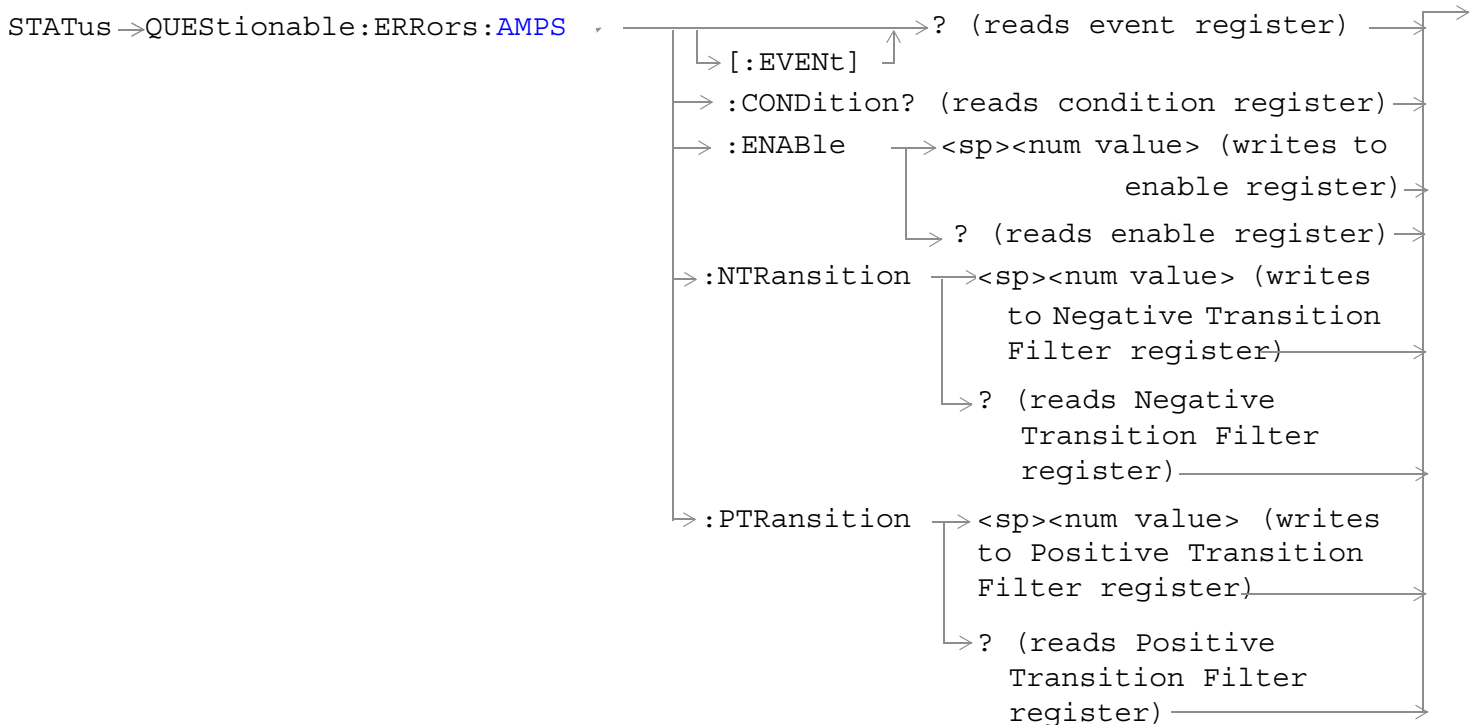
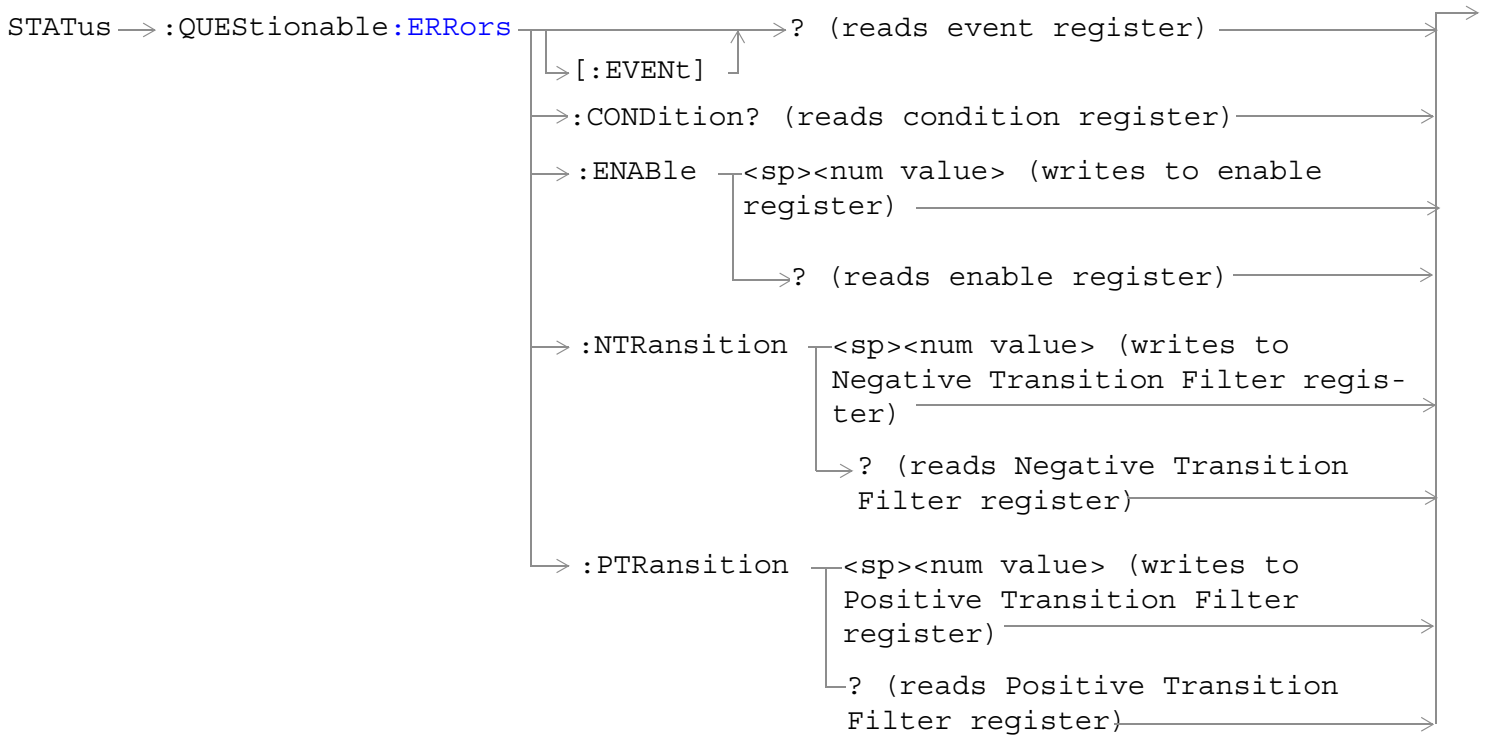
[“Diagram Conventions” on page 267](#)

### **STATus:PRESet**

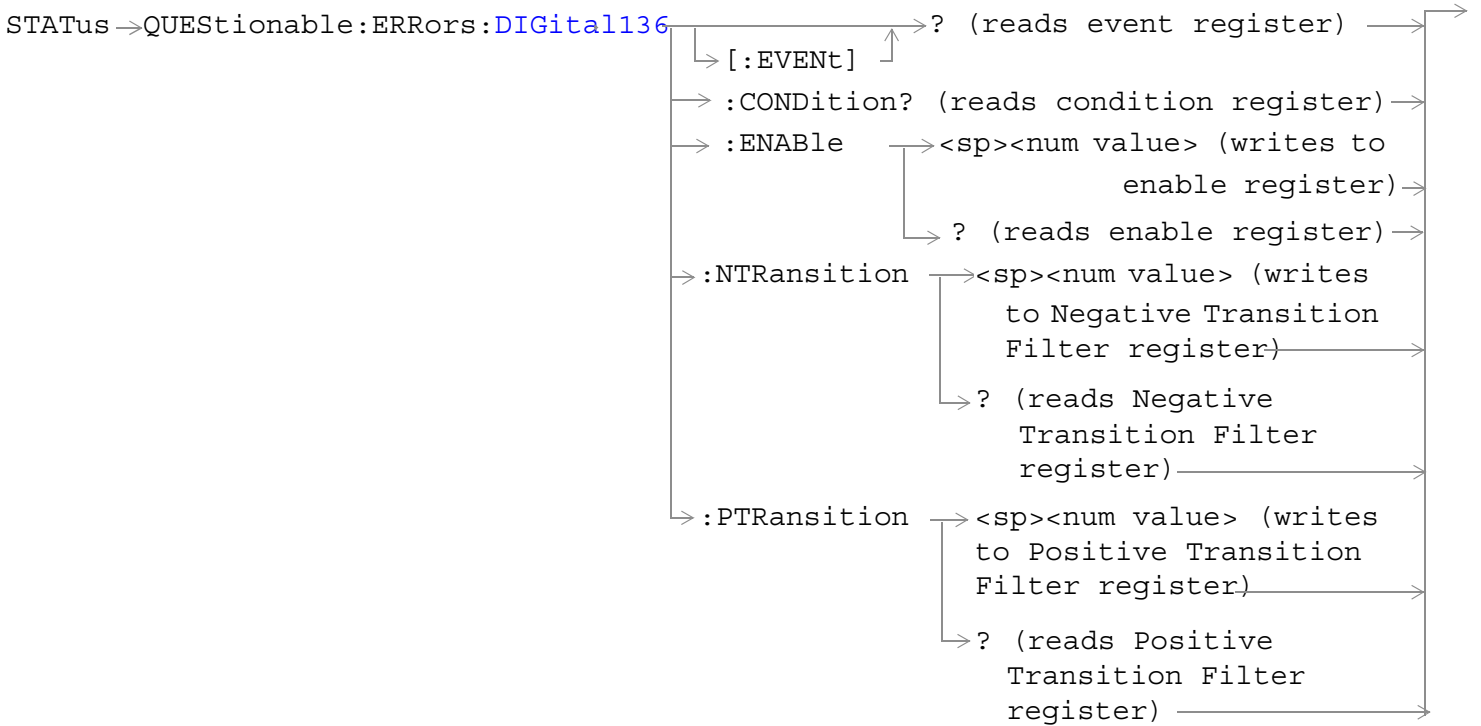
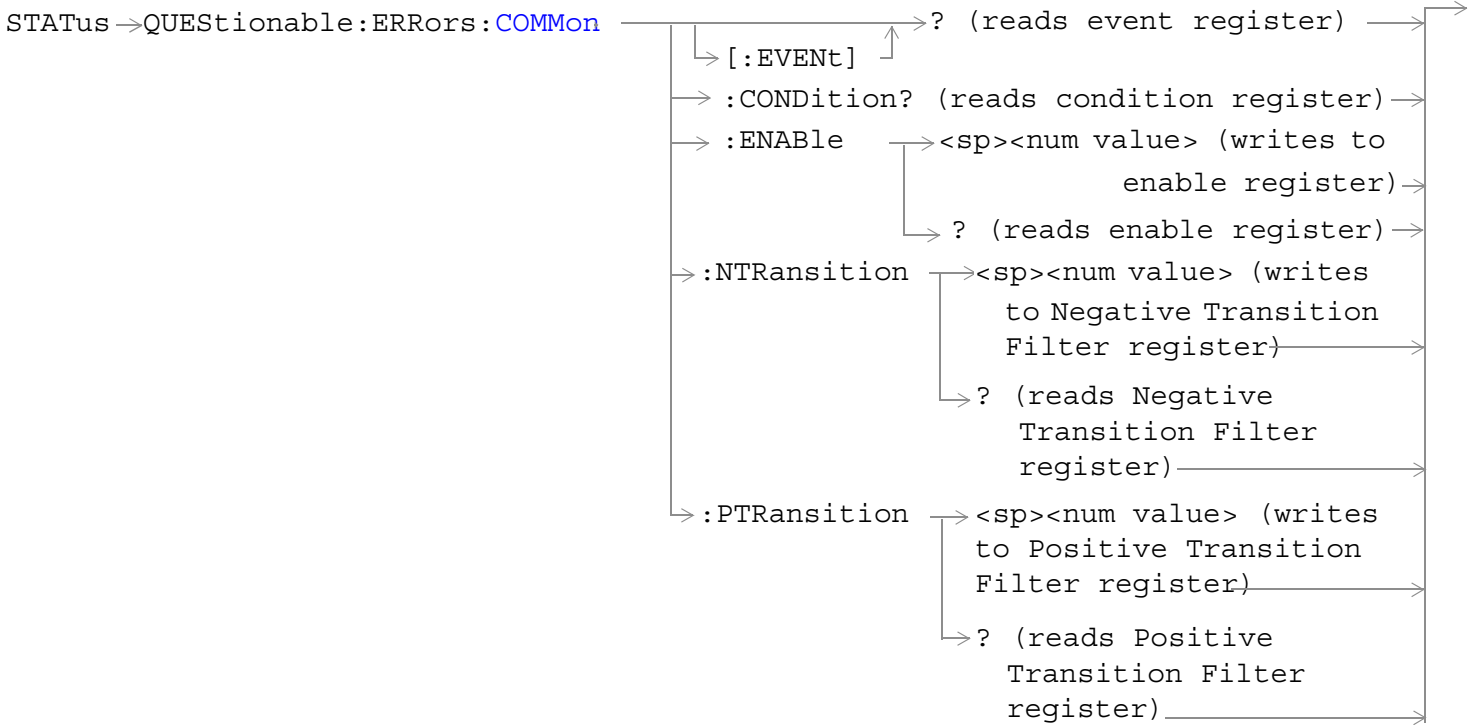
Function	Presets the Status Subsystem Sets all Enable Registers to 0 (not enabled). Sets all Positive Transition Registers (PTR) to 1 (positive transitions enabled). Sets all Negative Transition Registers (NTR) to 0 (negative transitions disabled).
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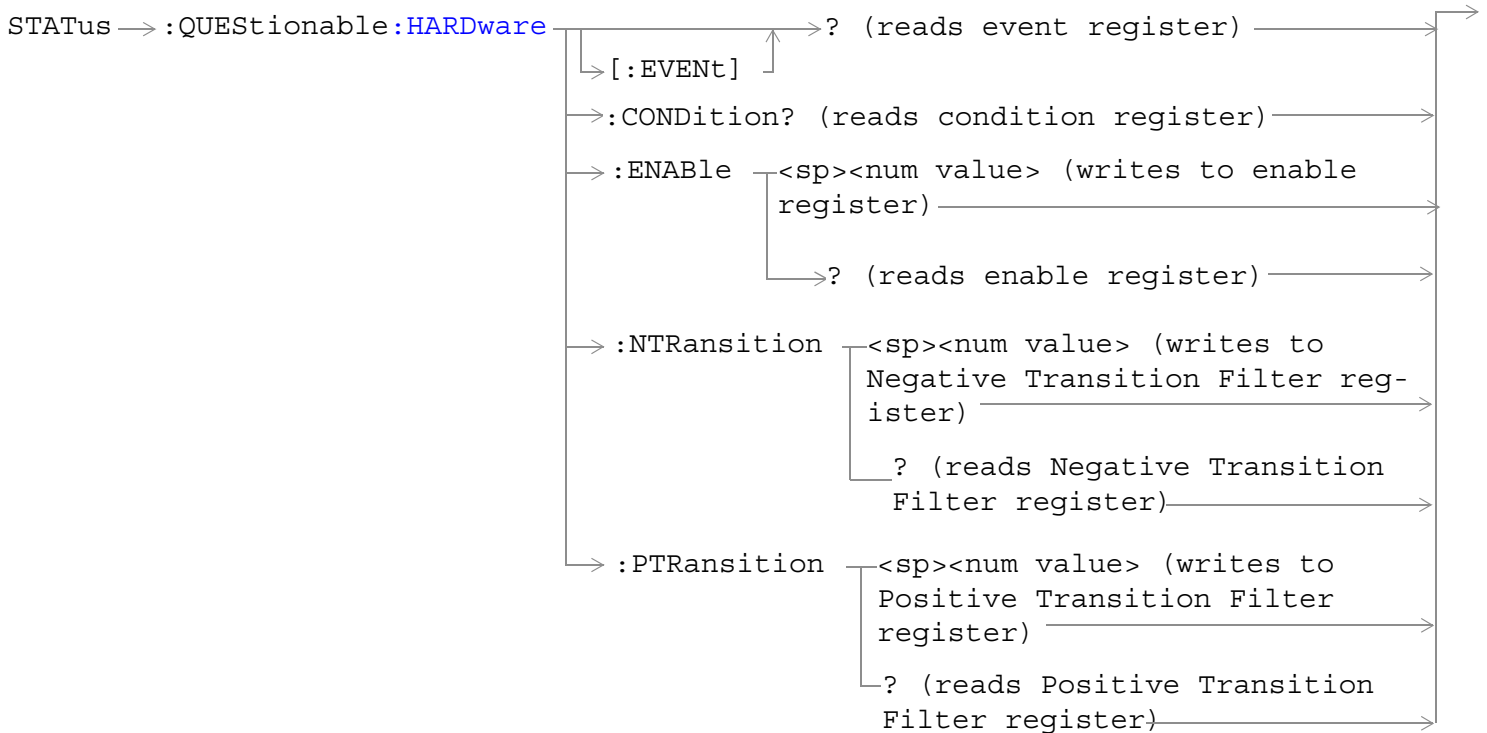
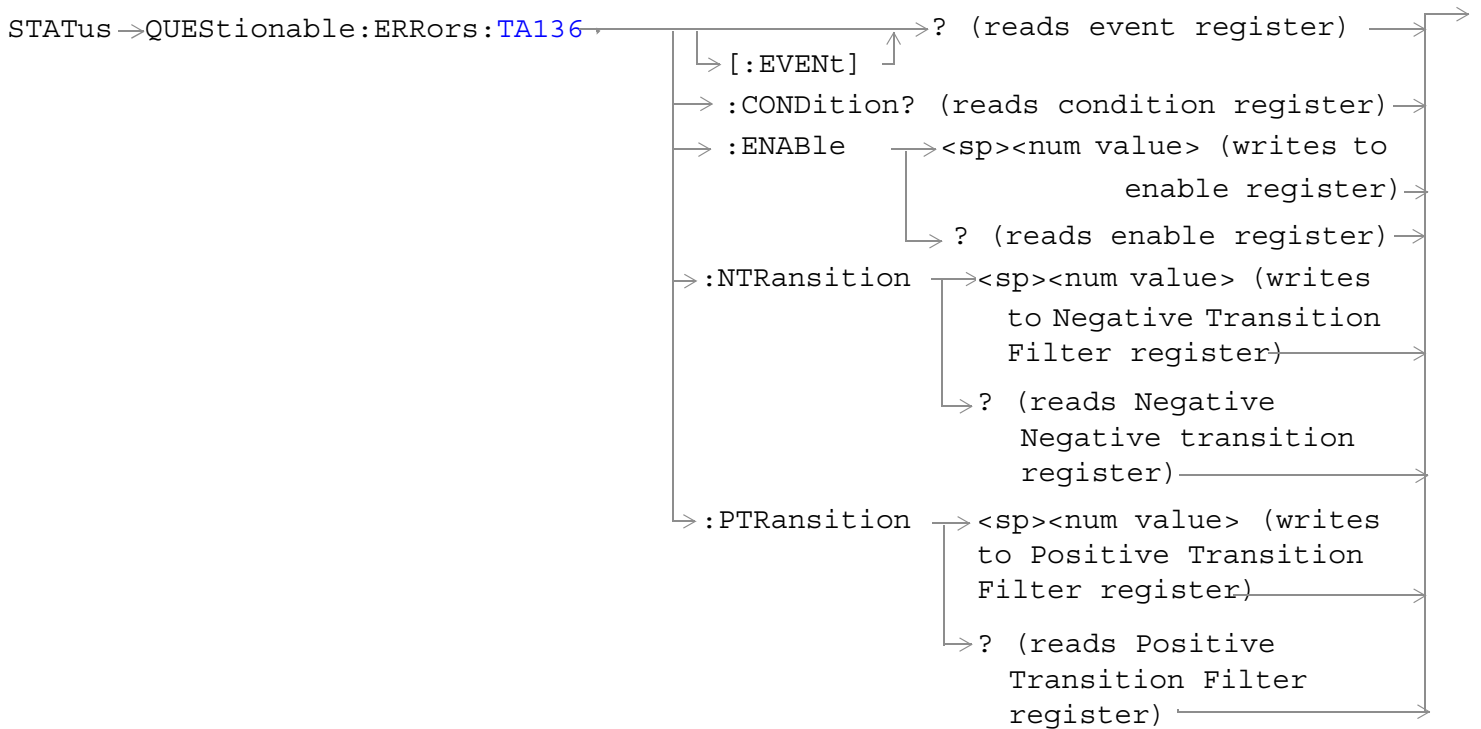
## STATus:QUEStionable





**STATus:QUEStionable**





“Diagram Conventions” on page 267

**STATus:QUEStionable****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 functionality 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 message bit for the STATus:QUEStionable:HARDware register.
10	1024	QUEStionable:CALL summary	This bit is the summary message bit for the STATus: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 message bit for the STATus: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 and clears the Questionable Event
!Register
OUTPUT 714;"STATUS:QUESTIONABLE:CONDITION?" !Queries and clears the Questionable Condition
!Register
OUTPUT 714;"STATUS:QUESTIONABLE:ENABLE 1024" !Sets the Questionable Enable Register
!for bit 10
OUTPUT 714;"STATUS:QUESTIONABLE:NTRANSITION 2" !Sets the Questionable Negative
!Transition Filter Register for bit 1
OUTPUT 714;"STATUS:QUESTIONABLE:PTRANSITION 2" !Sets the Questionable Positive
!Transition Filter Register for bit 1

```

**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 what 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	TA136 Summary bit	This bit is the summary message bit for the STATus:QUESTionable:CALL:TA136 register.
4	16	DIGital136 Summary bit	This bit is the summary message bit for the STATus:QUESTionable:CALL:DIGital136 register.
3	8	AMPS Summary bit	This bit is the summary message bit for the STATus:QUESTionable:CALL:AMPS register.
2	4	GSM Summary bit	This bit is the summary message bit for the STATus:QUESTionable:CALL:GSM register.
1	2	COMMon Summary bit	This bit is the summary message bit for the STATus:QUESTionable:CALL:COMMon register.
0	1	Extension Bit	This bit will always be 0.

**Program Example - STATus:QUESTionable:CALL Condition Register Bit Assignment**

```

OUTPUT 714;"STATUS:QUESTIONABLE:CALL:EVENT?" !Queries and clears the Questionable
!Call Event Register
OUTPUT 714;"STATUS:QUESTIONABLE:CALL:CONDITION?" !Queries and clears the Questionable
!Call Condition Register
OUTPUT 714;"STATUS:QUESTIONABLE:CALL:ENABLE 1024" !Sets the Questionable
!Call Enable Register for bit 10
OUTPUT 714;"STATUS:QUESTIONABLE:CALL:NTRANSITION 2" !Sets the Questionable Call
!Negative Transition Filter Register
!for bit 1
OUTPUT 714;"STATUS:QUESTIONABLE:CALL:PTRANSITION 2" !Sets the Questionable Call
!Positive Transition Filter Register

```

!for bit 1

**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	TA136 Summary bit	This bit is the summary message bit for the STATus:QUEStionable:ERRors:TA136 register.
4	16	DIGital136 Summary bit	This bit is the summary message bit for the STATus:QUEStionable:ERRors:DIGital136 register.
3	8	AMPS Summary bit	This bit is the summary message bit for the STATus:QUEStionable:ERRors:AMPS register.
2	4	GSM Summary bit	This bit is the summary message bit for the STATus:QUEStionable:ERRors:GSM register.
1	2	COMMon Summary bit	This bit is the summary message bit for the STATus:QUEStionable:CALL:ERRors register.
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 and clears the Questionable
!Errors Event Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:CONDITION?" !Queries and clears the Questionable
!Errors Condition Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:ENABLE 1024" !Sets the Questionable
!Errors Enable
!Register for bit 10

```



OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:NTRANSITION 2" !Sets the Questionable Errors  
!Negative Transition Filter Register  
!for bit 1

OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:PTRANSITION 2" !Sets the Questionable Errors  
!Positive Transition Filter Register  
!for bit 1

### STATus:QUEStionable:ERRors:COMMon Condition Register Bit Assignment

The STATus:QUEStionable:ERRors:COMMon register bits will be used to indicate information about the COMMon 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.

**STATus:QUEStionable**

Bit Number	Binary Weighting	Condition	Description
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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.
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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.
0	1	Extension Bit	This bit will always be 0.

**Program Example - STATus:QUEStionable:ERRors:COMMON Condition Register Bit Assignment**

```

OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:COMMON:EVENT?" !Queries and clears the Questionable
!Errors Common Event Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:COMMON:CONDITION?" !Queries the and clears the
!Questionable Errors
!Common Condition Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:COMMON:ENABLE 1024" !Sets the Questionable
!Errors Common Enable
!Register for bit 10
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:COMMON:NTRANSITION 2" !Sets the Questionable Errors
!Common Negative Transition
!Register for bit 1
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:COMMON:PTRANSITION 2" !Sets the Questionable Errors

```

!Common Positive Transition  
!Register for bit 1

### STATus:QUEStionable:ERRors:AMPS Condition Register Bit Assignment

The STATus:QUEStionable:ERRors:AMPS register bits will be used to indicate information about AMPS related 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.

**STATus:QUEStionable**

Bit Number	Binary Weighting	Condition	Description
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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.
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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.
0	1	Extension Bit	This bit will always be 0.

**Program Example - STATus:QUEStionable:ERRors:AMPS Condition Register Bit Assignment**

```

OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:AMPS:EVENT?" !Queries and clears the Questionable
!Errors AMPS Event Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:AMPS:CONDITION?" !Queries and clears the Questionable
!Errors AMPS Condition Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:AMPS:ENABLE 1024" !Sets the Questionable
!Errors AMPS Enable
!Register for bit 10
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:AMPS:NTRANSITION 2" !Sets the Questionable Errors
!AMPS Negative Transition
!Filter Register for bit 1
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:AMPS:PTRANSITION 2" !Sets the Questionable Errors
!AMPS Positive Transition

```

!Filter Register for bit 1

**STATus:QUESTionable:ERRors:DIGital136 Condition Register Bit Assignment**

The STATus:QUESTionable:ERRorsDIGital136 register bits will be used to indicate information about DIGital136 related 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.

**STATus:QUEStionable**

Bit Number	Binary Weighting	Condition	Description
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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.
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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.
0	1	Extension Bit	This bit will always be 0.

**Program Example - STATus:QUEStionable:ERRors:DIGital136 Condition Register Bit Assignment**

```

OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:DIGITAL136:EVENT?" !Queries and clears the
!Questionable Errors
!Digital136 Event Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:DIGITAL136:CONDITION?" !Queries and clears the
!Questionable Errors
!Digital136 Condition Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:DIGITAL136:ENABLE 1024" !Sets the Questionable
!Errors Digital136 Enable
!Register for bit 10
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:DIGITAL136:NTRANSITION 2" !Sets the Questionable
!Errors Digital136 Negative
!Transition Filter
!Register for bit 1
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:DIGITAL136:PTRANSITION 2" !Sets the Questionable
!Errors Digital136 Positive
!Transition Filter
!Register for bit 1

```

**STATus:QUEStionable:ERRors:TA136 Condition Register Bit Assignment**

The STATus:QUEStionable:ERRors:TA136 register bits will be used to indicate information about TA136 related 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.

**STATus:QUEStionable**

Bit Number	Binary Weighting	Condition	Description
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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.
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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which 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. After setting the Positive Transition Filter and the Negative Transition Filter you may query the Event Register to find out which of these errors occurred.
0	1	Extension Bit	This bit will always be 0.

**Program Example - STATus:QUEStionable:ERRors:TA136 Condition Register Bit Assignment**

```

OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:TA136:EVENT?" !Queries and clears the
!Questionable Errors
!TA136 Event Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:TA136:CONDITION?" !Queries and clears the
!Questionable Errors
!TA136 Condition Register
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:TA136:ENABLE 1024" !Sets the Questionable
!Errors TA136 Enable
!Register for bit 10
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:TA136:NTRANSITION 2" !Sets the Questionable
!Errors TA136 Negative
!Transition Filter
!Register for bit 1
OUTPUT 714;"STATUS:QUESTIONABLE:ERRORS:TA136:PTRANSITION 2" !Sets the Questionable
!Errors TA136 Positive
!Transition Filter
!Register for bit 1

```



**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:EVENT?" !Queries and clears the Questionable
!Hardware Event Register
OUTPUT 714;"STATUS:QUESTIONABLE:HARDWARE:CONDITION?" !Queries and clears the Questionable
!Hardware Condition Register
OUTPUT 714;"STATUS:QUESTIONABLE:HARDWARE:ENABLE 1024" !Sets the Questionable
!Hardware Enable
!Register for bit 10
OUTPUT 714;"STATUS:QUESTIONABLE:HARDWARE:NTRANSITION 2" !Sets the Questionable
!Hardware Negative Transition Filter
!Register for bit 1
OUTPUT 714;"STATUS:QUESTIONABLE:HARDWARE:PTRANSITION 2" !Sets the Questionable
!Hardware Positive Transition Filter
!Register for bit 1

```

## Status Byte Register

**\*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

### \*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 267](#)

## Standard Event Status Register

## 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: <ul style="list-style-type: none"> <li>• An IEEE 488.2 syntax error. The test set received a message that did not follow the syntax defined by the standard.</li> <li>• A semantic error. For example the test set received an incorrectly spelled command.</li> <li>• The test set received a group execution trigger (GET) inside a program message</li> </ul>
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: <ul style="list-style-type: none"> <li>• A &lt;PROGRAM DATA&gt; 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.</li> <li>• The test set could not execute a valid command due to some test set hardware/firmware condition.</li> </ul>
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	<p>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:</p> <ul style="list-style-type: none"> <li>• An attempt is made to read data from the output queue when no data is present or is pending.</li> <li>• Data in the output queue has been lost. An example of this would be an output queue overflow.</li> </ul>
1	2	Reserved for future use.	This bit will always be 0.
0	1	Operation Complete	<p>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.</p>

**Program Example - Standard Event Status Register**

OUTPUT 714; "\*ESR?" !Queries (reads) the Standard Event Status Register.

## SYSTEM Subsystem

### Description

The SYSTEM subsystem performs system level configuration functions of the test set.

### Syntax Diagrams and Command Descriptions

[“SYSTEM:APPLICATION” on page 511](#)

[“SYSTEM:BEEPer” on page 516](#)

[“SYSTEM:COMMunicate” on page 517](#)

[“SYSTEM:CONFigure:INFormation:HARDware:VERBose?”  
on page 521](#)

[“SYSTEM:CORRection” on page 522](#)

[“SYSTEM:CURRent:TA” on page 528](#)

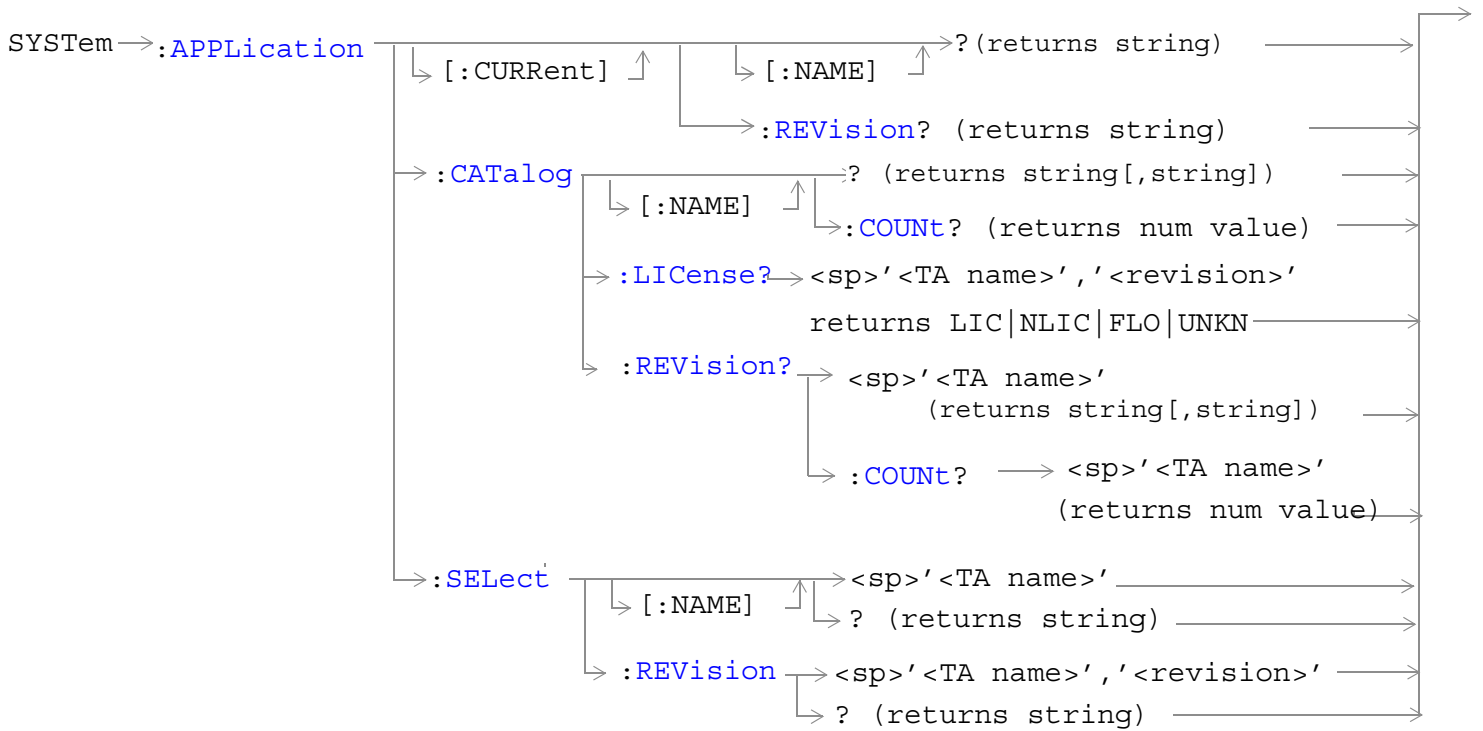
[“SYSTEM:ERRor?” on page 529](#)

[“SYSTEM:MEASurement:RESet” on page 530](#)

[“SYSTEM:PRESet” on page 531](#)

[“SYSTEM:SYNChronized” on page 534](#)

## SYSTEM:APPLICATION



[“Diagram Conventions” on page 267](#)

**SYSTEM:APPLICATION****SYSTEM:APPLICATION:CATALOG:LICENSE? '<test application name>','<revision>'**

Function	<p>Query the license status for a selected revision.</p> <p>The query must include two strings separated by a comma. The test application name and revision must be entered as they appear in the test application Setup menu, with the exception that the string is not case sensitive and can be entered in any combination of upper and lower case letters.</p> <p>The returned values are:</p> <ul style="list-style-type: none"> <li>• "LIC" indicates this is a licensed test application.</li> <li>• "NLIC" indicates this is not a licensed test application.</li> <li>• "UNKN" indicates that license status is unknown.</li> </ul>
Query	Range: LIC   NLIC   UNKN
<p>Programming Example</p> <pre>OUTPUT 714;"SYSTEM:APPLICATION:CATALOG:LICENSE? 'GSM mobile test','A.04.00'"</pre>	

**SYSTEM:APPLICATION:CATALOG:REVISION? '<test application name>'**

Function	<p>Query the test set for all revision numbers stored on the test set's hard drive for a specific test application. You must specify a test application.</p> <p>The test application name must be entered as it appears in the test application Setup menu, with the exception that the string is not case sensitive and can be entered in any combination of upper and lower case letters.</p>
Query	Range: One or more comma separated strings or a null string
<p>Programming Example</p> <pre>OUTPUT 714;"SYSTEM:APPLICATION:CATALOG:REVISION? 'AMPS/136 MOBILE TEST'"</pre>	

**SYSTEM:APPLICATION:CATALOG:REVISION:COUNT? '<test application name>'**

Function	<p>Query the test set for the number of revisions present on the hard disk for a specified test application. Up to 30 revisions can be stored for a test application.</p> <p>The test application name must be entered as it appears in the test application Setup menu, with the exception that the string is not case sensitive and can be entered in any combination of upper and lower case letters.</p>
Query	Range: 0 through 30
<p>Programming Example</p> <pre>OUTPUT 714;"SYSTEM:APPLICATION:CATALOG:REVISION:COUNT? 'AMPS/136 MOBILE TEST'"</pre>	



**SYSTem:APPLication:CATalog[:NAME]?**

Function	Query the test set for all of the names of the test applications stored on the hard drive. This query returns one or more strings, each string is separated by a comma.
Query	Range: AMPS/136 Mobile Test CDMA 2000 Mobile Test Mode GSM Mobile Test GPRS Mobile Test
Programming Example	
OUTPUT 714 ; "SYSTEM:APPLICATION:CATALOG:NAME?"	

**SYSTem:APPLication:CATalog[:NAME]:COUNT?**

Function	Query the test set for the total number test application names stored on the hard drive. Up to 30 test applications can be stored.
Query	Range: 0 through 30
Programming Example	
OUTPUT 714 ; "SYSTEM:APPLICATION:CATALOG:NAME:COUNT?"	

**SYSTem:APPLication[:CURRENT][:NAME]?**

Function	Query the test set for the name of the currently running test application.
Query	Range: AMPS/136 Mobile Test CDMA 2000 Mobile Test Mode GSM Mobile Test GPRS Mobile Test null string
Programming Example	
OUTPUT 714 ; "SYSTEM:APPLICATION:CURRENT:NAME?"	

**SYSTem:APPLication[:CURRENT]:REVISION?**

Function	Query the test set for the currently running test application revision number.
Query	Range: Any string up to 20 characters including null. A typical example would be A.01.01 for a licensed version.
Programming Example	
OUTPUT 714 ; "SYSTEM:APPLICATION:CURRENT:REVISION?"	

**SYSTEM:APPLICATION****SYSTEM:APPLICATION:SELECT[:NAME] '<test application name>'**

Function	<p>Selects a test application and reboots the test set. This will switch the test application to the revision already selected. There is no need to re-select the revision before switching. The reboot process takes about 1 minute.</p> <p>Queries the test set for the test application that is selected and will run after the next reboot of the test set. This string is not case sensitive.</p> <p>The test application name must be entered as it appears in the test application Setup menu, with the exception that the string is not case sensitive and can be entered in any combination of upper and lower case letters.</p> <hr/> <p><b>NOTE</b>      Selecting the correct name and the desired revision of a test application is important. This information should be reviewed before proceeding. The directions for how to determine test application name and revision are found in this document.</p> <hr/>
Setting	<p>Range:</p> <p>AMPS/136 Mobile Test</p> <p>CDMA 2000 Mobile Test Mode</p> <p>GSM Mobile Test</p> <p>GPRS Mobile Test</p>
Query	<p>Range:</p> <p>AMPS/136 Mobile Test</p> <p>CDMA 2000 Mobile Test Mode</p> <p>GSM Mobile Test</p> <p>GPRS Mobile Test</p> <p>null string</p>
<p><b>Programming Example</b></p> <p>OUTPUT 714;"SYSTEM:APPLICATION:SELECT:NAME 'AMPS/136 MOBILE TEST'"</p> <p>OUTPUT 714;"SYSTEM:APPLICATION:SELECT:NAME?"</p>	

**SYSTem:APPLication:SElect:REVision '<test application name>','<revision>'**

Function	<p>Selects a test application revision and a test application.</p> <p>The revision does not need to be set in order to switch test applications. The only time you select revisions is to change revisions.</p> <p>Queries the test set for the revision of a specified test application.</p> <p>The test application name and revision must be entered as they appear in the test application Setup menu, with the exception that the string is not case sensitive and can be entered in any combination of upper and lower case letters.</p> <hr/> <p><b>NOTE</b> GSM Mobile Test; revisions before A.04.00 did not have test application switching and provide no way to return to revisions that have switching. Users will need to reload a revision that has test application switching following the download process for upgrading firmware.</p> <hr/>
Setting	Range: A valid test application name and revision number for any licensed test application.
Query	Range: A string up to 20 characters, or the null string.
<p>Programming Example</p> <pre>OUTPUT 714;"SYSTEM:APPLICATION:SELECT:REVISION 'GSM MOBILE TEST','A.04.00'" OUTPUT 714;"SYSTEM:APPLICATION:SELECT:REVISION? 'GSM MOBILE TEST'"</pre>	

**Related Topics**

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[“Selecting a Radio Personality” on page 604](#)

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## SYSTem:BEEPer

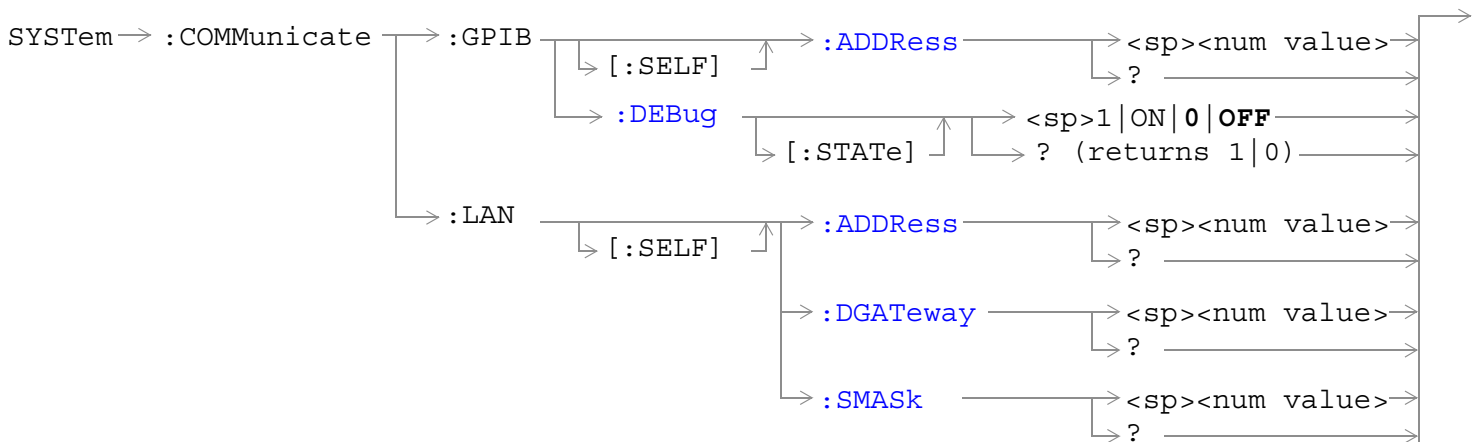


“Diagram Conventions” on page 267

### 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)
<b>Programming Example</b> OUTPUT 714;"SYSTem:BEEPer:STATE OFF" !Sets beeper state to off.	

## SYSTem:COMMunicate



“Diagram Conventions” on page 267

### 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	<a href="#">“Configuring the Test Set's GPIB Address” on page 592</a>
Programming Example	
OUTPUT 714; "SYSTem:COMMunicate:GPIB:SELf:ADDRESS 14" !Sets the GPIB address to 14.	

### SYSTem:COMMunicate:GPIB:DEBUg[:STATe]

Function	<p>Sets/queries the test set's SCPI debugger state.</p> <p>When the state is on; enhanced error messages (generated from GPIB commands with syntax errors) are shown the test set display.</p> <p>The error message is printed along with the syntax. &lt;ERR&gt; is displayed at the end of the incorrect node. Non-printable characters will be replaced with the \$ symbol. See <a href="#">“Error Messages” on page 611</a> for a list of the errors.</p> <p>The debugger state should be set to on only during GPIB code development. Test times will increase if the debugger state is left on.</p>
Setting	Range: 0 OFF   1 ON

**SYSTEM:COMMunicate**

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 <a href="#">“SYSTem:COMMunicate:LAN[:SELF]:SMASK” on page 520</a> .  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)
<i>Related Topics</i>	<a href="#">“Configuring the Test Set's LAN” on page 597</a>
<b>Programming Example</b> <pre>OUTPUT 714;"SYSTEM:COMMUNICATE:LAN:SELF:ADDRESS '130.015.156.255'" !Sets the   !LAN IP   !address.</pre>	

**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)
<b>Programming Example</b> <pre>OUTPUT 714;"SYSTEM:COMMUNICATE:LAN:SELF:DGATEWAY '130.2.6.200'"</pre>	

**SYSTem:COMMunicate****SYSTem:COMMunicate:LAN[:SELF]:SMASK**

Function	<p>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.</p> <p>If A is less than or equal to 127, the subnet mask is 255.0.0.0.</p> <p>If A is greater than 127 and less or equal to 191, the subnet mask is 222.255.0.0.</p> <p>If A is greater than 191, the subnet mask is 255.255.255.0.</p> <p>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.</p>
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)
<b>Programming Example</b> <pre>OUTPUT 714 ; "SYSTEM: COMMUNICATE: LAN: SELF: SMASK '255.2.6.200' "</pre>	



## **SYSTem:CONFIgure:INFormation:HARDware:VERBoSe?**

SYSTem——:CONFIgure ———> :INFormation ———> :HARDware ———> :VERBoSe? ———>

[“Diagram Conventions” on page 267](#)

### **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.
Programming Example	
OUTPUT 714; "SYSTEM:CONFIGURE:INFORMATION:HARDWARE:VERBOSE?" !Queries system hardware.	

### **Related Topics**

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[“Hardware Configuration Report” on page 593](#)

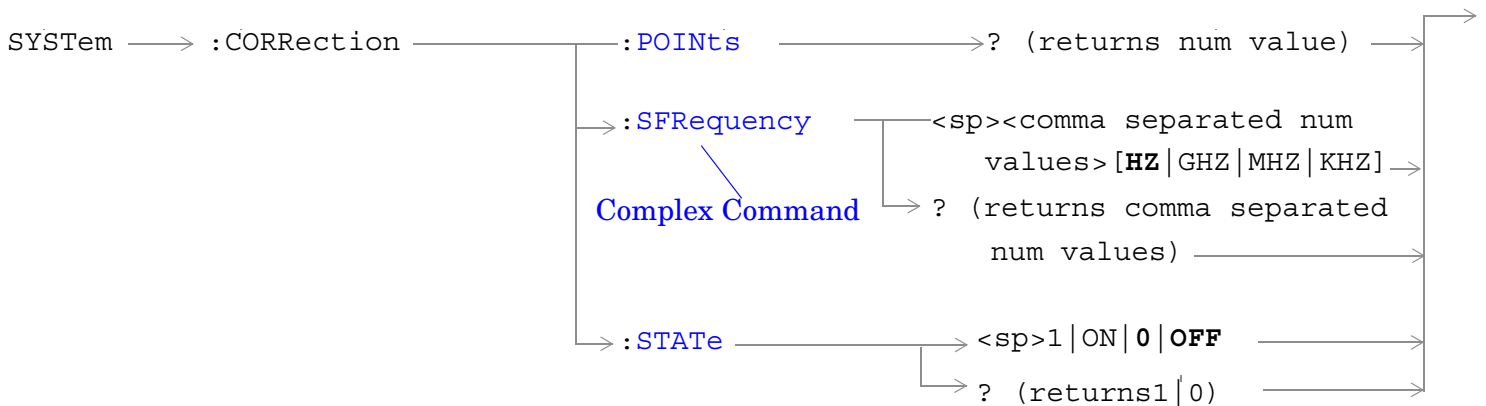
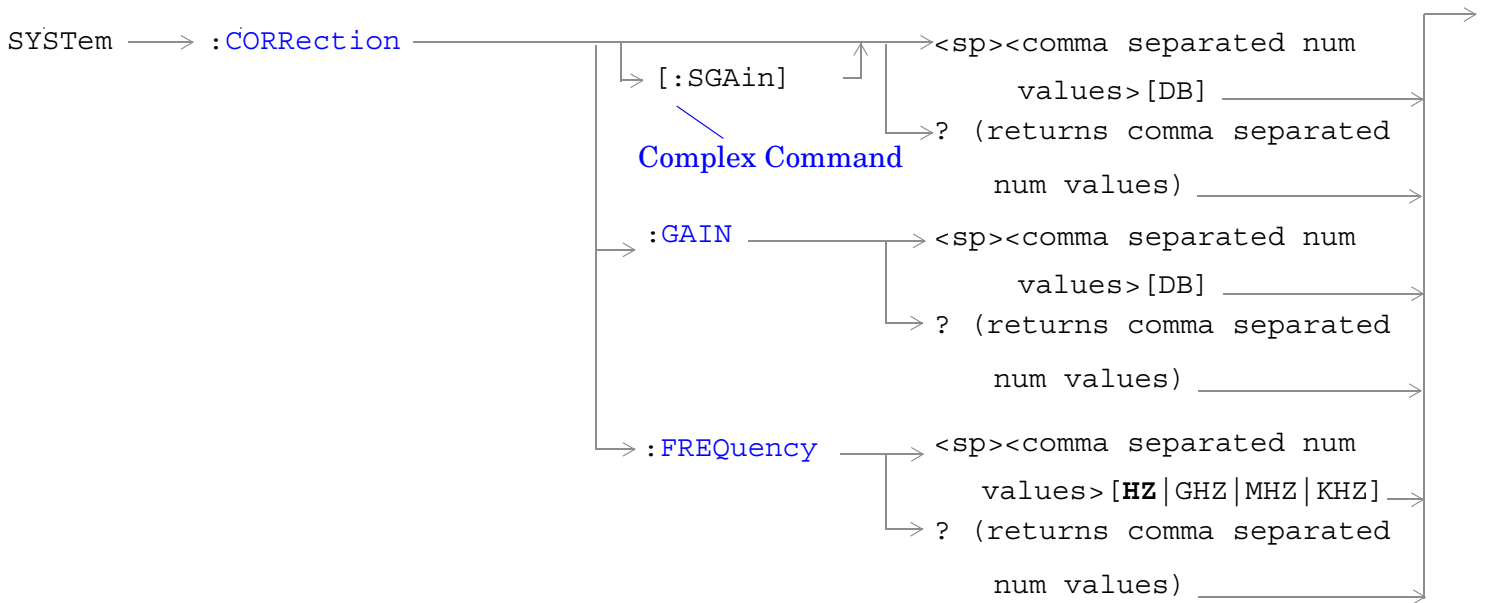
[“SYSTem:CURRent:TA” on page 528](#)

[“Obtaining Test Application Information” on page 603](#)

[“Obtaining Identification Information \\*IDN?” on page 595](#)

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## SYSTem:CORRection



“Diagram Conventions” on page 267

**SYSTem:CORRection[:SGain]**

Function	Sets/queries up to 20 comma separated offset values in dB. This command sets the state to On. See <a href="#">“Measurement Related Configuration” on page 599.</a> The units, dB, are optional. If no units are specified then units default to dB. Sending a null list (no values) sets the state of all offsets to Off.
Setting	Range: 0 to 20 values between -100 to +100 Resolution: 0.01
Query	Range: 1 to 20 values between -100 to +100, and NAN (9.91E+37) Resolution: 0.01
Factory Setting	Offsets 1 through 20, are set to 0.00 dB, state is set to Off
<b>Programming Example</b> <pre> OUTPUT 714;"SYSTEM:CORRECTION:SGAIN -2.55,-3.12,-3.68,-4.23,-4.74,-5.3" !A complex command that sets up to 20 comma separated offsets !and sets the state to On for the frequencies, offsets and !RF IN/OUT Amplitude Offset State  OUTPUT 714;"SYSTEM:CORRECTION:SGAIN" !Sets the state for all frequencies and offsets to Off </pre>	

**SYSTem:CORRection:FREQuency**

Function	Sets/queries up to 20 comma separated frequency values in MHz. The units, (GHz, MHz, kHz, Hz) are optional. If no units are specified, units default to Hz. See <a href="#">“Measurement Related Configuration” on page 599.</a> Sending a null list (no values) sets the state of all frequencies to Off.
Setting	Range: 0 to 20 comma separated values ranging from 292.5 MHz to 2700 MHz Resolution: 1 Hz
Query	Range: 1 to 20 comma separated values ranging from 292.5 MHz to 2700 MHz, and NAN (9.91E+37) Resolution: 1 HZ

**SYSTEM:CORRection**

Factory Setting	<ol style="list-style-type: none"><li>1. 800.00 MHz Off</li><li>2. 810.00 MHz Off</li><li>3. 820.00 MHz Off</li><li>4. 830.00 MHz Off</li><li>5. 840.00 MHz Off</li><li>6. 850.00 MHz Off</li><li>7. 860.00 MHz Off</li><li>8. 870.00 MHz Off</li><li>9. 880.00 MHz Off</li><li>10. 890.00 MHz Off</li><li>11. 900.00 MHz Off</li><li>12. 910.00 MHz Off</li><li>13. 920.00 MHz Off</li><li>14. 930.00 MHz Off</li><li>15. 940.00 MHz Off</li><li>16. 950.00 MHz Off</li><li>17. 960.00 MHz Off</li><li>18. 970.00 MHz Off</li><li>19. 980.00 MHz Off</li><li>20. 990.00 MHz Off</li></ol>
<p><b>Programming Example</b></p> <pre>OUTPUT 714;"SYSTEM:CORRECTION:FREQUENCY 1784.8 MHZ,1879.8 MHZ" !Sets up to 20 comma separated frequencies</pre> <p>OUTPUT 714;"SYSTEM:CORRECTION:FREQUENCY" !Sets the state for all frequencies and offsets to Off</p>	

**SYSTem:CORRection:GAIN**

Function	Sets/queries the up to 20 comma separated offset values in dB. See <a href="#">“Measurement Related Configuration” on page 599.</a> The units, dB, are optional. If no units are specified, units default to dB. Sending a null list (no values) sets the state of all offsets to Off.
Setting	Range: 0 to 20 values between -100 to +100 Resolution: 0.01
Query	Range: 1 to 20 values between -100 to +100, and NAN (9.91E+37) Resolution: 0.01
Factory Setting	Offsets 1 through 20, are set to 0.00 dB, state is set to off
<b>Programming Example</b> <pre>OUTPUT 714;"SYSTEM:CORRECTION:GAIN -3.12,-3.68,-4.23" !Sets up to 20 comma separated offset values  OUTPUT 714;"SYSTEM:CORRECTION:GAIN" !Sets the state for all frequencies and offsets to Off</pre>	

**SYSTem:CORRection:POINTs**

Function	Query returns the number of offsets that are in their On state when the RF IN/OUT Amplitude Offset State is also set to On. See <a href="#">“Measurement Related Configuration” on page 599.</a>
Query	Range: 1 to 20, and NAN (9.91E+37) Resolution: 1
<b>Programming Example</b> <pre>OUTPUT 714;"SYSTEM:CORRECTION:POINTS?" !Returns the number of frequencies and offsets !with their state set to On</pre>	

## SYSTem:CORRection:SFRequency

Function	<p>Sets/queries up to 20 comma separated frequency values in MHz. This command sets the state to On.</p> <p>The units (GHz, MHz, kHz, Hz) are optional. If no units are specified, units default to MHz.</p> <p>See <a href="#">“Measurement Related Configuration” on page 599</a>.</p> <p>Sending a null list (no values) sets the state of all frequencies to Off.</p>
Setting	<p>Range: 0 to 20 comma separated values from 292.5 MHz to 2700 MHz</p> <p>Resolution: 1 Hz</p>
Query	<p>Range: 1 to 20 comma separated values from 292.5 MHz to 2700 MHz, and NAN (9.91E+37)</p> <p>Resolution: 1 HZ</p>
Factory Setting	<ol style="list-style-type: none"> <li>1. 800.00 MHz Off</li> <li>2. 810.00 MHz Off</li> <li>3. 820.00 MHz Off</li> <li>4. 830.00 MHz Off</li> <li>5. 840.00 MHz Off</li> <li>6. 850.00 MHz Off</li> <li>7. 860.00 MHz Off</li> <li>8. 870.00 MHz Off</li> <li>9. 880.00 MHz Off</li> <li>10. 890.00 MHz Off</li> <li>11. 900.00 MHz Off</li> <li>12. 910.00 MHz Off</li> <li>13. 920.00 MHz Off</li> <li>14. 930.00 MHz Off</li> <li>15. 940.00 MHz Off</li> <li>16. 950.00 MHz Off</li> <li>17. 960.00 MHz Off</li> <li>18. 970.00 MHz Off</li> <li>19. 980.00 MHz Off</li> <li>20. 990.00 MHz Off</li> </ol>

## Programming Example

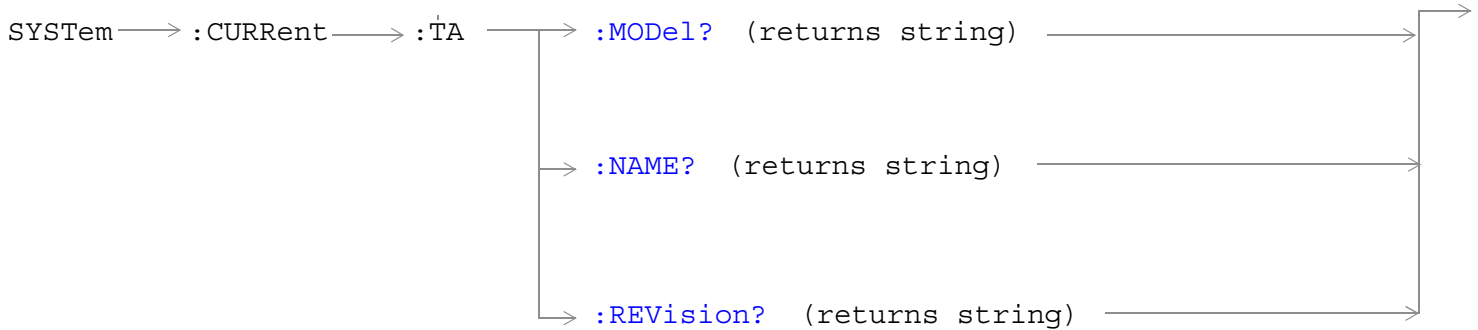
```
OUTPUT 714;"SYSTEM:CORRECTION:SFREQUENCY 1710.2 MHZ,1805.2 MHZ,1784.8 MHZ,1879.8 MHZ"
!Sets up to 20 comma separated frequencies and sets the state to On for the frequency,
!offset, and RF IN/OUT Amplitude Offset State
```

```
OUTPUT 714;"SYSTEM:CORRECTION:SFREQUENCY"
!Sets the state for all frequencies and offsets to Off
```

**SYSTem:CORRection:STATe**

Function	<p>Sets/queries the RF IN/OUT Amplitude Offset State. The state must be On before any of the offsets are active regardless of the state for any of the frequencies or offsets.</p> <p>When the RF IN/OUT Amplitude Offset State is On, the Instrument Status Area will indicate “Offset” regardless of the state for any of the frequencies or offsets.</p> <p>Setting any of the frequency or offset states to On will set the RF IN/OUT Amplitude Offset State to On.</p> <p>See <a href="#">“Measurement Related Configuration” on page 599</a>.</p>
Setting	0   OFF   1   ON
Query	0   1
Factory Setting	0 (off)
<p><b>Programming Example</b></p> <pre>OUTPUT 714;"SYSTEM:CORRECTION:STATE ON" !Sets the RF IN/OUT  !Amplitude Offset State to On</pre>	

## SYSTem:CURRent:TA



“Diagram Conventions” on page 267

### SYSTem:CURRent:TA:MODEl?

Function	Query the model number of the test application running. Printable ASCII characters up to a 15 character string. See “ <a href="#">Obtaining Test Application Information</a> ” on page 603.
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. This command is not recommended see “ <a href="#">SYSTem:APPLication</a> ” on page 511.
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. This command is not recommended see “ <a href="#">SYSTem:APPLication</a> ” on page 511.
Query	Range: ASCII codes 32 - 126 decimal excluding comma and semicolon
*RST Setting	non volatile, read from the test set’s hard disk.



## SYSTem:ERRor?

SYSTem → :ERRor?

[“Diagram Conventions” on page 267](#)

### SYSTem:ERRor?

Function	<p>Queries the contents of the Error/Event Queue. The Error/Event Queue may contain one or more messages with an error or event description.</p> <p>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 <a href="#">“Error Messages” on page 611</a>.</p>
Query	<p>Error/Event Queue</p> <ul style="list-style-type: none"> <li>• Range: 0 to 100 messages up to 255 characters in length</li> </ul>
<p>Programming Example</p> <pre>OUTPUT 714 ; "SYSTEM:ERROR?" !Query the contents of the Error/Event Queue</pre>	

---

## **SYSTEM:MEASurement:RESet**

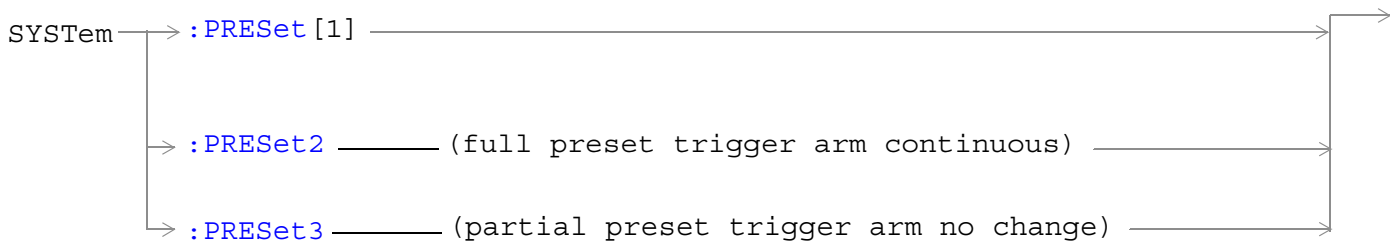
SYSTEM → :MEASurement → :RESet →

[“Diagram Conventions” on page 267](#)

### **SYSTEM:MEASurement:RESet**

Function	Sets all measurements to abort. If continuous triggering is enabled, measurements will begin a new measurement cycle.
Setting	These results are set to their default values when measurement reset occurs.

## SYSTem:PRESet



“Diagram Conventions” on page 267

### SYSTem:PRESet[1] (not recommended for use)

Function	<p>Not recommended for use at this time, use the SYSTem:PRESET3 command for partial preset.</p> <p>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.</p> <p>Any call in process is disconnected and all measurements are aborted and inactivated. Measurement parameters are not changed.</p> <p>A partial preset will not modify any measurement settings including trigger arm. See “<a href="#">Trigger Arm (Single or Continuous) Description</a>” on page 148.</p>
Related Topics	See “ <a href="#">Partial Preset</a> ” on page 567 for more details
<b>Programming Example</b> OUTPUT 714;"SYSTem:PRESET" !Partial preset when changing from remote to manual operation.	

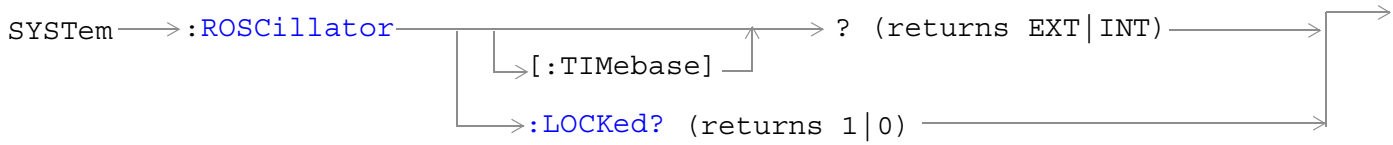
### SYSTem:PRESet2

Function	<p>Performs a full preset of the test set. This is the remote equivalent of pressing the SHIFT Preset keys on the front panel of the test set.</p> <p>All parameters are set to their default values. All measurements are aborted the trigger arm is set to continuous. See “<a href="#">Trigger Arm (Single or Continuous) Description</a>” on page 148.</p> <p>The *RST command will set the trigger arm to single.</p>
Related Topics	See “ <a href="#">Full Preset</a> ” on page 567 or details about the *RST full preset.
<b>Programming Example</b> OUTPUT 714;"SYSTem:PRESET2" !Full preset, trigger arm set to continuous.	

**SYSTem:PRESet3**

Function	<p>Performs a partial preset. This is the recommended command for users when a partial preset is needed during remote operation of the test set.</p> <p>Any call in process is disconnected and all measurements are aborted and inactivated. Measurement parameters are not changed.</p> <p>A partial preset will not modify any measurement settings including trigger arm. See <a href="#">“Trigger Arm (Single or Continuous) Description” on page 148.</a></p>
Related Topics	See <a href="#">“Partial Preset” on page 567</a> for more details.
<p><b>Programming Example</b></p> <pre>OUTPUT 714;"SYSTEM:PRESET3" !Partial preset when in remote operation.</pre>	

## SYSTEM:ROSCillator



“Diagram Conventions” on page 267

### SYSTEM:ROSCillator[:TIMEbase]?

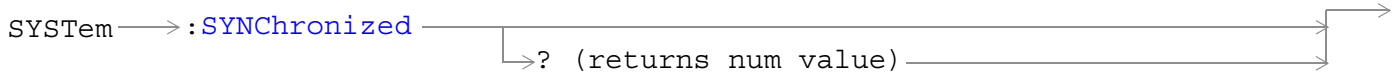
Function	Queries the timebase source. If an external timebase is used, it must have these characteristics: <ul style="list-style-type: none"> <li>• an output level of 0 to +13 dBm</li> <li>• frequency of 10 MHz</li> </ul>
Query	Range: INT = internal source EXT = external source

### SYSTEM:ROSCillator:LOCKed?

Function	Queries the timebase to find out if it is locked or unlocked. Returns 0 or 1.
Query	Range: 0 = unlocked 1 = locked

---

## SYSTEM:SYNChronized



[“Diagram Conventions” on page 267](#)

### SYSTEM:SYNChronized

Function	Sets/queries the test set to see that all prior sequential commands have completed or that all prior overlapped commands have started, indicating that the input buffer is synchronized.
Setting	Bit 12 of the status operation condition register is pulsed.
Query	Range: 1

# 6 General Usage





## Frequency Banded Parameters

Several parameters only affect test set operation in a particular frequency band. These are referred to as frequency banded parameters. The two bands used for the AMPS/136 Mobile Test Application are Cellular (800 MHz) and PCS (1900 MHz).

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 PCS band, the MS TX level can be set to 4 for the Cellular frequency band without affecting the mobile's output. When a handover to the Cellular band is made, the MS TX level of 4 for Cellular band will already be set and take effect.

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 (active) band. In the same way, querying a frequency banded parameter without specifying the band returns the value for the active band.

### List of Frequency Banded Parameters

The following are frequency banded parameters:

- DCCH Channel Number - See [“CALL:DCCH” on page 289](#).
- DTC Channel Number - See [“CALL:SETup” on page 324](#).
- Digital MS Power Level - See [“CALL:SETup” on page 324](#).
- Manual Digital Expected Power Level - See [“RFANalyzer” on page 416](#).
- ACC Channel Number (currently restricted to cellular band operation). See [“CALL:ACC” on page 282](#)
- AVC Channel Number (currently restricted to cellular band operation). See [“CALL:SETup” on page 324](#).
- Analog MS Power Level (currently restricted to cellular band operation). See [“CALL:SETup” on page 324](#).
- Manual Analog Expected Power Level (currently restricted to cellular band operation). See [“RFANalyzer” on page 416](#).

### GPIB Examples of Frequency Banded Parameters

```

10  OUTPUT 714;"CALL:DCCH:BAND PCS" !Select PCS band for the digital control channel.
20  OUTPUT 714;"CALL:DCCH:PCS 789" !Set the channel number for the PCS band DCCH. This
30  !value only affects PCS band DCCH operation, not Cellular band DCCH operation.
40  !
50  OUTPUT 714;"CALL:SETup:DTC:BAND PCS" !Select PCS band for digital traffic channel.
60  OUTPUT 714;"CALL:SETup:DTC:PCS 777" !Set the channel number for the PCS band DTC.
70  !This value only affects PCS band DTC operation, not Cellular band DTC operation.
80  !
90  OUTPUT 714;"CALL:SETup:MS:DIGital:TXLevel:PCS 1" !Set the MS TX level for
100 !the mobile station operating in PCS band to MS level 1. This value only affects
110 !PCS band DTC operation, not Cellular band DTC operation.
120 !
130 OUTPUT 714;"RFANalyzer:MANual:DIGital:POWer:PCS 28 DBM" ! Set the expected power
140 !for digital PCS band signals to 28 dBm. This command only sets the manual expected
141 !power for PCS band digital signals, and does not affect the expected power for
142 !cellular band digital signals. This command only affects test set operation when

```

## Frequency Banded Parameters

```
150 !the command "RFANalyzer:CONTROL:POW:AUTO OFF" is sent to enable manual RF analyzer
151 !control.
180 !
190 END
```

## Related Topics

\*\*\*\*\*

["Programming Handoffs" on page 115](#)

["Configuring the Control Channel \(CCH\)" on page 552](#)

["Configuring the Traffic Channel \(TCH\)" on page 565](#)

["Receiver Control" on page 561](#)

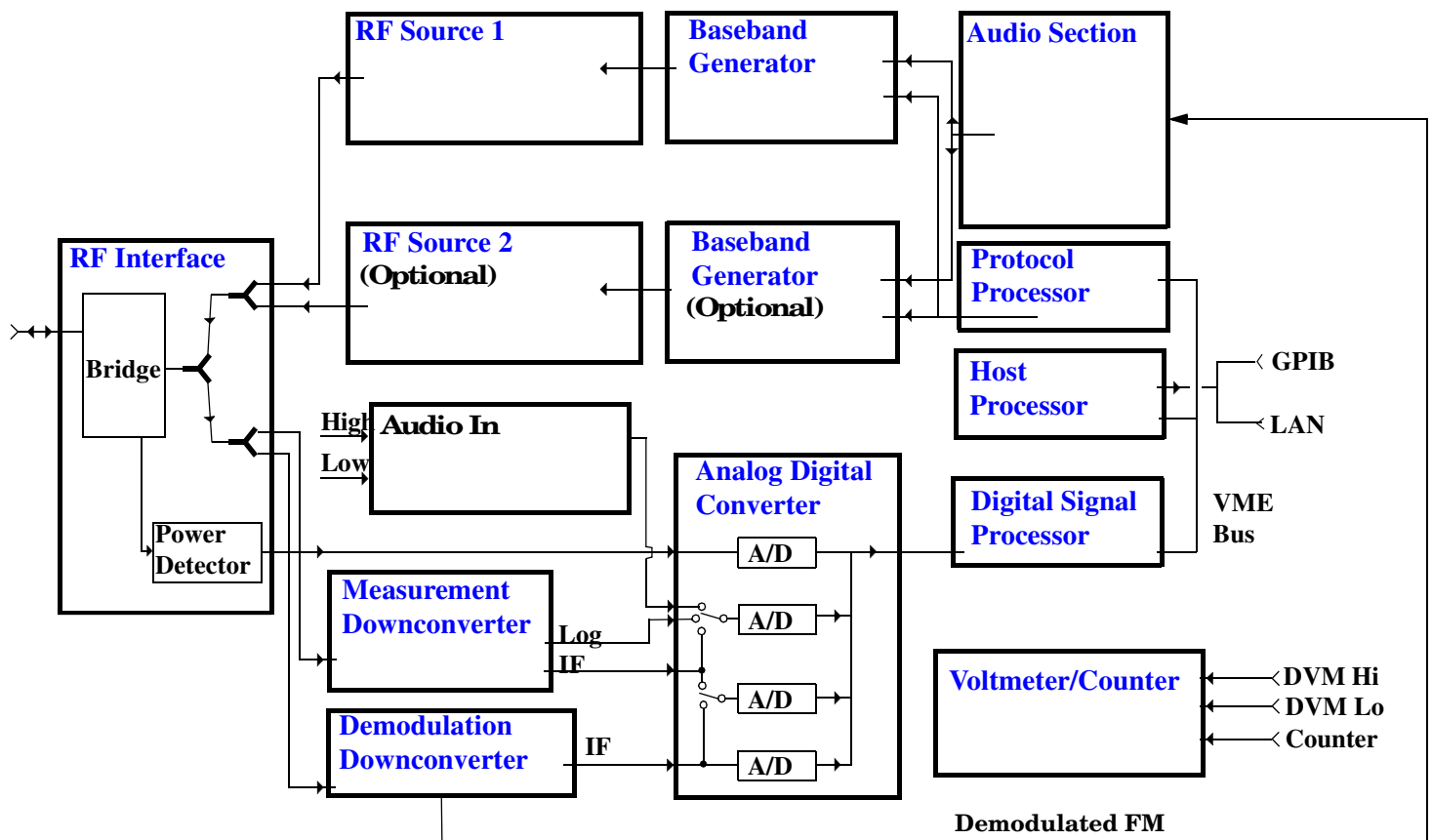
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## Block Diagram

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 119.

## 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

## Block Diagram

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 from the Digital Signal Processing and Protocol Processor modules to the appropriate output device (display, GPIB, 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.

## Block Diagram

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 V<sub>pk</sub> into > 600 ohm loads, and up to 0.8 V<sub>pk</sub> 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.

Demodulated audio can be selected from either of two Demodulation Downconverters. 300 - 3000 Hz BPF, 750 usec de-emphasis, and expander 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

Active cell mode is used to emulate a normal AMPS/136 cell interacting with the mobile station (MS), and is the default operating mode. Active cell mode is used to provide mobile operations such as camping, registering, paging, handoffs, and releasing calls, using over-the-air signaling. Except for the Loopback BER measurement (which is made in DTC test mode), all mobile measurements can be made using active cell mode. Subscriber information about the MS is also returned after registration and origination.

Call processing can be performed using a digital control channel (DCCH) or an analog control channel (ACC), and measurements can be made on a digital traffic channel (DTC) or on an analog voice channel (AVC). For more detail on the contents of these signals, see [“DCCH and DTC Descriptions” on page 546](#) and [“ACC and AVC Descriptions” on page 546](#).

DTC and AVC test operating modes are used if it is not possible, or not desired, to communicate with the mobile station via over-the-air signaling to make measurements. See [“DTC Test Operating Mode” on page 557](#) and [“AVC Test Operating Mode” on page 548](#).

## Active Cell Features

The basic features provided by active cell operating mode are:

- Generation of an analog or digital control channel.
- Call setup, both mobile station originated and base station emulator originated (paging).
- Registration of the mobile station, resulting in the following mobile station information being returned: ESN (Decimal and Hex), MIN1 (Hex), MIN2 (Hex), phone number, SCM, rate capability, digital MS protocol version, and MS called party number (for mobile-originated calls).
- Handoffs between channels of the same type (AVC to AVC, or DTC to DTC), handoffs between a DTC and an AVC, and handoffs between a cellular band DTC or AVC and a PCS band DTC.
- Changing traffic or voice channel parameters during a call using over-the-air signaling (such as MS transmit power level changes).
- Voice echoing through the mobile’s earpiece is available when the mobile is on a DTC.
- Base station emulator initiated and mobile station initiated call disconnection.
- Most measurements supported in the test application are available.
- The base station emulator automatically controls the test set’s demodulation receiver.
- The status of the call can be queried and used for program control.

## Setting the Test Set’s Operating Mode to Active Cell Mode

The active cell operating mode is set using the following test set command:  
OUTPUT 714;”CALL:OPERating:MODE CALL”

## Typical Operating Steps for Active Mode Testing

The exact order of testing an AMPS/136 mobile can vary greatly. The following steps provide a general order of testing to verify mobile station operation. For a step-by-step programming description, see [“Programming the Agilent Technologies 8960 Series 10 for TIA/EIA-136 Mobile Testing in Active Cell Operating Mode” on page](#)



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1. Enter any path loss between the mobile station and the test set as an Amplitude Offset. See [“Measurement Related Configuration” on page 599](#).
2. Select the Active Cell operating mode.
3. Select the Control Channel Type.
4. Set the control channel parameters. For a DCCH, these include the DCCH band, DCCH Channel, DCCH DVCC, and DCCH Burst Size (see [“Operating Considerations - DCCH Settling Time” on page 545](#)). For an ACC, set the ACC Channel number.
5. Set the Cell Power level. This level will be used for both control and traffic (voice) channels unless you change this level in your program.
6. Set the traffic or voice channel parameters to use when setting up a call. For a DTC, these include the band, DTC channel number, Dig MS TX Level, DTC DVCC, DTC timeslot, DTC burst size, and vocoder type. For an AVC, these include the MS TX Level, SAT color code, AVC channel number, and FM frequency and deviation (if desired).
7. Connect the antenna port of the mobile to the test set’s RF IN/OUT port and turn the mobile on.
8. Setup the measurements you want to make using the SETup syntax for each measurement.
9. After the mobile has camped on the control channel, originate a call from the test set or from the mobile. To originate a call from the test set, enter a paging number and issue the command to originate the call. To originate a call from the mobile, dial a number on the mobile’s keypad and initiate the call (such as pressing SEND).
10. Use the CALL STATus and CALL CONNected subsystems to determine when the mobile is in the connect state (connected on a traffic or voice channel). See [“Call Processing State Synchronization” on page 39](#).
11. If needed, query the returned mobile station information to verify correct mobile programming or to enter mobile information into a data base. See [“CALL:MS” on page 302](#).
12. Start each measurement using the INITiate syntax for each measurement.
13. Use the FETCh syntax to query each measurement result.
14. Enter the traffic or voice channel settings for the channel you want to hand off to.
15. Issue the handoff command to change the mobile’s traffic or voice channel.
16. Repeat steps 9 through 14 until all measurements are completed.

## Operating Considerations - DCCH Settling Time

Digital Control Channel (DCCH) parameters take up to five seconds to take effect when using the Active Cell operating mode. A protocol error will result if your test program does not allow enough time for the settings to take effect before attempting to originate a call. To provide settling time without using WAIT statements in your program, set up the DCCH at the start of your program before setting up measurement parameters or other test set settings. You can also use the repeat registration and repeat paging commands to prevent errors from occurring during registration or origination immediately after changing DCCH parameters. See [“CALL:PAGing:REPeat” on page 318](#) and [“CALL:REGister” on page 321](#).

## Related Topics

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[“CALL\[:CELL\]:OPERating:MODE” on page 315](#)

[“AVC Test Operating Mode” on page 548](#)

[“DTC Test Operating Mode” on page 557](#)

[“Configuring the Traffic Channel \(TCH\)” on page 565](#)

\*\*\*\*\*

## DCCH and DTC Descriptions

The following paragraphs describe the contents of the DCCH and DTC. Refer to the TIA/EIA-136.1 standard for a description of the various frame types, their contents, and their functions.

- The **digital control channel (DCCH)** is a full-rate non-burst signal on a user-selectable channel number. DCCH overhead messaging uses timeslots 1 and 4; with all other timeslots containing forward DTC filler data.

Each DCCH hyperframe is segmented into F-BCCH, E-BCCH, and SPACH slots, with no S-BCCH or Reserved slots allocated. The F-BCCH logical channel transmits the following messages: DCCH Structure, Access Parameters, Control Channel Selection Parameters, Registration Parameters, System Operator Code, and System Identity. The E-BCCH logical channel transmits the Neighbor Cell, System Operator Code, and Regulatory Configuration information. All remaining hyperframe slots are allocated to the PCH subchannel of the SPACH logical channel.

DCCH settings can take up to five seconds to take effect (see [“Operating Considerations - DCCH Settling Time” on page 545](#)).

- The **digital traffic channel (DTC)** is a full-rate, non-burst channel on a user-selectable channel number and on a user-selectable timeslot pair (1 and 4, 2 and 5, or 3 and 6). The remaining two unused forward DTC timeslot pairs contain forward DTC filler data.

## ACC and AVC Descriptions

The following paragraphs describe the contents of the ACC and AVC. Refer to the TIA/EIA-136.2 standard for a description analog control and voice channel operation.

- The **analog control channel (ACC)** is a continuous wideband data stream. Overhead and control-filler messages are sent on streams A and B. Mobile station control messages are sent on either stream A or stream B, depending on the mobile’s mobile identification number (MIN). Busy/idle bits are all set to 1 (idle). The BIS bit of the Access Type Parameters Global Action Message is set to 0 (zero), causing the mobile to ignore the state of the busy/idle bit during access attempts.

The overhead message train contains the following messages: System Parameter Overhead message, Access Type Parameters Global Action message, and Registration Identification Message (transmitted only during forced registration).

If the overhead message train or a mobile control message is not being sent, the Control-Filler Message is sent instead.

## ACC to DTC Burst Size Considerations

When a mobile that is camped on an ACC is commanded to go to a DTC, the mobile is *always* commanded to use shortened bursts on the DTC, regardless of the DTC Burst Size control setting. However, when originating a call from a DCCH to a DTC, or anytime a handoff to a DTC is performed, the DTC Burst Size you specify is used. See [“CALL:DTC:BURSt” on page 292](#).

- The **analog voice channel (AVC)** is a frequency modulated (FM) carrier containing one or more of the following signals:
  - Supervisory audio tone (SAT) - is settable to three frequencies: SAT1 (5970 Hz), SAT2 (6000 Hz), SAT3 (6030 Hz). Unless wideband data is being sent, SAT is always being transmitted on the AVC.
  - Wideband data - is used for sending digital messages to the mobile, and is only on while a message is being sent. The SAT and Audio signals are muted while wideband data is being sent. Messages are sent using Manchester-encoded FSK at a rate of 10 kbps and 8 kHz deviation.
  - Audio (voice) - is controlled by the user by allowing or muting the audio signal from the mobile. The audio received by the test set on the mobile's reverse analog voice channel (RVC) is re-transmitted by the test set on the forward AVC. The audio signal from the test set is muted while wideband data is being sent.

See [“Forward Channel FM Operation” on page 548](#) for more information on using internal and external FM.

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## AVC Test Operating Mode

Analog Voice Channel (AVC) test mode provides a forward voice channel for operating AMPS mobiles in test mode. This allows you to get the mobile transmitting on an AVC and test many functions in the mobile without the need to register or page the mobile.

### AVC Test Mode Operation

When the test set's operating mode is AVC test mode:

- No over the air signaling is available.
- Changes to the test set's AVC channel assignment occur immediately.
- When the test set's AVC channel is changed, the base station emulator is automatically reconfigured to receive the corresponding reverse AVC signal from the mobile. If needed, you can disable this operation by selecting manual receiver frequency control. See [“Receiver Control” on page 561](#).
- Changes to the MS TX Level automatically set the expected analog input power. If needed, you can disable this operation by selecting manual receiver power control. See [“Receiver Control” on page 561](#).
- SAT modulation of the test set's forward AVC can be turned on or off, and can be set to any of the three color code frequencies.
- Internal FM of the forward AVC is available for various audio frequency tests.
- An external FM source can be used to provide addition frequency modulation of the forward AVC.

### Forward Channel FM Operation

Frequency modulation of the forward channel in AVC test mode is a combination of the SAT, internal FM, and external FM settings. No wideband data is present.

To meet specifications, the total peak FM deviation cannot exceed 20 kHz. Limitations for each FM source are as follows:

- SAT - can be turned on or off, and has three color code selections: SAT1 (5970 Hz), SAT2 (6000 Hz), SAT3 (6030 Hz). Peak deviation is fixed at 2 kHz.
- Internal FM - can be turned on or off, has a rate range of 100 Hz to 20 kHz, and a peak deviation range of 0 Hz to 20 kHz.
- External FM - uses the test set's rear-panel FM Mod In port to connect an external modulation source. The fixed peak deviation for a 100 Hz to 20 kHz tone is 20 kHz/Volt.

### AVC Test Mode Operation Using Automated Receiver Control

The following procedure demonstrates the use of AVC test mode where the base station emulator's RF generator frequency, measurement receiver frequency, and expected input power are automatically set by the call control settings used. This is the most common way to use test mode because it requires less individual configuration of call parameters.

This procedure provides general programming steps, but is not written around any specific test requirements. Some of the settings shown are the default power up settings for AVC Test mode.

Putting the mobile in analog test mode at the correct channel number and power setting is the responsibility of the user.

1. Select AVC Test mode.  
OUTPUT 714;"CALL:OPERating:MODE AVCT"
2. Turn on the base station emulator's RF Generator and set the output level to -50 dBm.  
OUTPUT 714;"CALL:POWer -50"
3. Set the AVC channel number to 777.  
OUTPUT 714;"CALL:SETup:AVC 777"
4. Set the MS TX Level to two (2). (This is the mobile's power level setting, not the expected power in dBm.)  
OUTPUT 714;"CALL:SETup:MS:ANALog:TXLevel:CELLular 2"
5. Turn the forward channel AVC SAT on.  
OUTPUT 714;"CALL:AVCTest:AVC:SATone:STATE ON"
6. Set the SAT color code to SAT1 (5970 Hz).  
OUTPUT 714;"CALL:SETup:AVC:SATone SAT1"
7. Turn on internal FM, and set the deviation to 8.0 kHz and the rate to 1004 Hz.  
OUTPUT 714;"CALL:FM:INTernal 8 KHZ;INT:FREQuency 1004 HZ"  
  
If you do not want internal FM on, use the FM State command to turn it off:  
OUTPUT 714;"CALL:FM:INTernal:STATE OFF"
8. Turn external FM off.  
OUTPUT 714;"CALL:FM:EXTernal:STATE OFF"
9. Connect the mobile's antenna port to the test set's RF IN/OUT port and put the mobile in analog test mode, transmitting at power level two on channel 777.

If your mobile's audio is not muted, you should hear a 1004 Hz tone out of its speaker. If you have an acoustic or direct connection to the mobile's audio output, you can make audio measurements through the test set's AUDIO IN connections. See ["Audio Analyzer Measurement Description" on page 57](#).

You can also make analog transmit power and frequency stability measurements on the mobile's reverse channel carrier. If you modulate your mobile's carrier, you can measure the frequency modulation characteristics. See ["Analog Transmit Power Measurement Description" on page 52](#), ["Frequency Stability Measurement Description" on page 87](#), and ["Frequency Modulation \(FM\) Measurement Description" on page 81](#).

## AVC Test Mode Operation Using Manual Receiver Control

Note: Changing the operating mode affects manual receiver control parameters. See ["Effects on Receiver Control When Changing Operating Mode" on page 564](#).

The following procedure demonstrates the use of AVC test mode where the base station emulator's RF generator frequency, measurement receiver frequency, and expected input power are manually configured. Manual control is not commonly used in production testing, but is provided to allow the measurement receiver and RF generator to be used to perform tests where automated control may not be used; such as when tuning the receiver to make measurements outside of the cellular band during AMPS testing.

This procedure provides general programming steps, but is not written around any specific test requirements. Some of the settings shown are the default power up settings for AVC Test mode.

**AVC Test Operating Mode**

Putting the mobile in analog test mode at the correct channel number and power setting is the responsibility of the user.

1. Select AVC Test mode.

```
OUTPUT 714;"CALL:OPERating:MODE AVCT"
```

2. Turn on the base station emulator's RF Generator and set the output level to -50 dBm.

```
OUTPUT 714;"CALL:POWer -50"
```

3. Set the base station emulator's RF generator to 893.310 MHz; the forward channel frequency for channel 777.

```
OUTPUT 714;"CALL:RFGenerator:FREQuency 893.310 MHZ"
```

4. Enable manual receiver frequency control and tune the measurement receiver to 848.31 MHz (reverse channel 777).

```
OUTPUT 714;"RFANalyzer:MANual:MEASurement 848.310 MHZ"
```

5. Enable manual control of the receiver's expected analog input level power setting.

```
OUTPUT 714;"RFANalyzer:CONTRol:POWer:AUTO OFF"
```

6. Set the expected input level value to correspond to mobile station power level two.

```
OUTPUT 714;"RFANalyzer:MANual:ANALog:POWer 28 DBM"
```

7. Turn the forward channel AVC SAT on.

```
OUTPUT 714;"CALL:AVCTest:AVC:SATone:STATe ON"
```

8. Set the SAT color code to SAT1 (5970 Hz).

```
OUTPUT 714;"CALL:SETup:AVC:SATone SAT1"
```

9. Turn on internal FM, and set the deviation to 8.0 kHz and the rate to 1004 Hz.

```
OUTPUT 714;"CALL:FM:INTernal 8 KHZ;INT:FREQuency 1004 HZ"
```

If you do not want internal FM on, use the FM State command to turn it off:

```
OUTPUT 714;"CALL:FM:INTernal:STATe OFF"
```

10. Turn external FM off.

```
OUTPUT 714;"CALL:FM:EXTernal:STATe OFF"
```

11. Connect the mobile's antenna port to the test set's RF IN/OUT port and put the mobile in analog test mode, transmitting at power level two and channel 777.

If your mobile's audio is not muted, you should hear a 1004 Hz tone out of the speaker. If you have an acoustic or direct connection to the mobile's audio output, you can make audio measurements through the test set's AUDIO IN connections. See ["Audio Analyzer Measurement Description" on page 57](#).

You can also make analog transmit power and frequency stability measurements on the mobile's reverse channel carrier. If you modulate your mobile's carrier, you can measure the frequency modulation characteristics. See ["Analog Transmit Power Measurement Description" on page 52](#), ["Frequency Stability Measurement Description" on page 87](#), and ["Frequency Modulation \(FM\) Measurement Description" on page 81](#).

## Related Topics

\*\*\*\*\*

[“Programming the Agilent Technologies 8960 Series 10 for TIA/EIA-136 Mobile Testing in Test Mode” on page 217](#)

[“Receiver Control” on page 561](#)

[“DTC Test Operating Mode” on page 557](#)

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## Configuring the Control Channel (CCH)

The control channel parameters are configured using the following call processing subsystem functions and commands.

### CCH Parameters

- Cell Power - for both digital control channel (DCCH) and analog control channel (ACC) level.
- Cell Power State
- Control Channel Type: DCCH or ACC
- DCCH Band: Cellular (800 MHz) or PCS
- DCCH Channel number
- ACC Channel number
- System ID
- SOC (System Operator Code)
- MCC (Mobile Country Code)

### GPIB Examples:

#### Cell Power and State (complex command)

```
OUTPUT 714;"CALL:POWer -85 DBM"
```

would set the cell power state to on and set the cell's RF transmitter power to -85 dBm. See ["CALL:POWer" on page 319](#).

#### Cell Power

```
OUTPUT 714;"CALL:POWer:AMPLitude -85 DBM"
```

would set the cell's RF transmitter power to -85 dBm if the cell power state is set to on. If the cell power state is set to off, this command is remembered by the test set but does not take effect until the cell power state is changed to on. See ["CALL:POWer" on page 319](#).

#### Cell Power State

```
OUTPUT 714;"CALL:POW:STAT ON"
```

would turn on the cell's RF transmitter. See ["CALL\[:CELL\]:POWer:STATe" on page 320](#).

#### Control Channel Type

```
OUTPUT 714;"CALL:CCHannel:TYPE DCCH"
```

would select a digital control channel (DCCH). See ["CALL:CCHannel" on page 284](#).



## DCCH Band

OUTPUT 714;"CALL:DCCH:BAND CELLular"

would select the cellular (800 MHz) band for the DCCH. See ["CALL:DCCH" on page 289](#).

## DCCH Channel Number

See ["CALL:DCCH" on page 289](#).

OUTPUT 714;"CALL:DCCH 777"

would set the active digital control channel to 777.

OUTPUT 714;"CALL:DCCH:CELLular 556"

would set the cellular band (800 MHz) digital control channel to 556.

OUTPUT 714;"CALL:DCCH:PCS 588"

would set the PCS band (1900 MHz) digital control channel to 588.

## ACC Channel Number

OUTPUT 714;"CALL:ACC 334"

would set the analog control channel to 334. See ["CALL:ACC" on page 282](#).

## System ID

OUTPUT 714;"CALL:SID 231"

would set the system ID number to 231. See ["CALL:SID" on page 335](#).

## SOC

OUTPUT 714;"CALL:SOC 479"

would set the system operator code to 479. See ["CALL:SOCode" on page 336](#).

## MCC

OUTPUT 714;"CALL:MCC 777"

would set the mobile country code to 777. See ["CALL:MCCCode" on page 301](#).

## Operating Considerations

There are a number of parameters for the control channel and the traffic channel (see ["Configuring the Traffic Channel \(TCH\)" on page 565](#)) 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.

Changes to the DCCH do not take effect immediately. See ["Operating Considerations - DCCH Settling Time" on page 545](#).

Parameters can be queried from the test set regardless of the state of the test set.

## Related Topics

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[“Frequency Banded Parameters” on page 537](#)

[“Configuring the Traffic Channel \(TCH\)” on page 565](#)

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## CW Operating Mode

CW operating mode provides an unmodulated carrier of adjustable frequency and amplitude, manual adjustment of the measurement receiver and demodulation (uplink) receiver frequencies, and manual setting of the expected CW input power.

Note: Changing the operating mode affects manual receiver control parameters. See [“Effects on Receiver Control When Changing Operating Mode”](#) on page 564.

## CW Test Mode Operation

When the test set's operating mode is set to CW:

- No over the air signaling is used.
- No demodulation or channel decoding is available.
- An unmodulated RF signal can be generated while analyzing another signal (at the same frequency or at a different frequency). No interaction exists between these controls.
- With the exception of mobile reported values, all test set measurements are accessible. Immediate triggering should be used for most measurements because no overhead signaling is occurring. Protocol triggering will time-out (if time-outs are enabled) or report an integrity indicator other than zero (0) and not provide valid results. RF Rise triggering may or may not work, depending on the type of signal being measured.
- Expected CW power, measurement receiver frequency, and uplink receiver frequency are available as manual settings only; no automatic control is provided.

## CW Mode Operation

The following command examples show you how to control each function for CW operating mode:

1. Select CW operating mode:  
OUTPUT 714;"CALL:OPERating:MODE CW"
2. Set the cell power output level to be transmitted by the test set:  
OUTPUT 714;"CALL:POWer -45 DBM"
3. Set the RF generator frequency:  
OUTPUT 714;"CALL:RFGenerator:FREQuency 870 MHZ"
4. Set the expected CW power level to be received by the test set:  
OUTPUT 714;"RFANalyzer:CW:EXPEcted:POWer 23 DBM"
5. Set the measurement receiver frequency:  
OUTPUT 714;"RFANalyzer:MANual:MEASurement 870.030 MHZ"
6. Set the uplink (demodulation) receiver frequency. (Not typically used in CW operating mode):  
OUTPUT 714;"RFANalyzer:MANual:UPLink 870.030 MHZ"

## **Related Topics**

\*\*\*\*\*

[“Active Cell Operating Mode” on page 544](#)

[“AVC Test Operating Mode” on page 548](#)

[“DTC Test Operating Mode” on page 557](#)

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## DTC Test Operating Mode

Digital Traffic Channel (DTC) test mode provides a forward digital traffic channel (FDTC) for operating TDMA mobiles in test mode in the cellular and PCS bands.

### DTC Test Mode Operation

When the test set's operating mode is DTC test mode:

- No over the air signaling or message decoding is available.
- The generated DTC contains a repeating random pattern (voice echoing is not supported).
- Changes to the test set's DTC channel assignment and band occur immediately.
- When the test set's DTC channel or band is changed, the base station emulator is automatically reconfigured to receive the corresponding reverse DTC signal from the mobile. If needed, you can disable this operation by selecting manual receiver frequency control. See ["Receiver Control" on page 561](#).
- Changes to the MS TX Level automatically set the expected digital input power for the selected band. If needed, you can disable this operation by selecting manual receiver power control. See ["Receiver Control" on page 561](#).
- It is the user's responsibility to match the mobile's test mode settings to the test set's base station emulator settings in order to synchronize the mobile to the test set's FDTC. These settings include the DTC band and channel number, DTC timeslot, DTC vocoder, DTC digital verification color code (DVCC), and MS TX Level.
- Digital transmit power, modulation accuracy, adjacent channel power, and loopback BER measurements can all be made on the reverse DTC if the mobile is synchronized properly to the test set.

### DTC Test Mode Operation Using Automated Receiver Control

The following procedure demonstrates the use of DTC test mode where the base station emulator's RF generator frequency, measurement receiver frequency, and expected input power are automatically set by the call control settings used. This is the most common way to use test mode because it requires less individual configuration of call parameters.

This procedure provides general programming steps, but is not written around any specific test requirements. Some of the settings shown are the default power up settings for DTC test mode, and may not need to be changed in your program.

Putting the mobile in digital test mode and configuring it to match the settings used in the actual DTC test mode program is the user's responsibility.

1. Select DTC Test operating mode.  
OUTPUT 714;"CALL:OPERating:MODE DTCT"
2. Turn on the base station emulator's RF Generator and set the output level to -50 dBm.  
OUTPUT 714;"CALL:POWer -50"
3. Set the DTC band to Cellular (800 MHz).  
OUTPUT 714;"CALL:SETup:DTC:BAND CELLular"
4. Set the DTC channel number to 777.  
OUTPUT 714;"CALL:SETup:DTC 777"

**DTC Test Operating Mode**

5. Set the MS TX Level to two (2). (This is the mobile's power level setting, not the expected power in dBm.)  
OUTPUT 714;"CALL:SETup:MS:DiGital:TXLevel 2"
6. Set the DTC Timeslot to 1 & 4.  
OUTPUT 714;"CALL:SETup:DTC:TSLot 1"
7. Set the DTC Digital Verification Color Code (DVCC) to 1.  
OUTPUT 714;"CALL:SETup:DTC:DVCCCode 1"
8. Set the vocoder type to ACELP (CC1)  
OUTPUT 714;"CALL:SETup:DTC:VOCoder ACEL1"
9. Connect the mobile's antenna port to the test set's RF IN/OUT port and put the mobile in digital test mode, transmitting at power level two on channel 777 in the cellular (800 MHz) band.

If the mobile synchronized properly to the test set, you can now make measurements on the mobile's reverse digital traffic channel. See ["Adjacent Channel Power Measurement Description" on page 48](#), ["Digital Modulation Accuracy Measurements Description" on page 74](#), and ["Digital Transmit Power Measurement Description" on page 70](#). Loopback BER can be measured by selecting the Loopback BER measurement and then reducing the cell power to the desired measurement level.

**DTC Test Mode Operation Using Manual Receiver Control**

Note: Changing the operating mode affects manual receiver control parameters. See ["Effects on Receiver Control When Changing Operating Mode" on page 564](#).

The following procedure demonstrates the use of DTC test mode where the base station emulator's RF generator frequency, measurement receiver frequency, and expected input power are manually configured. Manual is provided to allow the measurement receiver and RF generator to be used to perform tests where automated control may not be used.

This procedure provides general programming steps, but is not written around any specific test requirements. Some of the settings shown are the default power up settings for DTC Test mode.

Putting the mobile in digital test mode and configuring it to match the settings used in the actual DTC test mode program is the user's responsibility.

1. Select DTC Test mode.  
OUTPUT 714;"CALL:OPERating:MODE DTCT"
2. Turn on the base station emulator's RF Generator and set the output level to -50 dBm.  
OUTPUT 714;"CALL:POWer -50"
3. Set the base station emulator's RF generator to 893.310 MHz; the forward channel frequency for channel 777.  
OUTPUT 714;"CALL:RFGenerator:FREQuency 893.310 MHz"
4. Enable manual receiver frequency control and tune the measurement receiver to 848.31 MHz (reverse channel 777).  
OUTPUT 714;"RFANalyzer:MANual:MEASurement 848.310 MHz"
5. Enable manual control of the receiver's expected cellular (800 MHz) band digital input power setting.  
OUTPUT 714;"RFANalyzer:CONTRol:POWer:AUTO OFF"
6. Set the expected power value to correspond to mobile station power level two.  
OUTPUT 714;"RFANalyzer:MANual:DiGital:POWer 28 DBM"
7. Set the DTC Timeslot to 1 & 4.  
OUTPUT 714;"CALL:SETup:DTC:TSLot 1"

8. Set the DTC Digital Verification Color Code (DVCC) to 1.

OUTPUT 714;"CALL:SETup:DTC:DVCCode 1"

9. Set the vocoder type to ACELP (CC1)

OUTPUT 714;"CALL:SETup:DTC:VOCoder ACEL1"

10. Connect the mobile's antenna port to the test set's RF IN/OUT port and put the mobile in digital test mode, transmitting at power level two and channel 777 in the cellular band.

If the mobile synchronized properly to the test set, you can now make measurements on the mobile's reverse digital traffic channel. See ["Adjacent Channel Power Measurement Description" on page 48](#), ["Digital Modulation Accuracy Measurements Description" on page 74](#), and ["Digital Transmit Power Measurement Description" on page 70](#). Loopback BER can be measured by selecting the Loopback BER measurement and then reducing the cell power to the desired measurement level.

## Related Topics

\*\*\*\*\*

["Programming the Agilent Technologies 8960 Series 10 for TIA/EIA-136 Mobile Testing in Test Mode" on page 217](#)

["Receiver Control" on page 561](#)

["AVC Test Operating Mode" on page 548](#)

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## 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

- Mobile Station (MS) TX Level (for an AVC). Takes effect after origination or handoff.  
OUTPUT 714;"CALL:SETup:MS:ANALog:TXLevel 3" !Specifies mobile power level 3.
- Mobile Station (MS) TX Level (for a DTC). Takes effect after origination or handoff.  
OUTPUT 714;"CALL:SETup:MS:DIGital:TXLevel 3" !Specifies mobile power level 3.
- Mobile Station (MS) TX Level (for an AVC). Immediately changes the AVC MS TX Level.  
OUTPUT 714;"CALL:MS:ANALog:TXLevel 5" !Specifies mobile power level 5.
- Mobile Station (MS) TX Level (for a DTC). Immediately changes the DTC MS TX Level.  
OUTPUT 714;"CALL:MS:DIGital:TXLevel 5" !Specifies mobile power level 5.

### Operating Considerations

The command to change the MS TX Level is not issued to the mobile until one of the following actions is performed:

- The mobile is brought up on a traffic channel after camping on a control channel.
- A handoff is performed. See [“Programming Handoffs” on page 115](#).
- A command is sent to immediately change the level without performing a handoff.

There are a number of parameters for the control channel (see [“Configuring the Control Channel \(CCH\)” on page 552](#)) and the traffic channel (see [“Configuring the Traffic Channel \(TCH\)” on page 565](#)) 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.

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 [“Receiver Control” on page 561](#).

The CALL:SETup:MS:DIGital|ANALog:TXLevel commands set the MS TX Level for the active band. See [“Frequency Banded Parameters” on page 537](#).

### Related Topics

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[“CALL:SETup” on page 324](#)

[“CALL:MS” on page 302](#)

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## Receiver Control

The test set normally sets all receiver parameters automatically using call control settings. You may want to control the test set's receiver parameters manually rather than allowing the test set to control them. This ability is referred to as manual receiver control.

### Selecting Manual or Automatic Receiver Control

- Auto mode is the default for all operating modes except CW (which defaults to manual mode). The receiver's expected power and measurement frequency settings are set automatically according to the call control settings you specify (AVC/DTC Channel number, DTC Band, and MS TX Level).
- Manual mode allows you to override some or all of the automatic settings by first selecting the manual mode for the setting and then specifying the desired value. You can view the affected settings by selecting F12 (Receiver Control) from the Call Setup screen. A full or partial preset of the test set, including cycling power, returns the test set back to auto mode.

### GPIO Examples

The following program examples use simple commands to perform a single function. Complex commands that enable manual receiver control and set a specified parameter at the same time are also available. See [“RFANalyzer” on page 416](#) for a listing of all receiver control syntax.

```
OUTPUT 714;"RFANalyzer:CONTROL:MEASUREMENT:FREQUENCY:AUTO OFF" !Enables manual control of the measurement receiver's frequency.
```

```
OUTPUT 714;"RFANalyzer:MANUAL:MEASUREMENT:FREQUENCY 825.030 MHZ" !Tunes the measurement receiver to 825.030 MHz through manual receiver control.
```

```
OUTPUT 714;"RFANalyzer:CONTROL:MEASUREMENT:FREQUENCY:AUTO ON" !Returns measurement receiver frequency tuning control to auto.
```

Manual control parameter values are stored internally (as long as the test set is powered on). Enabling manual control of a parameter without providing a new value causes a previously stored value to immediately take effect. This allows you to pre-define manual control parameter values in your program before enabling manual control.

## Operating Mode and Receiver Control

### Manual Receiver Control Parameters

The following parameters can be individually set to manual control:

- Expected Power Control
- Measurement Frequency
- Link Frequency

**Receiver Control**

**Expected Power Control** The expected power from the mobile is set manually using the following settings (see “Expected Power” on page 563):

- **Analog Power Cellular Band** - expected power for cellular band AMPS (analog) measurements when operating in the AVC Test or Active Cell operating modes:  

```
OUTPUT 714;"RFANalyzer:MANual:ANALog:POWer:CELLular 24 DBM"
```
- **Digital Power Cellular Band** - expected power for TDMA (digital) signals in the cellular band when operating in the DTC Test or Active Cell operating modes:  

```
OUTPUT 714;"RFANalyzer:MANual:DIGital:POWer:CELLular 24 DBM"
```
- **Digital Power PCS Band** - expected power for TDMA (digital) signals in the PCS band when operating in the DTC Test or Active Cell operating modes:  

```
OUTPUT 714;"RFANalyzer:MANual:DIGital:POWer:PCS 24 DBM"
```
- **CW Power**- expected power for analog carriers when operating in the CW mode. This value is used with manual and auto receiver control:  

```
OUTPUT 714;"RFANalyzer:CW:EXPEcted:POWer 24 DBM"
```

---

**NOTE** During manual receiver control, make sure you are using the correct operating mode for the type of measurement you are making. Trying to make a digital measurement while operating in AVC Test mode, or making an analog measurement while operating in DTC Test mode, will likely result in an error. The error occurs because the test set uses the expected power setting for the *operating mode* you are using, and uses different methods to measure analog and digital signals. Using the analog method to measure a digital signal, or vice versa, results in the error.

Also, it is recommended that you specify the expected power each time you perform a handoff to a new band or traffic channel type during manual receiver control. This ensures that the correct expected power is set for the new channel settings.

---

**Measurement Frequency** Measurement frequency is used to tune the test set's measuring receiver for all mobile carriers: analog (including CW) or digital systems, cellular or PCS band.

```
OUTPUT 714;"RFANalyzer:MANual:MEASurement 942.6 MHZ" !Enables manual measurement
!receiver control and sets the test set's receiver frequency to 942.6 MHz.
```

**Link Frequency** Link Frequency sets the test set's demodulation receiver frequency, used to demodulate information from the mobile's reverse channel transmission.

```
OUTPUT 714;"RFANalyzer:MANual:UPLink 942.6 MHZ" !Enables manual demodulation
!receiver control and sets the test set's receiver frequency to 942.6 MHz.
```

---

**NOTE** Manual control of the demodulation receiver frequency is rarely needed. Use the measurement receiver when manual receiver frequency control is required.

---

## Auto Receiver Control

The receiver settings are derived from the following parameters when using automated control:

- Expected Power - derived from the MS TX Level setting for the specified system type, queried/set using the following mnemonics: CALL:SETup:MS:ANALog:TXLevel, CALL:SETup:MS:DIGital:TXLevel, CALL:SETup:MS:DIGital:TXLevel:CELL, CALL:SETup:MS:DIGital:TXLevel:PCS
- Measurement Frequency and Link Frequency - derived from the DTC Band and DTC Channel or AVC Channel settings, queried/set using the following mnemonics: CALL:SETup:DTC:BAND, CALL:SETup:DTC, CALL:SETup:DTC:CELLular, CALL:SETup:DTC:PCS, CALL:SETup:AVC

See [“CALL:SETup” on page 324](#) for a description of the CALL:SETup commands.

## Expected Power

To make accurate measurements, the test set needs to know how much power to expect at the test set's RF IN/OUT port; referred to as the Expected Power. It gets this value from the call control MS TX Level setting during automatic receiver control, or by the user specifying the expected power with the receiver power control set to manual. See [“Expected Power Control” on page 562](#) for more information.

You can set the expected power level beyond the capability of the test set's hardware 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 [“Description” on page 599](#) 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 you set 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.

## Cellular Band (800 MHz) Mobile Power Class Considerations for Expected Input Level

The nominal power output for power settings 0, 1, 8, 9, and 10 are different for power class 1 and power class 4 mobiles *when operating in the cellular (800 MHz) band*, and affect the expected input level. (Power levels 0 to 7 are used for analog and digital signals, but power levels 8, 9, and 10 are only used for digital signals. See IS-137, section 3.2.1.)

When the MS TX Level is set to power level 0 or power level 1, the test set *assumes you are testing a power class 1 mobile* and sets the expected input level accordingly. If you are testing a power class 4 mobile and have the MS TX Level set to 0 or 1, the test set will likely display an under range condition when making a measurement, indicating that the signal being measured is well below the expected input level. This is because power levels 0 and 1 = 4W (36 dBm) for a power class 1 mobile, but only 0.6W (about 28 dBm) for a class 4 mobile.

When the MS TX Level is set to power level 8, 9, or 10, the test set *assumes you are testing a power class 4 mobile* and sets the expected input level accordingly. If you are testing a power class 1 mobile, the test set may display an over range condition when making a measurement, indicating that the signal being measured is well above the expected level. This is because power levels 8, 9, and 10 are about 5 dB higher for a power class 1 mobile than for a class 4 mobile.

If an under range or over range condition occurs during a measurement due to a power class difference, use manual receiver control to set the correct expected level. See [“Expected Power Control” on page 562](#).

**Receiver Control****Effects on Receiver Control When Changing Operating Mode**

After selecting the operating mode to use and setting one or more receiver controls to manual, the receiver control settings remain as you set them until you change operating mode. Changing operating mode causes some or all receiver parameters to return to automatic control. The table below lists the effects on receiver control parameters for a change in operating mode.

**Table 7.**

<b>Operating Mode Where You Set the Receiver Control Parameters</b>	<b>Operating Mode You Changed To</b>	<b>Effects on the Receiver Control Settings</b>
Active Cell, AVC Test, DTC Test, CW	AVC Test, DTC Test	Expected power control is set to auto. Measurement frequency is set to auto. Uplink frequency is set to auto.
AVC Test, DTC Test	Active Cell	Expected power control is set to auto. Measurement frequency is set to auto.
Active Cell, AVC Test, DTC Test	CW	Measurement and uplink frequencies are set to the previous CW operating mode settings.

**Related Topics**

\*\*\*\*\*

[“AVC Test Operating Mode” on page 548](#)

[“DTC Test Operating Mode” on page 557](#)

[“Active Cell Operating Mode” on page 544](#)

[“RFAnalyzer” on page 416](#)

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## Configuring the Traffic Channel (TCH)

The digital traffic channel (DTC) and analog voice channel (AVC) parameters are configured using the call processing subsystem commands shown in the following sections.

See [“Active Cell Operating Mode” on page 544](#), [“AVC Test Operating Mode” on page 548](#), [“DTC Test Operating Mode” on page 557](#), and [“CW Operating Mode” on page 555](#) for details about using each mode for mobile test.

### Selecting the Traffic Channel Type: DTC or AVC

The mobile can be initially assigned to, or later handed off to, an AVC or a DTC when using Active Cell operating mode. Parameters for the DTC and AVC can be sent to the test set at any time. However, a handoff to a different type of traffic channel cannot occur unless you specify the type of traffic channel to use before performing the handoff.

For example, if you bring the mobile up on a DTC, you can send commands to the test set to configure an AVC without interfering with mobile operation. To hand off the mobile to the AVC you configured, you must first change the traffic channel type to AVC, then issue the handoff command.

The following GPIB example illustrates selecting an analog voice channel (AVC) before a handoff:

```
OUTPUT 714;"CALL:TCHannel:TYPE AVC"
```

### AVC (Analog Voice Channel) Parameters

- AVC Channel

```
OUTPUT 714;"CALL:SETup:AVC 777" !Specifies channel number 777 for the AVC.
```

- SAT Color Code

```
OUTPUT 714;"CALL:SETup:AVC:SATone SAT2" !Specifies SAT2(6000Hz).
```

### Using Additional Frequency Modulation (FM) on the Forward AVC

The test set can use both internal and external signals to provide FM on the forward AVC. During Active Cell operating mode, this feature is only available when FM is enabled and the mobile is on an active AVC. It does not affect DTC operation. This feature is also available with AVC Test operating mode. See [“Forward Channel FM Operation” on page 548](#).

### DTC (Digital Traffic Channel) Parameters

- DTC Band

```
OUTPUT 714;"CALL:SETup:DTC:BAND PCS" !Specifies PCS band (1900 MHZ) operation.
```

- DTC Channel (see [“Frequency Banded Parameters” on page 537](#))

```
OUTPUT 714;"CALL:SETup:DTC 890" !Specifies channel 890 in the active band for the DTC.
```

- Vocoder Type

```
OUTPUT 714;"CALL:SETup:DTC:VOCoder ACELP1" !Specifies the ACELP1 vocoder.
```

- DTC Burst Size.

## Configuring the Traffic Channel (TCH)

OUTPUT 714;"CALL:DTC:BURSt SHORtened" !Specifies to use shortened DTC bursts.

- DTC Digital Verification Color Code (DVCC).

OUTPUT 714;"CALL:SETup:DTC:DVCC 4" !Specifies a DVCC of 4.

- DTC Timeslot.

OUTPUT 714;"CALL:SETup:DTC:TSLot 3" !Specifies timeslots 3 and 5.

## Operating Considerations

The traffic channel parameters do not affect the output of the test set's base station emulator until the mobile is commanded by the test set (over the control channel) to go to the defined traffic channel.

Changes made to the traffic channel parameters while the mobile is on a DTC or an AVC do not take effect until a handoff is performed.

When a call is ended, the output of the test set is set to the current control channel settings.

## Related Topics

\*\*\*\*\*

["Configuring the Control Channel \(CCH\)" on page 552](#)

["Configuring Mobile Station Operating Parameters" on page 560](#)

["Frequency Banded Parameters" on page 537](#)

["Receiver Control" on page 561](#)

["CALL:SETup" on page 324](#)

["Programming Handoffs" on page 115](#)

\*\*\*\*\*

# 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.

## 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 you to setup new measurements and their parameters. If new setup parameters are not needed, use a partial preset to save time.

### Example

```
OUTPUT 714;"*RST" !Recommended command for a full preset, sets trigger arm to single.
```

```
OUTPUT 714;"SYSTEM:PRESET2" !Command for a full preset, sets trigger arm to continuous.
```

The \*RST common command is the recommended command for a full preset operation.

---

**NOTE** Transmit power is not set to OFF during a full preset, transmit power will be set to the default value.

---

\*RST gives the same results as partial preset with the exception of Trigger Arm and the measurement parameters.

**Table 8. Full Preset Behavior**

Function	Result
Trigger Arm	Continuous (manual operation full preset or SYSTEM:PRESET2 command)
Trigger Arm	Single (remote operation full preset, *RST command)
Measurement Parameters	all set to defaults

**Preset Descriptions****Table 8. Full Preset Behavior**

Function	Result
Maskable Message Display State	On (manual operation full preset)
Maskable Message Display State	Off (remote operation full preset)

**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 531](#)

[“\\*RST” on page 343](#)

\*\*\*\*\*



## Instrument Status Area

### Description

The Instrument status area is found on the bottom center of the test set's display.

**Figure 4. 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.

### Int Ref

When a suitable external time base is not 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.

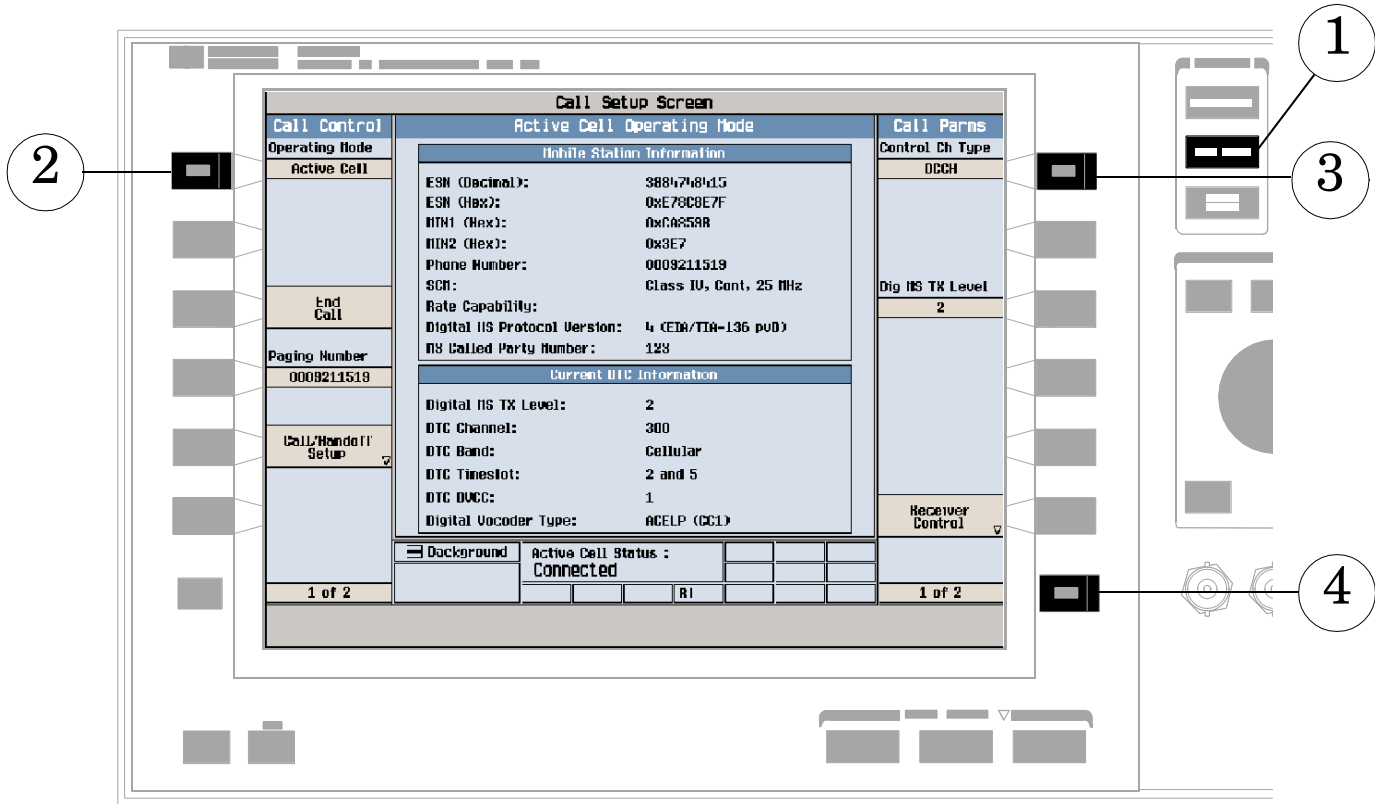
**Instrument Status Area**

- 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?

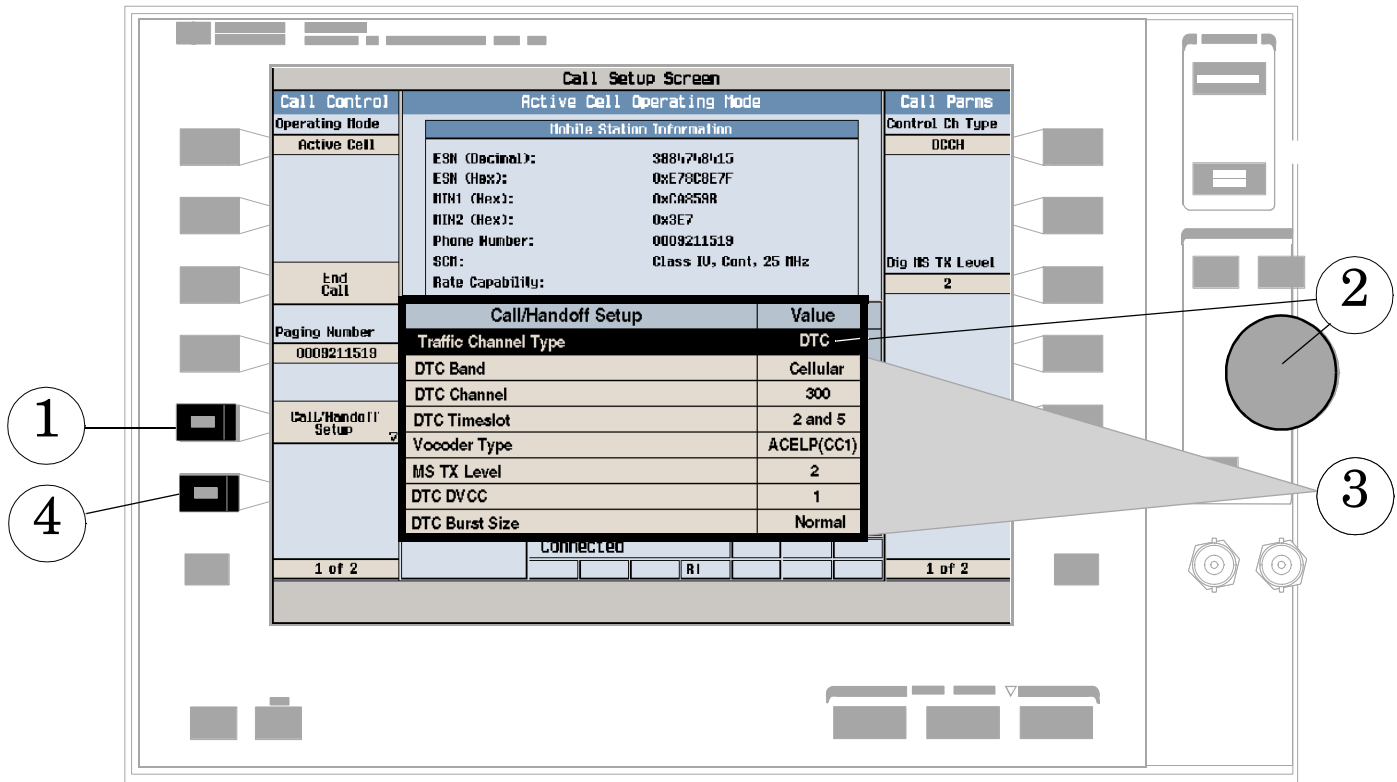
Call parameters specify the type of control and traffic channel to use, and their associated parameters, when originating a call or performing a handoff.

### Configure the Control Channel



1. Press the CALL SETUP key.
2. Select Active Cell operating mode.
3. Press F7, then turn and press the knob to specify the control channel type: ACC or DCCH.
4. Press the MORE key to access additional control channel parameters such as Cell Power and control channel number.

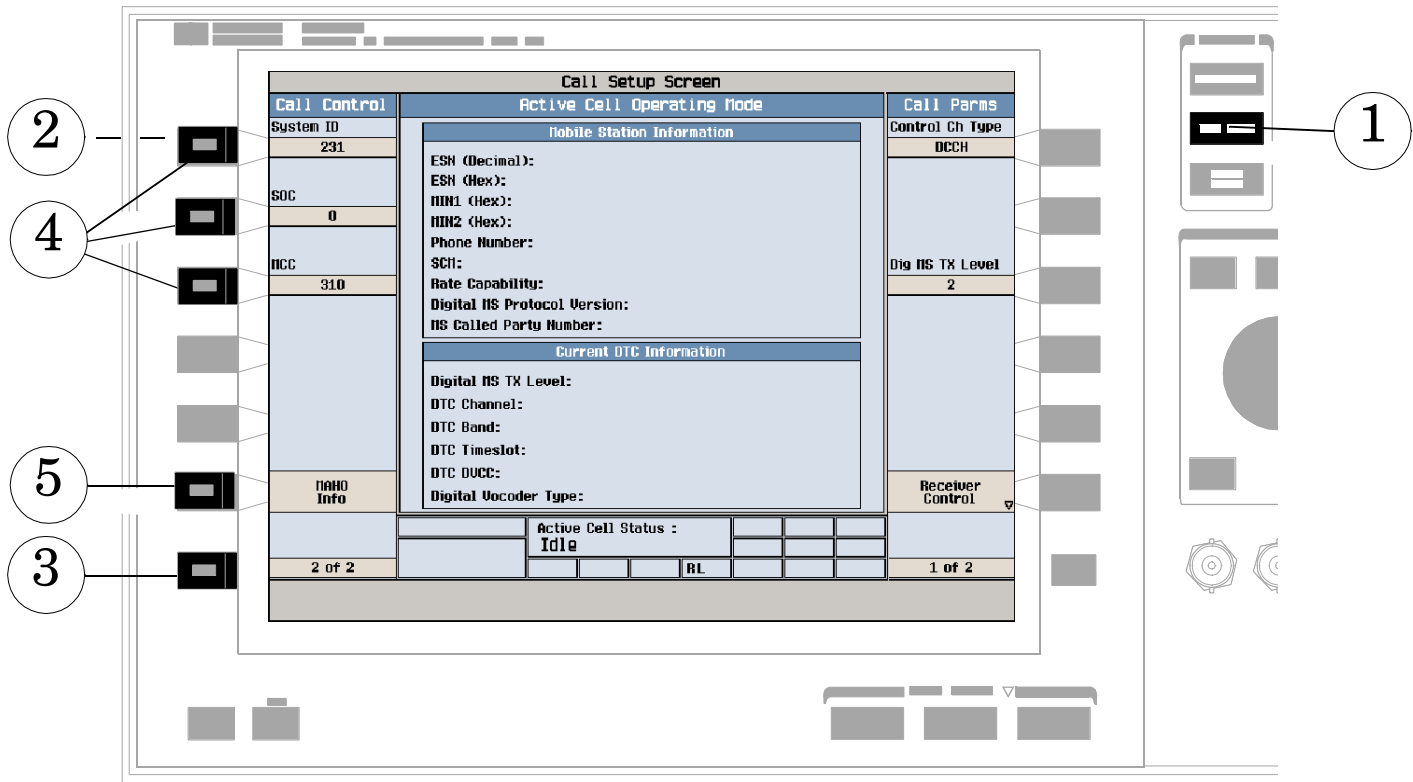
## Configure the Traffic Channel



1. Press F5 to access the Call/Handoff Setup menu.
2. Turn the knob to highlight the Traffic Channel Type setting, and press the knob to select AVC or DTC.
3. Using the knob and the DATA ENTRY keys, set the rest of the AVC or DTC parameters as needed.
4. Press F6 to close the Call/Handoff Setup menu.

## How Do I Change Cell Parameters?

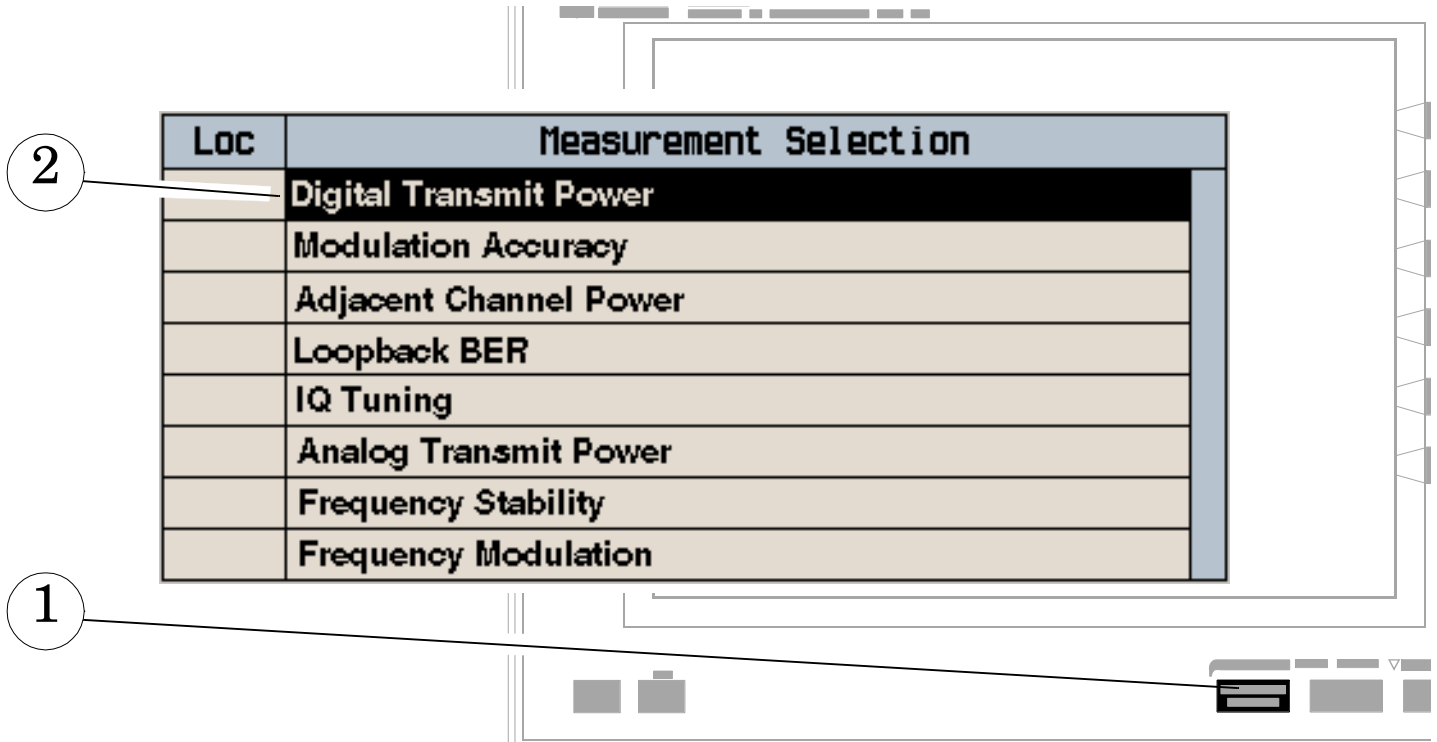
Cell parameters specify the information sent to the mobile to identify the cell and to tell the mobile to report mobile assisted handoff (MAHO) information.



1. Press the CALL SETUP key.
2. Select Active Cell operating mode.
3. Press the MORE key to select screen 2 of 2.
4. Press F1, F2, or F3 to change available cell parameters: Digital Control CHannel uses System ID, SOC, and MCC. Analog Control Channel uses System ID.
5. Press F6 to access MAHO BER and RSSI features (only available during Digital Traffic Channel operation).

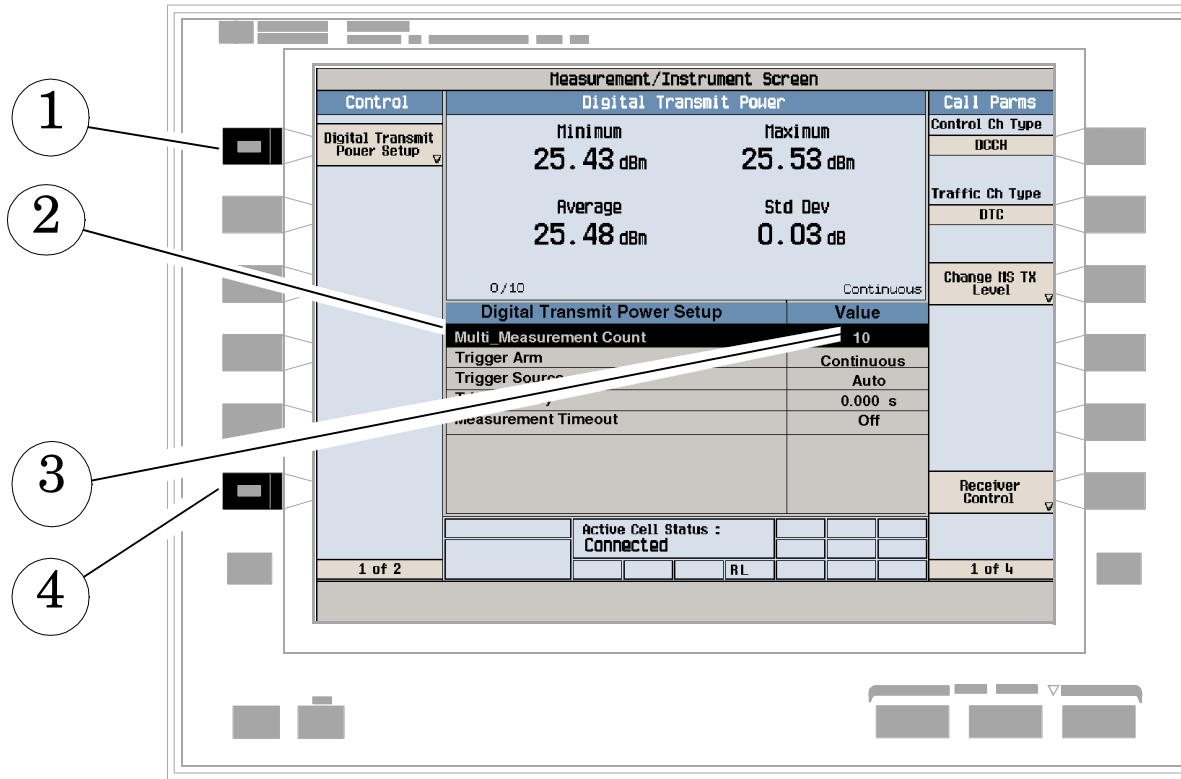
## How Do I Change Measurement Setup?

### A. Select a measurement.



1. Press the MEASUREMENT SELECTION key.
2. Highlight a measurement to setup and press the knob.

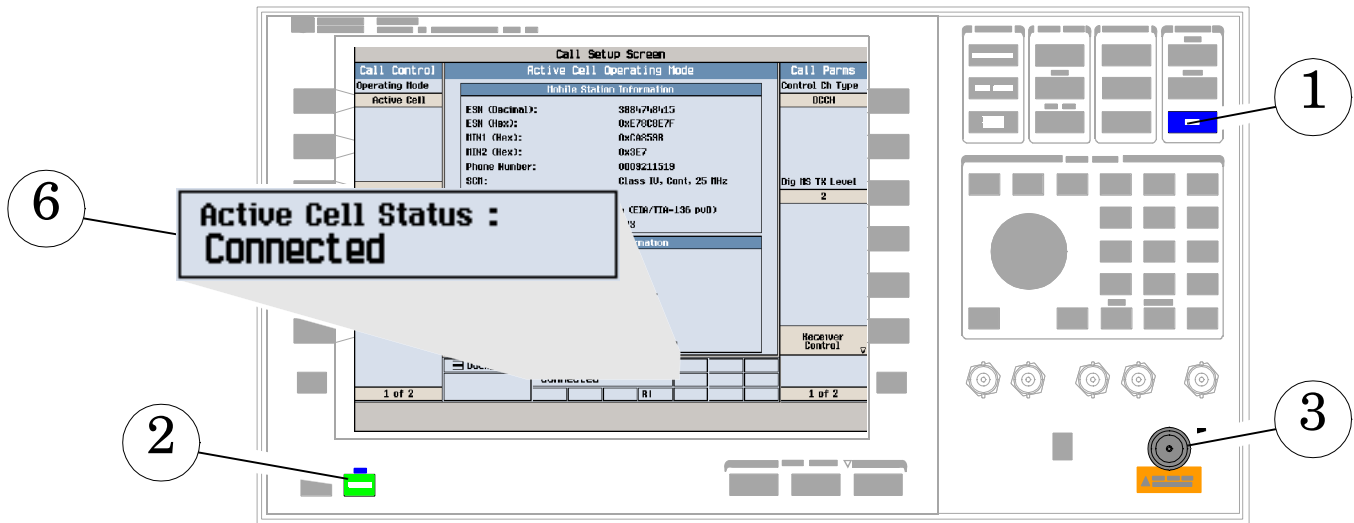
**B. Set up the measurement.**



1. With the desired measurement displayed, press the setup key (F1).
2. Highlight a parameter and press the knob.
3. Enter a value or selection and press the knob. Note: When statistical measurement results are available, change the Multi-Measurement Count Number parameter from “Off” to 1 or greater.
4. Press Close Menu (F6).

## How Do I Make Measurements on a Mobile?

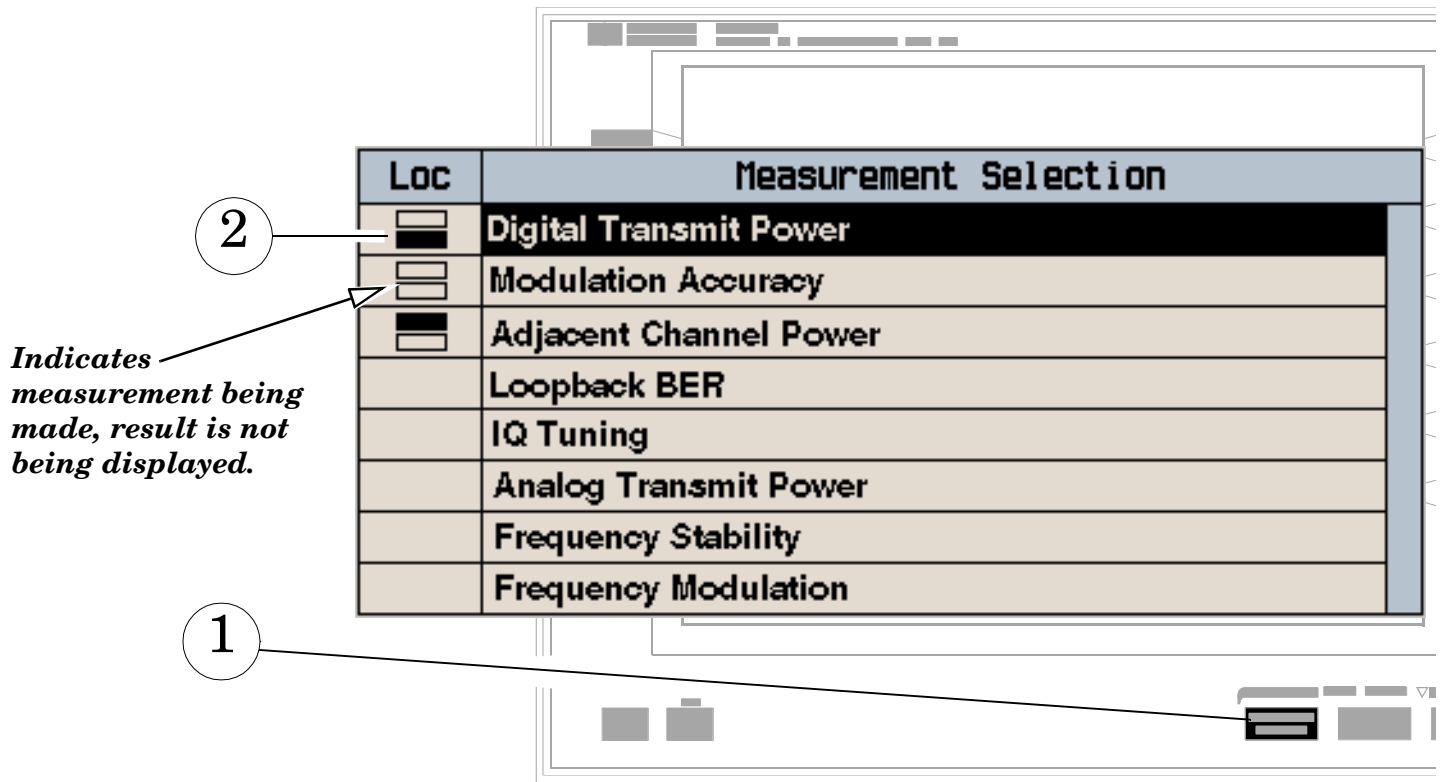
### A. Establish a call.



1. Press the SHIFT key.
2. Press the PRESET key.
3. Connect the mobile.
4. Wait until the mobile shows service (camped). Cellular band (800 MHz) DCCH is the default.
5. On the mobile press 1, 2, 3, and then press send.
6. Check for "Connected" in the Active Cell Status field.

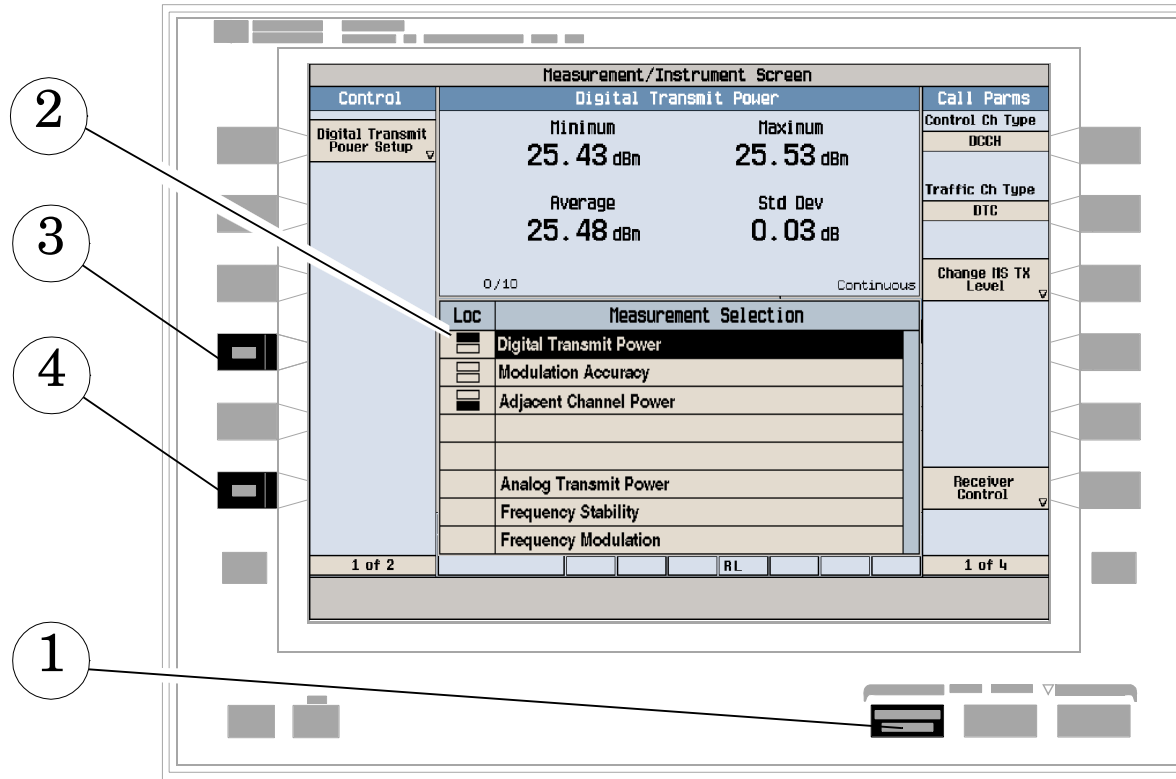


## B. Select measurements.



1. Press the MEASUREMENT SELECTION key.
2. Highlight a measurement and press the knob.
3. Repeat steps 1 and 2 to add measurements.

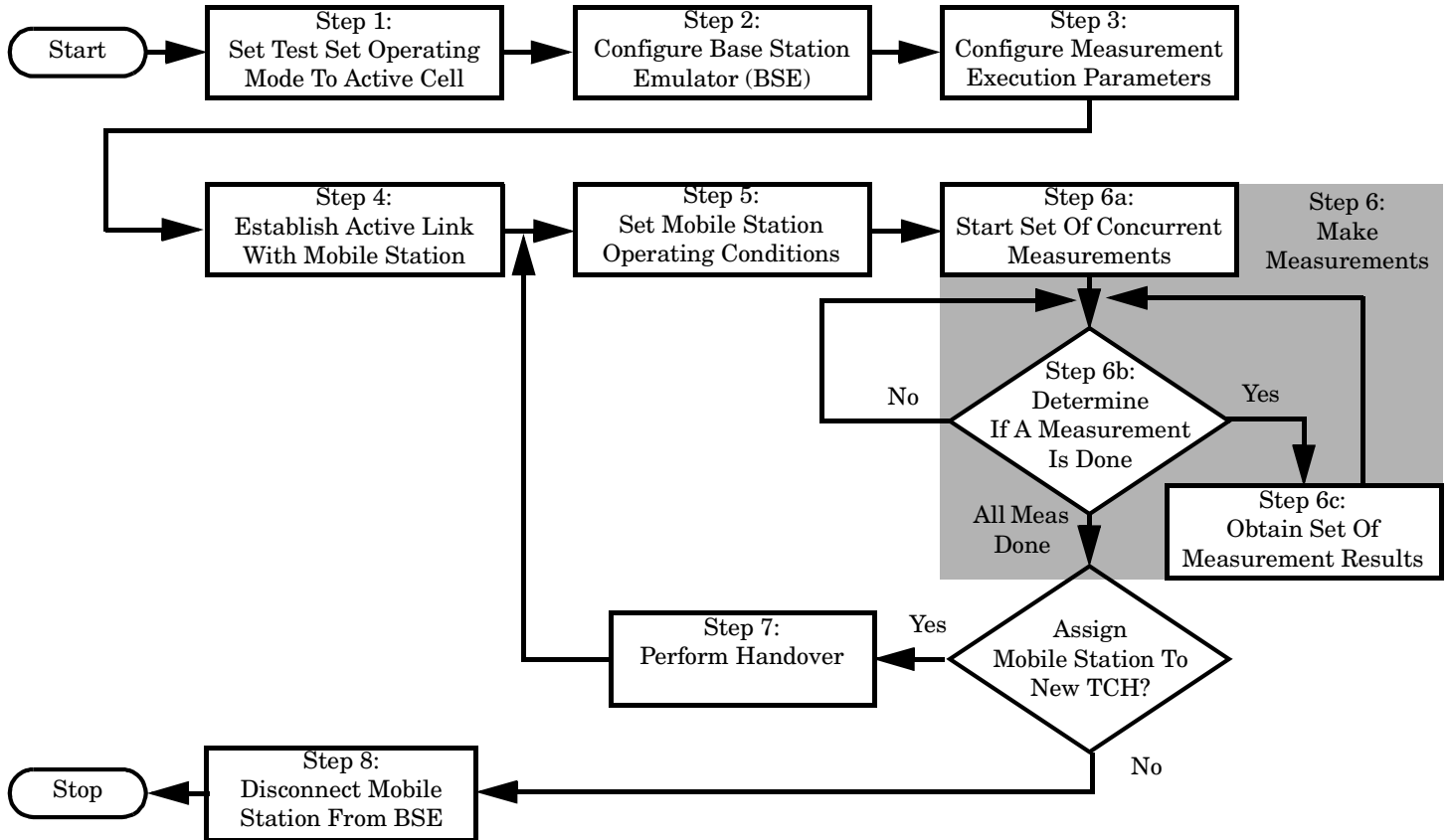
## How Do I Turn Off a Measurement?



1. Press the MEASUREMENT SELECTION key.
2. Use the knob to highlight the measurement you want to turn off.
3. Press Close Measurement (F4).
4. Press Close Menu (F6).

## Programming Overview

**Figure 5. Typical Flow Of Tasks Performed By Control Program**

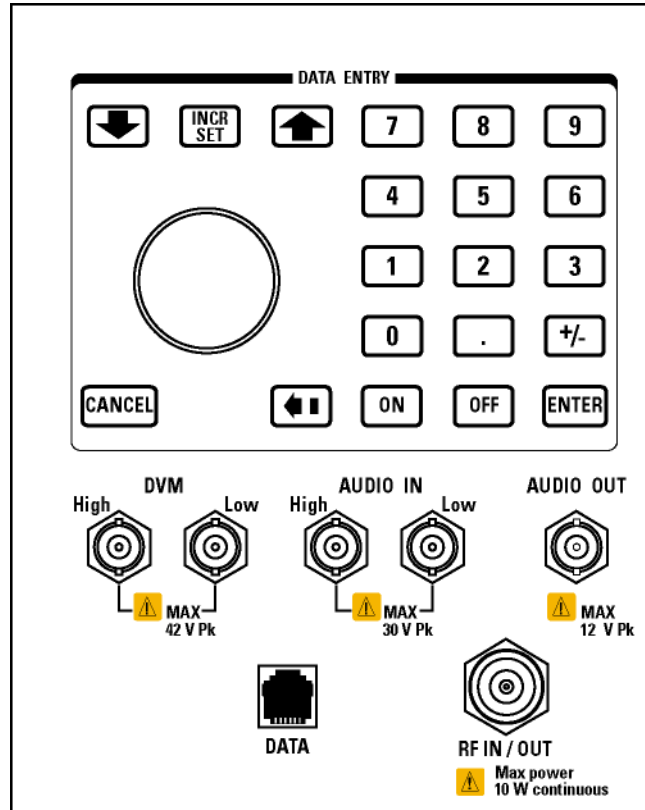


### Related Topics

- \*\*\*\*\*
- [“Programming an Adjacent Channel Power Measurement” on page 49](#)
  - [“Programming an Analog Transmit Power Measurement” on page 54](#)
  - [“Programming an Audio Frequency Measurement” on page 63](#)
  - [“Programming an Audio Level Measurement” on page 65](#)
  - [“Programming a Distortion Measurement” on page 68](#)
  - [“Programming a Digital Transmit Power Measurement” on page 71](#)
  - [“Programming a Frequency Modulation \(FM\) Measurement” on page 83](#)
  - [“Programming a Frequency Stability Measurement” on page 88](#)
  - [“Programming an IQ Tuning Measurement” on page 94](#)
  - [“Programming Digital Modulation Accuracy Measurements” on page 76](#)
  - [“Programming a SINAD Measurement” on page 107](#)
  - [“Establishing an Active Link with the Mobile Station” on page 33](#)
- \*\*\*\*\*

## Front Panel Connectors

### Description



### AUDIO IN

The input to the audio analyzer is a floating input differential amplifier. Both the AUDIO IN High and AUDIO IN Low BNC connectors should be connected to provide noise immunity. Refer to the technical specifications for more information.

### AUDIO OUT

This BNC connector accesses to the test set's audio generator. Refer to the technical specifications for more information.

### DATA

This RJ-45 connector provides front panel access to the rear panel LAN connection. This connector is used for downloading firmware upgrades, or new test applications into the test set. No other types of communication are possible with the LAN port.

The the DATA connector on the front panel is connected internally to the ETHERNET TO FRONT PANEL connector on the rear panel. In order to use the front panel DATA connector, connect the rear panel LAN PORT, to the rear panel ETHERNET TO FRONT PANEL connector with the LAN jumper cable.

The LAN jumper cable, part number E5515-61160, is supplied with the test set.

## DVM

Not functional for this release.

## RF IN/OUT

This Type-N connector is the path for all RF signals in or out of the test set. Refer to the technical specifications for more information.

## Related Topics

\*\*\*\*\*

[“Audio Level Measurement Description” on page 64](#)

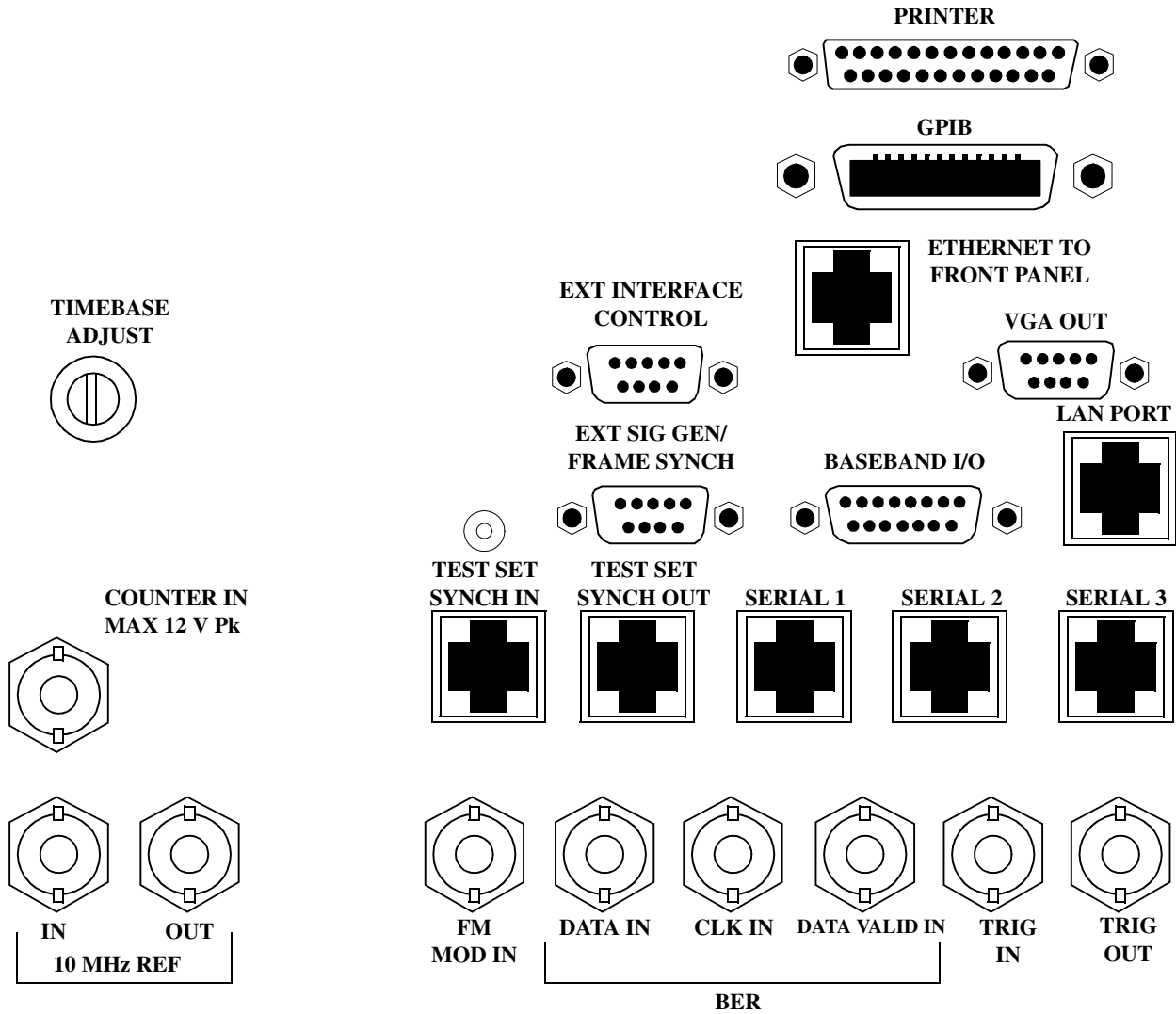
[“AFGenerator” on page 274](#)

[“Configuring the Test Set’s LAN” on page 597](#)

\*\*\*\*\*

# Rear Panel Connectors

## Description



### BASEBAND I/O

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 the DATA connector on the front panel is connected internally to the ETHERNET TO FRONT PANEL connector on the rear panel. In order to use the front panel DATA connector the user must connect the rear panel LAN PORT, to the rear panel ETHERNET TO FRONT PANEL connector with the LAN jumper cable.

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**

This BNC connector let's you use an external signal to frequency modulate the test set's RF generator. It has a fixed sensitivity of 20 KHz/volt, and a frequency range of 100Hz to 20 KHz.

## **GPIB**

The GPIB connector allows test set control with compatible devices.

## **LAN PORT**

This RJ-45 connector provides connection for down loading firmware upgrades, or new test applications into the test set. No other types of communication are possible with the LAN port.

## **PRINTER**

Not functional for this release.

## **SERIAL 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

\*\*\*\*\*

[“Timebase Description/Configuration” on page 608](#)

[“SYSTEM:ROSCillator” on page 533](#)

[“Configuring the Test Set’s GPIB Address” on page 592](#)

[“Configuring the Test Set’s LAN” on page 597](#)

\*\*\*\*\*

---

## 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 are be closed, and any manual entries are be aborted when the test set transitions from local mode to remote mode.

The remote annunciator (R) will appear in the Instrument Status Area of the test set's display indicating that the test set is in remote mode.

When the test set is in remote mode press the LOCAL key on the front panel in order to gain manual control.

#### 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 516](#)

["Error Messages" on page 611](#)

\*\*\*\*\*

---

## 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 347](#)

\*\*\*\*\*

---

## 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 347](#)

\*\*\*\*\*

---

## Configuring the Test Set's GPIB Address

### 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:\[;SELF\]:ADDRes” on page 517](#)

\*\*\*\*\*



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## Hardware Configuration Report

### Description

You can generate a list of the test set's hardware configuration over the LAN or GPIB.

The LAN query is the easiest and most direct way to query the test set's hardware configuration. This method uses your web browser to display a formatted report.

The GPIB query returns an unformatted character string that must be buffered and saved to an HTML file to provide formatted text.

### LAN Query

1. Refer to the SYSTEM CONFIG screen to determine the LAN address.
2. Open a web browser and enter <LAN address>/iconfig. For example, if your LAN address is 130.2.2.147, you would enter:  
130.2.2.147/iconfig
3. The web browser will then display formatted text. A partial list of the hardware configuration information is shown below:

### Agilent Technologies 8960 Series 10 E5515A

**Serial Number: US00000097**

**Current Test Application:** E1960A, GSM Mobile Test, A.04.01

**Instrument Options Installed:** RF Source 2

HOST BOOT ROM REV: A.02.03\_BOOT

PROTOCOL BOOT ROM REV: MOM\_PROTOCOL\_BSP\_1.7

DSP BOOT ROM REV: A.00.01

### GPIB Query

Use the following Basic example as a model to store the test set's configuration as an HTML file.

### 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
```

## Hardware Configuration Report

In the future, the hardware configuration report may increase in length. More space would then need to be allocated for the arrays.

Display the HTML file using a web browser or HTML text editor.

## Related Topics

\*\*\*\*\*

[“SYSTEM:CONFigure:INFormation:HARDware:VERBose?” on page 521](#)

[“SYSTEM:CURRENT:TA” on page 528](#)

[“Obtaining Test Application Information” on page 603](#)

[“Obtaining Identification Information \\*IDN?” on page 595](#)

[“Rear Panel Connectors” on page 582](#)

\*\*\*\*\*

---

## Obtaining Identification Information \*IDN?

### Description

Test set information is returned from a \*IDN? query. The \*IDN? query provides information about the Manufacturer, Model Number, Serial Number, and Firmware Revision. \*IDN? is defined in IEEE Std. 488.2-1992, 10.14.

### Test Set Information

\*IDN? query returns identification information as a comma separated string.

```
DIM A$ [100]
OUTPUT 714;"*IDN?" !returns manufacturer,model number, serial number and "0"
                !separated by commas
ENTER 714;A$
PRINT A$          !prints, for example "Agilent Technologies, 8960 Series 10 E5515B,
                !US38020105,0
```

- Agilent Technologies is the manufacturer.
- Printable ASCII characters excluding comma and semicolon up to a 25-character string.  
Model number example: 8960 Series 10 E5515B
- Printable ASCII characters excluding comma and semicolon up to a 10-character string.  
Serial number example: US00000123
- Printable ASCII characters excluding comma and semicolon up to a 20-character string.  
Firmware revision example: 0

---

**NOTE** The \*IDN? query will always indicate that the firmware revision is zero. SYSTEM:APPLication[:CURRent]:REVision? is the recommended way to query the firmware revision.

---

## Related Topics

\*\*\*\*\*

[“Hardware Configuration Report” on page 593](#)

[“Obtaining Test Application Information” on page 603](#)

[“IEEE 488.2 Common Commands” on page 343](#)

[“CALibration” on page 279](#)

[“SYSTEM:COMMunicate” on page 517](#)

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---

## 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 different network class, 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.

## Configuring the Test Set's LAN

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 different network class, 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 519](#)

[“SYSTEM:COMMunicate:LAN\[:SELF\]:DGATEway” on page 519](#)

[“SYSTEM:COMMunicate:LAN\[:SELF\]:SMASK” on page 520](#)

\*\*\*\*\*

---

## Measurement Related Configuration

### Description

Amplitude offset is provided in order to compensate for loss or gain of the external network between the test set and the DUT, (device under test).

The test set allows the user to select up to 20 different offsets at 20 different frequencies.

There are 5 non-volatile amplitude offset parameters that require your attention:

- RF IN/OUT Amplitude Offset State
- Frequency state 1 - 20
- Frequency 1 - 20
- Offset state 1-20
- Offset 1 - 20

---

**NOTE** Frequency and offset values must be set independently.  
It is not necessary to use all 20 offsets or frequencies.

---

### RF IN/OUT Amplitude Offset State

The RF IN/OUT Amplitude Offset State can be changed to On by setting any of the 20 offsets or frequencies to the On state. The RF IN/OUT Amplitude Offset State can also be turned On or Off independently of the frequency or offset state. When the RF IN/OUT Amplitude Offset State is On, the Offset indicator will appear in the Instrument Status Area of the test set display.

If the RF IN/OUT Amplitude Offset State is Off none of the amplitude offsets are active even if the states of the individual offsets are set to On.

**Remote User** To set the RF IN/OUT Amplitude Offset State to On:

```
OUTPUT 714;"SYSTEM:CORRECTION:STATE ON" !Sets the RF IN/OUT  
!Amplitude Offset State to On
```

**Manual User** In order to manually set the RF IN/OUT Amplitude Offset State, go to the SYSTEM CONFIG screen, and press the RF IN/OUT Amptd Offset key, F5. Amplitude offset loss, gain and state settings are found by pressing the RF IN/OUT Amptd Offset Setup key, F2. RF IN/OUT Amplitude Offset State is the first parameter in the RF IN/OUT Amplitude Offset Setup menu.

When any of the 20 frequencies or offsets are manually set to On, the RF IN/OUT Amplitude Offset State is also set to On.

### Frequency 1 - 20

Up to 20 different RF offset frequencies can be defined by the user to correct network loss or gain.

When operating at frequencies not specified in the RF IN/OUT Amplitude Offset frequency list, but between

**Measurement Related Configuration**

the lowest and highest frequencies in the list, the test set will use linear interpolation to define offset values.

When operating at frequencies above the highest frequency specified, or below the lowest frequency specified in the RF IN/OUT Amplitude Offset frequency list, the test set will use the offset of the closest associated frequency.

If the user repeats a frequency entry, only the first entry along with its offset will be used by the test set, even though both of the repeated frequencies may be shown. If a frequency is repeated a warning will appear:

---

**NOTE** Duplicate RF IN/OUT Amplitude Offset Frequency. The first occurrence of duplicate is used.

---

**Remote User** If less than 20 frequencies are sent, the first positions of the RF IN/OUT Amplitude Offset Setup menu will fill in according to the number of frequencies sent. This means that if 6 frequencies are sent, Frequency 1 through Frequency 6 will reflect the values sent by the user, and Frequency 7 through Frequency 20 will remain off.

Sending any new frequency values in subsequent commands will write over the original values and set the state to Off for any frequencies not set with the new command.

Sending a null list (no values) with the frequency command results in setting the state for Frequency 1 - 20 to Off .

There are two different commands that can be used to set the RF offset frequency.

- Frequency is set, and the frequency state is set to On with this complex command:

```
OUTPUT 714;"SYSTEM:CORRECTION:SFREQUENCY 1710.2 MHZ,1805.2 MHZ,1784.8 MHZ,1879.8 MHZ"
!A complex command that sets the up to 20 comma separated frequencies and sets the state to On
!for the frequencies, offsets, and RF IN/OUT Amplitude Offset State
```

- Frequencies are set with this command:

```
OUTPUT 714;"SYSTEM:CORRECTION:FREQUENCY 1784.8 MHZ,1879.8 MHZ" !Sets up to 20 comma
!separated frequencies
```

**Manual User** Manual users may set the state or the value for any of the 20 frequencies from the RF IN/OUT Amplitude Offset Setup menu. Frequency values may be set in any order, i.e. set Frequency 1 and then skip to Frequency 20. The frequency state and value is individually controlled for manual users.

In order to manually set the RF offset frequencies go to the SYSTEM CONFIG screen, and press the RF IN/OUT Amptd Offset key, F5. Amplitude offset loss, gain and state settings are found by pressing the RF IN/OUT Amptd Offset Setup key, F2. RF offset frequencies 1 through 20 are listed in the RF IN/OUT Amplitude Offset Setup menu.

When any of the 20 frequencies are manually set to On, the RF IN/OUT Amplitude Offset State and the associated offset state are also set to On.

**Offset 1 - 20**

Up to 20 different offset values can be defined by the user to correct network loss or gain.

Duplicate offsets are allowed as long as they are associated with different frequencies.

**Remote User** Sending any new offset values in subsequent commands will write over the original values and set the state to Off for any offsets not set with the new command.



There are two different commands to set offsets.

- Offsets are set, and the offset state is set to On with this complex command:

```
OUTPUT 714;"SYSTEM:CORRECTION:SGAIN -2.55,-3.12,-3.68,-4.23,-4.74,-5.3"  
!A complex command that sets up to 20 comma separated offsets and sets the state to On for  
!the frequencies, offsets and RFIN/OUT Amplitude Offset State
```

- Offsets are set with this command:

```
OUTPUT 714;"SYSTEM:CORRECTION:GAIN -3.12,-3.68,-4.23" !Sets up to 20 separated offset values
```

**Manual User** Manual users may set the state or the value for any of the 20 offsets from the RF IN/OUT Amplitude Offset Setup menu. Offset values may be set in any order, i.e. set Offset 1 and then skip to Offset 20. The offset state and value is individually controlled for manual users.

In order to manually set the RF offsets go to the SYSTEM CONFIG screen, and press the RF IN/OUT Amptd Offset key, F5. Amplitude offset gain, loss and state settings are found by pressing the RF IN/OUT Amptd Offset Setup key, F2. RF offsets 1 through 20 are listed in the RF IN/OUT Amplitude Offset Setup menu.

When any of the 20 offsets are manually set to On, the RF IN/OUT Amplitude Offset State and the associated frequency state are also set to On.

### Points

Remote users can query the test set to determine the number of offsets that are in the On state.

```
OUTPUT 714;"SYSTEM:CORRECTION:POINTS?" !Query returns the number of  
!frequencies that have their  
!offset states set to On
```

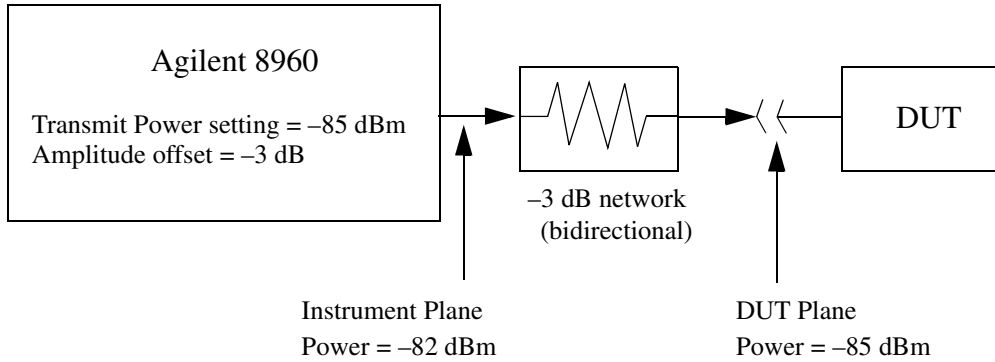
### RF IN/OUT Amplitude Offset

The offset values allow the test set to represent the RF level at the DUT.

**Transmitter Example** When you set transmit power level, the test set uses the amplitude offset value to adjust the power so that the power at the DUT will match the transmit power setting.

With the test set's transmit power set to  $-85$  dBm, the RFIN/OUT Amplitude Offset State set to On, and a  $-3$  dB offset at some frequency. The power transmitted from the test set will be  $-82$  dBm, the 3dB loss in the network means that the DUT will be see  $-85$  dBm.

**Figure 6. Amplitude Offset Transmitter Example**

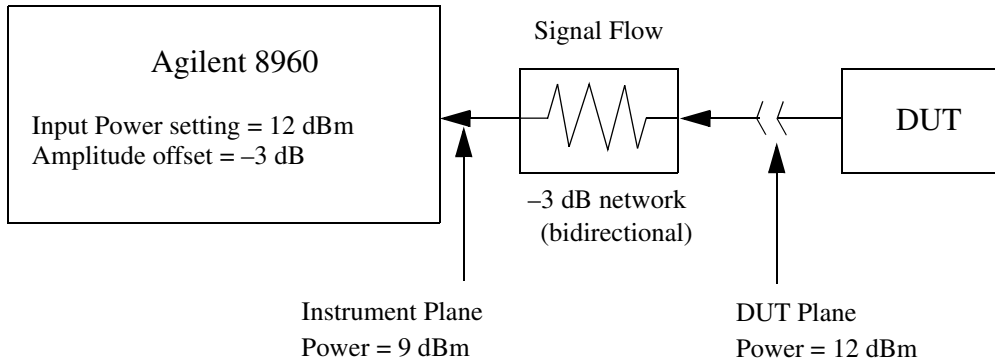


The transmit power setting reflects the power at the DUT plane.

**Receiver Example** The received power setting reflects the power at the DUT. This means the value displayed for received power does not change; however, the test set's hardware changes internally to expect a level that includes the offset.

With the test set's received power set to 12 dBm, the RF IN/OUT Amplitude Offset State set to On, and a -3 dB offset at some frequency. The received power remains unchanged at 12 dBm to reflect the level at the DUT. The test set's internal hardware changes to receive 9 dBm, the power received at the test set's RF IN/OUT connector.

**Figure 7. Amplitude Offset Receiver Example**



The input power setting reflects the power at the DUT plane.

**Related Topics**

\*\*\*\*\*

[“SYSTEM:CORRection” on page 522](#)

\*\*\*\*\*

---

## Obtaining Test Application Information

### Description

Test application information may be viewed from the SYSTEM CONFIG screen. Test application information may be queried using SYSTem:APPLication or SYSTem:CURRent GPIB queries. Queries for information about the current test application, selected test application, or any of the test applications loaded on your test set are available.

### Test Application Information

Each test application has a name, model number, at least one revision, and a license status. This is a sample of the queries available to you.

1. Test application name query:

```
OUTPUT 714;"SYSTEM:APPLICATION:CURRENT:NAME?"
```

This query will return GSM Mobile Test, if that test application is currently running.

2. Model number query:

```
OUTPUT 714;"SYSTem:CURRent:TA:MODe1?"
```

This query will return E1960A, if that test application is currently running.

3. Revision query:

```
OUTPUT 714;"SYSTEM:APPLICATION:CURRENT:REVISION?"
```

This query will return A.04.01, if that revision is currently running.

4. License status query:

```
OUTPUT 714;"SYSTEM:APPLICATION:CATALOG:LICENSE? 'GSM mobile test','A.04.01'"
```

This query will return LIC, if the test application is licensed for use.

### Related Topics

\*\*\*\*\*

["SYSTem:APPLication" on page 511](#)

["Obtaining Identification Information \\*IDN?" on page 595](#)

["Hardware Configuration Report" on page 593](#)

["SYSTem:COMMunicate" on page 517](#)

["CALibration:DATE" on page 280](#)

["SYSTem:CURRent:TA" on page 528](#)

\*\*\*\*\*

---

## Selecting a Radio Personality

### Description

Different radio personalities or radio standards, (such as GSM, AMPS or TIA/EIA 136) can be tested when the optional test applications are purchased from Agilent Technologies. Some test applications will have the ability to test more than one radio standard.

When the operations described in this section are queried, several seconds may pass before the information is ready to be displayed.

You can query the current revision, the selected revision, all the revisions, and the total count of revisions for a selected test application. These queries are helpful when changing revisions or loading new revisions. They are not usually necessary when switching test applications.

The Test Application Setup menu will display all of the test applications available along with the selected revision. The selected revision is the revision that would run if the test set was switched to that test application. There is no need to select a revision every time you want to switch test applications.

---

**NOTE** Selecting the correct name and the desired revision of a test application is important. This information should be reviewed before proceeding.

---

### Test Applications Switching

Selecting of a different test application is accomplished manually using the front panel keys, or remotely over GPIB. The test set must be rebooted in order for the test application to become functional. The reboot will happen automatically when the you tell the test set to switch test applications. Rebooting to another test application takes about one minute.

**Remote User** In order to switch to another test application use this GPIB command:

```
OUTPUT 714;"SYSTEM:APPLICATION:SELECT:NAME `GSM MOBILE TEST`"
```

Sending this command will cause the test set to reboot.

**Manual User** Test application switching is found on the SYSTEM CONFIG screen.

To switch to the test application you have selected.

1. Press the Test Application key.
2. Use the knob or arrows to scroll to the test application you want.
3. Press the knob or enter key.
4. A menu will appear asking "Switch Now?" If you answer "No" nothing will change, if you answer "Yes" the test set will reboot in the new test application.

### Revision Selection

Different revisions of the test applications in your test set will provide different functionality. Switching

revisions does not reboot the test set in a new test application. It merely selects a revision for the next switch. A revision will remain the selected revision until a different revision is selected by you.

---

**NOTE** If you switch test applications to an older version that does not support test application switching you will not have a path to get back. Using the firmware upgrade process to load firmware with the correct version will fix this problem.

Test application switching is available on revisions greater than A.04.00 of GSM Mobile Test, and all other test applications that are developed thereafter.

---

**Remote User** These are commands to query revision information or select a revision. Selecting a new revision does not switch test applications.

- In order to query a **selected** test application revision (running or not) use this GPIB command:

```
OUTPUT 714;"SYSTEM:APPLICATION:SELECT:REVISION? 'AMPS/136 MOBILE TEST' "
```

- In order to query the revision of the test application **currently running** use this GPIB command:

```
OUTPUT 714;"SYSTEM:APPLICATION:CURRENT:REVISION?"
```

- In order to query **all** of the revisions available for a test application use this GPIB command:

```
OUTPUT 714;"SYSTEM:APPLICATION:CATALOG:REVISION? 'AMPS/136 MOBILE TEST' "
```

- In order to **select** a revision of a test application use this GPIB command:

```
OUTPUT 714;"SYSTEM:APPLICATION:SELECT:REVISION 'GSM mobile test','A.04.01' "
```

- Query that returns the number of revisions for a specified test application:

```
OUTPUT 714;"SYSTEM:APPLICATION:CATALOG:REVISION:COUNT? 'GSM MOBILE TEST' "
```

**License Status of Test Applications** The test application license status can be queried for a particular test application and revision using the following GPIB command:

```
OUTPUT 714;"SYSTEM:APPLICATION:CATALOG:LICENSE? 'GSM mobile test','A.04.01' "
```

This query returns one of the following:

- "LIC" The test application license status is, licensed
- "NLIC" The test application license status is, not licensed
- "UNKN" The test application license status is, unknown

---

**CAUTION** If you switch to an unlicensed state the test set will reboot to SYSTEM CONFIG screen, unable to switch to any other screen or make any measurements. View the Test Application Setup menu to determine the licensed versions of test applications available. Use the Test Application key to switch to a licensed version of the test application.

---

**Manual User** Revision selection is found in the SYSTEM CONFIG screen, Test Application Setup menu. Revisions are shown with their license status. This is where you select the revision and test application that you want, it does not switch test applications. After the revision number is a letter, this letter indicates the

## Selecting a Radio Personality

revision license status; Licensed “L”, Not Licensed “N”, or Unknown “U”.

- “L” This revision of test application appears to have a license. The test application may have been developed before licensing and therefore needs no license.
- “N” This test application does not appear to have a license. Selecting a not licensed revision will result in an error +130.
- “U” This test application has unknown license status.

1. Press the Test Application Setup key.
2. Use the knob or arrows and scroll to the test application you want.
3. Press the knob or enter key to display the revision menu.
4. Use the knob or enter key to scroll to the revision you want.
5. Press the knob or enter key to select the revision.

## Test Application Names

Each test application has a name associated with it.

- “AMPS/136 Mobile Test” for the E1961A test application.
- “CDMA 2000 Mobile Test Mode” for the E1962A test application.
- “GSM Mobile Test” for the E1960A test application.
- “GPRS Mobile Test” for the E1964A test application.

**Remote User** In order to query or switch test applications remotely you must use the test application name exactly as it appears (without regard to case) in the Test Application Setup menu of the test set display.

- Query the name of the all test applications installed in the test set.  
OUTPUT 714; "SYSTEM:APPLICATION:CATALOG:NAME?"
- Query the name of the selected test application (running or not):  
OUTPUT 714; "SYSTEM:APPLICATION:SELECT:NAME?"
- Query the name of the currently running test application:  
OUTPUT 714; "SYSTEM:APPLICATION:CURRENT:NAME?"
- In order to know the number of test applications installed in the test set, use the following GPIB command:  
OUTPUT 714; "SYSTEM:APPLICATION:CATALOG:NAME:COUNT?"

**Manual User** The names of test applications installed in the test set can be viewed from the Test Application Setup menu found in the SYSTEM CONFIG screen. This menu shows you how each test application is spelled and should be used as a reference for GPIB commands.

## Test Application Model Number

Each test application has a model number associated with it.

**Remote User** This query will return E1960A, if that test application is currently running.

```
OUTPUT 714;"SYSTEM:CURRENT:TA:MODEL?"
```

**Manual User** The test application model number is found in the SYSTEM COFIG screen in the Instrument Information window.

### Programming Example

This program example assumes that the you want to switch to the GSM test application.

1. Query the list of test application names to get exact spelling of the GSM test application. This is not necessary if you already know the exact name.
2. Query the test set to get a list of all revisions for "GSM Mobile Test." This is not necessary if you are not changing revisions.
3. Select a revision of "GSM Mobile Test." This is not necessary if you are not changing revisions.
4. Select the GSM test application. This will switch test applications and cause the test set to reboot.

```
10 OUTPUT 714;"SYSTEM:APPLICATION:CATALOG:NAME?"
20 !Queries all of the test application names
30 ENTER 714;N$
40 PRINT "The CATALOG names that are loaded are ";N$
50 OUTPUT 714;"SYSTEM:APPLICATION:CATALOG:REVISION? 'GSM MOBILE TEST'"
60 !Queries all revisions of GSM MOBILE TEST
70 ENTER 714;Cat_rev$
80 PRINT "The revisions for the GSM Mobile Test Application are ";Cat_rev$
90 OUTPUT 714;"SYSTEM:APPLICATION:SELECT:REVISION 'GSM MOBILE TEST','A.04.01'"
100 !Selects a revision
110 OUTPUT 714;"SYSTEM:APPLICATION:SELECT:NAME 'GSM MOBILE TEST'"
120 !Switches the test application to GSM MOBILE TEST
130 END
```

### Related Topics

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["SYSTEM:APPLICATION" on page 511](#)

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## Timebase Description/Configuration

### 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 533](#)

["Rear Panel Connectors" on page 582](#)

\*\*\*\*\*



# 8 Error Messages



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## Error Messages

### Error Message Descriptions

- [“Fixed Timer Messages” on page 614](#)
- [“Manual User Error Messages” on page 617](#)
- [“-400 to -499 Query Errors” on page 629](#)
- [“-300 to -399 SCPI Specified Device-Specific Errors” on page 627](#)
- [“-200 to -299 Execution Errors” on page 624](#)
- [“-100 to -199 Command Errors” on page 620](#)
- [“+100 to +199 Core Device-Specific Error” on page 630](#)
- [“+200 to +299 Call Processing Device-Specific Error” on page 632](#)
- [“+300 to +399 Link Control Device-Specific Error” on page 634](#)
- [“+400 to +499 Core Hardware Device-Specific Error” on page 635](#)
- [“+500 to +599 Test Application Hardware Device-Specific Error” on page 638](#)
- [“+600 to +699 Instrument Device-Specific Error” on page 640](#)
- [“+700 to +799 Test Application Measurement Device-Specific Error” on page 641](#)
- [“+800 to +899 Core Measurement Device-Specific Error” on page 642](#)

## Description

### 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 of the test set can be set to on or off.

The error/event queue is read remotely using the `SYSTEM:ERROR?` query. 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

Error messages can be cleared from the test set's display using 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 Indicators** These messages occur as a result of a measurement, they indicate the validity of the measurement. Measurement integrity indicators are read with the `FETCh` command.

**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.

**Maskable Messages** These messages are intended to inform the user of a condition within the test set. They are generally meant to provide information to the user. The user will need to decide if this condition is undesirable and if they want the message to appear.

**Maskable Message Display State** The Maskable Messages Display State found in the Instrument Setup menu gives users a way to block these messages and the associated beep from ever happening. When the state is Off these messages and their associated beep will be blocked. The Maskable Message Display State can be set manually or with the following GPIB command:

```
OUTPUT 714;"DISPLAY:MESSAGE:MASKABLE:STATE OFF" !Prevents certain messages from appearing on the display.
```

### Instrument Maskable Messages

- Instrument warning: Audio Generator instrument has been closed.
- Instrument warning: Audio Analyzer instrument has been closed.
- Instrument warning: Analog Audio instrument has been closed.

### AMPS/136 Mobile Test Maskable Messages

- Digital 136 measurement warning; Digital Transmit Power measurement has been closed.
- Digital 136 measurement warning; Modulation Accuracy measurement has been closed.
- Digital 136 measurement warning; Adjacent Channel Power measurement has been closed.

- Digital 136 measurement warning; Loopback Bit Error measurement has been closed.

## Related Topics

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[“SYSTem:COMMunicate:GPIB:DEBug\[:STATe\]” on page 517](#)

[“Test Set Beeper” on page 589](#)

[“SYSTem:ERRor?” on page 529](#)

[“Integrity Indicator” on page 121](#)

[“FETCh? Subsystem” on page 350](#)

[“DISPlay:MESSage:MASKable:STATe” on page 347](#)

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## Fixed Timer Messages

### Description

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

Timer Name	Description	Value
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
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

**Fixed Timer Messages**

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

### Description

These messages are intended to be displayed on the manual user interface only, and are not entered into the Error/Event Queue.

Error Message	Description
The function you requested is not yet available.	The test set does not have this capability.
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.
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.
The function you requested is not available in this TA.	This function is used in another Test Application.
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.
Instrument warning: Audio generator instrument has been closed.	The audio generator instrument was closed automatically by the test set.
Instrument warning: Audio Analyzer instrument has been closed.	The audio analyzer instrument was closed automatically by the test set.
Measurement warning: Analog audio measurement has been closed.	Analog audio measurements have been closed by the test set.
Warning; Call processing disabled	The call processing functions are not active because the test set is performing calibration operations.

### AMPS/136 Specific Measurement Maskable Messages

These messages are maskable so that they can be blocked from appearing on the display. See [“Error Messages” on page 611](#).

Dynamic power can only be measured with all other measurements turned off. A warning message is displayed when the dynamic power measurement is first made, alerting you to the fact that previously active measurements have been closed. Re-enabling other measurements automatically disables the dynamic power

measurement.

**Table 9. Digital 136 Specific Measurement Maskable Messages**

Messages	Description
Digital 136 measurement warning; Digital Transmit Power measurement has been closed	Indicates that a measurement has been inactivated because of a resource conflict. This message is typically generated when dynamic power measurements are initiated.
Digital 136 measurement warning; Modulation Accuracy measurement has been closed	Indicates that a measurement has been inactivated because of a resource conflict. This message is typically generated when dynamic power measurements are initiated.
Digital 136 measurement warning; Adjacent Channel Power measurement has been closed	Indicates that a measurement has been inactivated because of a resource conflict. This message is typically generated when dynamic power measurements are initiated.
Digital 136 measurement warning; Loopback Bit Error measurement has been closed	Indicates that a measurement has been inactivated because of a resource conflict. This message is typically generated when dynamic power measurements are initiated.
Digital 136 protocol warning; No response to handoff, retrying.	The test set's base station emulator commanded the mobile to perform a handoff, but no response was received from the mobile. The handoff will be attempted again.
Digital 136 measurement warning; Dynamic Power measurement has been closed.	The dynamic power measurement was closed because another measurement was selected. Dynamic power measurements can not be performed while other measurements are active.

**Table 10. AMPS Specific Measurement Maskable Messages**

Error Message	Description
AMPS measurement warning; Analog Transmit Power measurement has been closed.	Indicates that a measurement has been inactivated because of a resource conflict. This message is typically generated when dynamic power measurements are initiated.
AMPS measurement warning; Frequency Stability measurement has been closed.	Indicates that a measurement has been inactivated because of a resource conflict. This message is typically generated when dynamic power measurements are initiated.
AMPS measurement warning; Frequency Modulation measurement has been closed.	Indicates that a measurement has been inactivated because of a resource conflict. This message is typically generated when dynamic power measurements are initiated.

**Table 10. AMPS Specific Measurement Maskable Messages**

Error Message	Description
AMPS protocol warning; No response to handoff, retrying.	The test set's base station emulator commanded the mobile to perform and handoff, but no response was received from the mobile. The handoff will be attempted again.
AMPS protocol warning; No response to power level change, retrying.	The test set's base station emulator commanded the mobile to change power level, but no response was received from the mobile. A power level change will be attempted again.

## -100 to -199 Command Errors

### Description

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.

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.

Error Message	Description
-114 Header suffix out of range	Indicates the value of a header suffix attached to a program mnemonic makes the header invalid.
-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.

**-100 to -199 Command Errors**

<b>Error Message</b>	<b>Description</b>
-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.
-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, an 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.

Error Message	Description
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## Related Topics

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[“Standard Event Status Register” on page 507](#)

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## -200 to -299 Execution Errors

### Description

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.

**-200 to -299 Execution Errors**

<b>Error Message</b>	<b>Description</b>
-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 488.2, 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

### Description

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.

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.

Error Message	Description
-361 Parity error in program message	Parity bit not correct when data received for example, on a serial port.
-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.

## Related Topics

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[“Standard Event Status Register” on page 507](#)

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## **-400 to -499 Query Errors**

### **Description**

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.

<b>Error Message</b>	<b>Description</b>
-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

### Description

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>	<p>&lt;message1&gt; will appear as:</p> <p>If the DSP generated the assert:</p> <p style="padding-left: 40px;">;P:DSP T:&lt;task ID&gt; E:&lt;error code&gt; C:&lt;error classif.&gt; F1:&lt;flag 1&gt; F2:&lt;flag 2&gt;</p> <p>If the Protocol processor generated the assert:</p> <p style="padding-left: 40px;">;P:Protocol T:&lt;task ID&gt; L:&lt;line number&gt; F:&lt;file name&gt;</p> <p>If the Host processor generated the assert:</p> <p style="padding-left: 40px;">;P:Host T:&lt;task ID&gt; L:&lt;line number&gt; F:&lt;file name&gt;</p>
+102 Exception; Cycle power. Exception message<message2>	<p>&lt;message2&gt; will appear as: T:&lt;task ID&gt; or V:&lt;vector number&gt; or PC:&lt;program counter&gt; or DA:&lt;data adrs reg value&gt;.</p> <p>Vector number, program counter and data address register values are hexadecimal format.</p>
+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.

Error Message	Description
+113 Internal error; <VI NAME> forced inactive	Indicates that a VI is inactivated when not executed. <VI NAME> includes : “IntVmVI”, “GSMFixedVI”, “MiscVI”, “GSMSacchMriVI”, “IQSelfCalVI1”, “IQSelfCalVI2”, “TA RevisionVI”.
+114 Internal error; <VI NAME> not responding	Indicates that a VI has not been instantiated or the state is not available. <VI NAME> includes : “IntVmVI”, “GSMFixedVI”, “MiscVI”, “GSMSacchMriVI”, “IQSelfCalVI1”, “IQSelfCalVI2”, “TA RevisionVI”.
+115 Internal error; <VI NAME> inactive	Indicates that a VI has been made inactive. <VI NAME> includes : “IntVmVI”, “GSMFixedVI”, “MiscVI”, “GSMSacchMriVI”, “IQSelfCalVI1”, “IQSelfCalVI2”, “TA RevisionVI”.
+120 Warning; Receiver over range due to requested settings	Indicates the total received power (a combination of received power and amplitude offset) is above the range of the test set.
+121 Warning; Receiver under range due to requested settings	Indicates the total received power (a combination of received power and amplitude offset) is below the range of the test set.
+122 Warning; Reference out of lock	Indicates the test set’s internal reference is out of lock.
+123 Warning; Duplicate RF IN/OUT Amplitude Offset Frequency entry. First frequency entry in RF IN/OUT Amplitude Offset table will be used.	Indicates that an amplitude offset value for that frequency has already been entered. The test set will use the amplitude offset value entered first.
+124 Warning; Source over range due to requested settings	The setting selected for total transmit power (a combination of cell power, awgn power, amplitude offset) is above the test set’s range.
+125 Warning; Source under range due to requested settings	The setting selected for total transmit power (a combination of cell power, awgn power, amplitude offset) is below the test set’s range.
+130 Configuration error; Unable to switch to indicated Test Application	The test application selected is not available for this test set.
+131 Configuration error; Current Test Application is not licensed (License = N). Select another Test Application	The test application selected is not licensed. Select another version or test application that is licensed (License = L).

## +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.

### Protocol Failure Messages

Many of the call processing errors are the result of protocol signals not being received from the mobile. Protocol failures do not necessarily cause a call to be disconnected, but are displayed to inform the user of a protocol error occurring during call processing operation.

**Table 11. Digital 136 Call Processing Error Messages**

Error Message	Description
+201 Digital 136 call disconnected; Reverse channel failure.	The test set stopped receiving a valid reverse DTC signal from the mobile while in the connected state.
+202 Digital 136 call disconnected; No response to release.	The mobile did not respond when a command was sent by the test set to release the call while connected.
+250 Digital 136 protocol failure; Signal not found on new traffic channel.	The test set commanded the mobile to go to a new traffic channel, but the test set could not find the mobile's signal at the new channel setting.
+251 Digital 136 protocol failure; No response to power level change.	The test set commanded the mobile to change its output power setting, but the mobile's level did not change.
+252 Digital 136 protocol failure; No response to alert during paging.	The mobile was paged, but it did not respond to the alert message.
+253 Digital 136 protocol failure; No response to connect.	The mobile was paged, but it did not send a connect response when the call was answered.
+255 Digital 136 protocol failure; No response to start MAHO.	The test set commanded the mobile to send MAHO information when on a DTC, but the mobile did not respond.
+256 Digital 136 protocol failure; No response to stop MAHO.	The test set commanded the mobile to stop sending MAHO information when on a DTC, but the mobile did not respond.
+258 Digital 136 protocol failure; No response to handoff.	The test set commanded the mobile to change one or more traffic channel settings (handoff) while on a DTC, but the mobile did not respond.

**Table 12. AMPS Call Processing Error Messages**

Error Message	Description
+201 AMPS call disconnected; Reverse channel failure.	The test set stopped receiving a valid reverse AVC signal from the mobile while in the connected state.



**Table 12. AMPS Call Processing Error Messages**

Error Message	Description
+202 AMPS call disconnected; No response message to release.	The mobile did not respond when a command was sent by the test set to release the call while connected.
+203 AMPS call disconnected; No signaling tone response to release.	The mobile did not send the expected signaling tone when commanded to release the call while connected.
+250 AMPS protocol failure; Signal not found on new traffic channel.	The test set commanded the mobile to go to a new traffic channel, but the test set could not find the mobile's signal at the new channel setting.
+251 AMPS protocol failure; No response to alert.	The mobile was paged, but it did not respond to the alert message.
+252 AMPS protocol failure; No answer.	The mobile was paged, and the active cell status was in the alerting state, but the page was not answered.
+258 AMPS protocol failure; No response to handoff.	The test set commanded the mobile to change one or more traffic channel settings (handoff) while on an AVC, but the mobile did not respond.
+259 AMPS protocol failure; No response to power level change.	The test set commanded the mobile to change its output power setting, but the mobile's level did not change.

## +300 to +399 Link Control Device-Specific Error

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 507](#) for information on this register.

**No link control errors are currently defined for this test application.**

Error Message

## +400 to +499 Core Hardware Device-Specific Error

### Description

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.

Error Message	Description
+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	

**+400 to +499 Core Hardware Device-Specific Error**

<b>Error Message</b>	<b>Description</b>
+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	
+423 Hardware failure; Unable to access networking information	
+424 Hardware failure; Bit clock B is not responding	
+425 Hardware failure; Invalid EEPROM checksum <EEPROM board ID>	See the list of EEPROM board ID names below.
+426 Hardware failure; Unable to write to EEPROM <EEPROM board ID>	See the list of EEPROM board ID names below.
+427 Hardware failure; Unable to read from EEPROM <EEPROM board ID>	See the list of EEPROM board ID names below.
+428 Hardware failure; Board not identified <board ID>	See the list of board ID names below.
+429 Hardware failure; Could not create board identification <board ID>	See the list of board ID names below.
+430 Hardware failure; Control version not compatible with FW <board ID>	See the list of board ID names below.
+431 Hardware failure; RF IO DAC cannot be calibrated due to present temperature	
+432 Hardware failure; RF hardware is not responding	
+433 Hardware failure; RF source FM hardware is not responding	
+434 Hardware failure; Audio source FM hardware is not responding	

Error Message	Description
+460 Hardware failure; Hardware doesn't support requested operation	This error occurs when a setting is attempted that is not possible with the test set's hardware. The current firmware needs new hardware in order to work.

**<board ID> names**

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

**<EEPROM board ID> names**

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

**Related Topics**

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[“Standard Event Status Register” on page 507](#)

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## +500 to +599 Test Application Hardware Device-Specific Error

### Description

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.

**Table 13. TA136 Hardware Error Messages**

Error Message	Description
+500 TA136 hardware failure; Base station emulator hardware is not responding.	The test set's base station emulator hardware is not responding to a command when using the AMPS/136 test application.
+501 TA136 hardware failure; Base station emulator trigger hardware is not responding.	The test set's base station emulator trigger hardware is not responding to a command when using the AMPS/136 test application.
+502 TA136 hardware failure; DSP Demod Hardware is not responding.	The test set's Digital Signal Processing demodulation hardware is not responding to a command when using the AMPS/136 test application.

**Table 14. Digital 136 Hardware Error Messages**

Error Message	Description
+500 Digital 136 hardware failure; Base station emulator hardware is not responding.	The test set hardware responsible for creating a digital control channel (DCCH) or a digital traffic channel (DTC) is not responding to a command.

**Table 15. AMPS Hardware Error Messages**

Error Message	Description
+500 AMPS hardware failure; Base station emulator hardware is not responding.	The test set hardware responsible for creating an analog control channel (ACC) or an analog voice channel (AVC) is not responding to a command.
+503 AMPS hardware failure; Base station emulator trigger hardware is not responding.	The test set's base station emulator trigger hardware is not responding to a command when connected on an analog voice channel (AVC).

## Related Topics

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[“Standard Event Status Register” on page 507](#)

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## +600 to +699 Instrument Device-Specific Error

### Description

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.

Error Message	Description
+601 Instrument failure; Audio generator hardware is not responding	Indicates a problem occurs when attempting to control the test set's audio generator.

### Related Topics

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[“Standard Event Status Register” on page 507](#)

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## +700 to +799 Test Application Measurement Device-Specific Error

These errors are generated when a problem occurs that is specific to one of the test set’s measurements. 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 [“STATUS:QUESTIONABLE” on page 490](#) for information on this register.

**Table 16. Digital 136 Specific Measurement Error Messages**

Error Message	Description
+701 Digital 136 measurement failure; Digital Transmit Power hardware is not responding.	The test set’s digital power measurement hardware is not operating correctly.
+702 Digital 136 measurement failure; Modulation Accuracy hardware is not responding.	The test set’s modulation accuracy measurement hardware is not operating correctly.
+703 Digital 136 measurement failure; Adjacent Channel Power hardware is not responding.	The test set’s adjacent channel power measurement hardware is not operating correctly.
+704 Digital 136 measurement failure; Loopback Bit Error hardware is not responding.	The test set’s loopback bit error measurement hardware is not operating correctly.
+705 Digital 136 measurement failure; IQ Tuning hardware is not responding	The test set’s IQ Tuning measurement hardware is not operating correctly.

**Table 17. AMPS Specific Measurement Error Messages**

Error Message	Description
+701 AMPS measurement failure; Analog Transmit Power hardware is not responding.	The test set’s analog transmit power measurement hardware is not operating correctly.
+702 AMPS measurement failure; Frequency Stability hardware is not responding.	The test set’s frequency stability measurement hardware is not operating correctly.
+703 AMPS measurement failure; Frequency Modulation hardware is not responding.	The test set’s frequency modulation measurement hardware is not operating correctly.

### Related Topics

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See [“Integrity Indicator” on page 121](#).

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## +800 to +899 Core Measurement Device-Specific Error

### Description

These errors are generated when a problem occurs that is specific to one of the test set's core measurements (such as analog audio).

When one of these errors is generated, the '+800 errors' bit in the questionable error status register is set.

Error Message	Description
+801 Measurement failure; Analog audio hardware is not responding	Indicates that a problem occurs when attempting to control the measurement's hardware.
+802 Measurement failure; Audio analyzer hardware is not responding	Indicates that a problem occurs when attempting to control the measurement's hardware.

### Related Topics

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["Standard Event Status Register" on page 507](#)

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## 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 611](#)

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## Revision Information

This document describes features and functionality that are part of the E1961A AMPS/136 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 - November 2000” on page 644](#)
- [“A.02 release - June 2000” on page 644](#)

### A.03 release - November 2000

Two features were added for this release:

- Selectable AC or DC coupling between the Audio Generator and the front panel AUDIO OUT port.
- Induced bit errors on the forward DTC. You can specify the level of induced bit errors (from 0% to 20%) that are sent to the mobile while on a DTC.

### A.02 release - June 2000

#### Measurement Functionality

The following measurement functionality has been implemented. Statistics from each measurement include the minimum, maximum, average and standard deviation of each result when multiple measurements are made.

UI=User Interface, MUI=Manual User Interface, RUI=Remote User Interface

#### Measurement Functionality

Measurement	User Settings	UI Access	Results
Analog TX Power	<ul style="list-style-type: none"> <li>• Trigger arm</li> <li>• Measurement timeout</li> <li>• Multi-measurement count</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity</li> <li>• Power in dBm</li> </ul>
Frequency Modulation	<ul style="list-style-type: none"> <li>• Trigger arm</li> <li>• Measurement timeout</li> <li>• Multi-measurement count</li> <li>• Distortion on or off</li> <li>• Distortion fundamental frequency</li> <li>• Expander on or off</li> <li>• Filter type</li> <li>• 100 Hz BW BPF center frequency</li> <li>• De-emphasis on or off</li> <li>• Detector type</li> <li>• Modulation frequency on or off</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity</li> <li>• Deviation in kHz</li> <li>• Distortion in %</li> <li>• Modulation frequency in Hz</li> </ul>

**Measurement Functionality**

Measurement	User Settings	UI Access	Results
Frequency Stability	<ul style="list-style-type: none"> <li>• Trigger arm</li> <li>• Measurement timeeout</li> <li>• Multi-measurement count</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity</li> <li>• Frequency error in Hz</li> <li>• Worst frequency error in ppm</li> <li>• RF frequency in MHz</li> </ul>
Digital TX power	<ul style="list-style-type: none"> <li>• Trigger source</li> <li>• Trigger arm</li> <li>• Trigger delay</li> <li>• Measurement timeout</li> <li>• Multi-measurement count</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity</li> <li>• Power in dBm</li> </ul>
Digital Modulation Accuracy	<ul style="list-style-type: none"> <li>• Trigger source</li> <li>• Trigger arm</li> <li>• Trigger delay</li> <li>• Measurement timeout</li> <li>• Multi-measurement count</li> <li>• EVM10 on or off</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity</li> <li>• EVM1 in % rms</li> <li>• Frequency error in Hz</li> <li>• Phase error in degrees rms</li> <li>• Magnitude error in % rms</li> <li>• Origin offset in dBc</li> <li>• EVM10 in % rms</li> </ul>
Adjacent Channel Poser	<ul style="list-style-type: none"> <li>• Trigger source</li> <li>• Trigger arm</li> <li>• Trigger delay</li> <li>• Measurement timeout</li> <li>• Multi-measurement count</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity</li> <li>• Lower adjacent channel power in dBc</li> <li>• Upper adjacent channel power in dBc</li> <li>• Lower 1st alternate channel power in dBc</li> <li>• Upper 1st alternate channel power in dBc</li> <li>• Lower 2nd alternate channel power in dBc</li> <li>• Upper 2nd alternate channel power in dBc</li> </ul>
IQ Tuning	<ul style="list-style-type: none"> <li>• Trigger source</li> <li>• Trigger arm</li> <li>• Trigger delay</li> <li>• Measurement timeout</li> <li>• Multi-measurement count</li> <li>• Reference offset frequency</li> <li>• Spur measurement frequency</li> <li>• Offset frequencies</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity</li> <li>• Power at each offset frequency in dB relative to level of reference offset frequency</li> <li>• Power spur frequency in dB relative to level of reference offset frequency</li> </ul>
Dynamic Power	<ul style="list-style-type: none"> <li>• Trigger arm</li> <li>• Measurement timeout</li> <li>• Burst count</li> <li>• Power step difference</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity for each burst</li> <li>• Power for each burst in dBm</li> </ul>
Loopback BER	<ul style="list-style-type: none"> <li>• Trigger arm</li> <li>• Measurement timeout</li> <li>• Number of bits to test</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity</li> <li>• Number of bits tested</li> <li>• Bit error ratio in %</li> <li>• Number of bad bits</li> </ul>

**Revision Information****Measurement Functionality**

Measurement	User Settings	UI Access	Results
Audio Analyzer	<ul style="list-style-type: none"> <li>• Trigger arm</li> <li>• Measurement timeout</li> <li>• Multi-measurement count</li> <li>• SINAD and Distortion on or off</li> <li>• SINDAD/Distortion fundamental frequency</li> <li>• Expander reference level</li> <li>• Filter type</li> <li>• 100 Hz BW BPF center frequency</li> <li>• De-emphasis on or off</li> <li>• Detector type</li> <li>• Expected peak voltage</li> <li>• Audio frequency on or off</li> </ul>	MUI and RUI	<ul style="list-style-type: none"> <li>• Integrity</li> <li>• Audio level in V rms or peak</li> <li>• SINAD in dB</li> <li>• Audio harmonic distortion in %</li> <li>• Audio frequency in Hz</li> </ul>

**Instrument Functionality**

- Audio Generator with user-settable amplitude, frequency and pulse on or off.
- Audio analyzer with analysis of audio signals applied to the Audio Input ports of the test set. User-settable parameters and measurement results in [“Measurement Functionality” on page 644](#).

**Active Cell Operating Mode**

Active cell operating mode is available via the MUI and RUI. Some functionality is limited to MUI or RUI use and these are indicated in the following text.

Active cell operating mode provides call processing from the test set to allow a call to be established and maintained during testing of a mobile station. The test set can transmit and receive on an AVC or on a DTC in either band. The test set can receive on a DCCH in either band.

For this release, active cell operating mode allows the user to set the following parameters for use on a digital channel.

- Cell power level
- MS TX level
- Control channel type (ACC or DCCH)
- ACC channel number
- ACC SID
- DCCH band (cellular 800 MHz or PCS 1900 MHz)
- DCCH channel number
- DCCH DVCC, SID, MCC, and SOC
- DCCH burst size (normal or abbreviated)
- MSID-MIN format (RUI only)
- Traffic channel type (AVC or DTC)

- DTC band (cellular 800 MHz or PCS 1900 MHz)
- DTC channel number
- DTC timeslot (1 and 4, 2 and 5, or 3 and 6)
- Vocoder type (VSELP or ACELP)
- DTC DVCC
- DTC burst size (normal or shortened)
- MAHO reporting start and stop
- Number of MAHO neighbor cells to report (0 to 6) and their bands and channel numbers

For this release, the following call processing actions can be performed by the test set as initiated by the user while in active cell operating mode on a digital channel.

- Registration of the mobile station by the test set using a single registration command or by using repeating registration commands (RUI only)
- Paging of the mobile station by the test set from an ACC to a DTC in the cellular 800 MHz band and from a DCCH in either band to a DTC in either band. Paging can be performed using a single page command or by using repeating page commands (RUI only).
- Origination from the mobile station to the test set from an ACC to a DTC in the cellular 800 MHz band and from a DCCH in either band to a DTC in either band
- Test set release from a DTC in either band to a DCCH in either band and from a DTC in either band to an ACC
- Mobile station release from a DTC in either band to a DCCH in either band and from a DTC in either band to an ACC
- Immediate handoff to new MS TX level
- Handoff from a DTC in either band to an AVC
- Handoff from a DTC in either band to a DTC in either band
- Handoff when user presses Execute Handoff key

For this release, the following mobile station reported information is available to the user while in active cell operating mode on a digital channel.

- MSID - MIN format and phone number format
- SCM
- ESN - decimal and hexadecimal
- Protocol version
- Rate capability
- MS called party number
- MS phone number (paging number)
- MAHO BER (no induced errors)
- MAHO RSSI
- MAHO neighbors RSSI

## Revision Information

- SCM transmission support (RUI only)
- SCM bandwidth support (RUI only)

For this release, active cell operating mode allows the user to set the following parameters for use on an analog channel.

- Cell power level
- MS TX level
- Control channel type (ACC or DCCH)
- ACC channel number
- ACC SID
- DCCH band (cellular 800 MHz or PCS 1900 MHz)
- DCCH channel number
- DCCH DVCC, SID, MCC and SOC
- DCCH burst size (normal or abbreviated)
- Traffic channel type (AVC or DTC)
- AVC channel number
- SAT color code (SAT1 5970 Hz, SAT2 6000 Hz, or SAT3 6030 Hz)
- Internal FM frequency
- Internal FM deviation
- MSID - MIN format (RUI only)

For this release, the following call processing actions can be performed by the test set as initiated by the user while in active cell operating mode on an analog channel.

- Registration of the mobile station by the test set
- Paging of the mobile station by the test set from an ACC to an AVC or from a DCCH in either band to an AVC
- Origination from the mobile station to the test set from an ACC to an AVC or from a DCCH in either band to an AVC
- Test set release from an AVC to an ACC and from an AVC to a DCCH in either band
- Mobile station release from an AVC to an ACC and from an AVC to a DCCH in either band
- Immediate handoff to new MS TX level
- Handoff from an AVC to a DTC in the cellular 800 MHz band
- Handoff from an AVC to an AVC
- Handoff when user presses Execute Handoff key

For this release, the following mobile reported information is available to the user while in active cell operating mode on an analog channel

- MSID - MIN format and phone number format
- MS phone number (paging number)
- SCM



- ESN - decimal and hexadecimal
- Protocol capability
- MS called party number

Active cell operating mode also allows the user to set up the test set's receiver. The following parameters can be set.

- Receiver power control
- Receiver measurement frequency control

### **AVC Test Operating Mode**

AVC test operating mode is available via MUI and RUI.

AVC test operating mode is used for analog testing of mobile stations without signaling. An AVC with SAT is generated on the forward channel. AVC test operating mode allows the user to set the following parameters for generation by the test set.

- Cell power level
- MS TX level
- AVC channel number or frequency
- SAT color code (SAT1 5970 Hz, SAT2 6000 Hz, or SAT3 6030 Hz)
- SAT state (on or off)
- Internal FM frequency
- Internal FM deviation
- External FM state (on or off)

AVC test operating mode also allows the user to set up the test set's receiver. The following parameters can be set.

- Receiver power control
- Receiver measurement frequency control
- Receiver uplink frequency control

AVC test operating mode includes an MUI window titled Current Analog Voice Channel Information. This window displays the following parameters

- Analog MS TX level
- AVC channel
- SAT color code

### **DTC Test Operating Mode**

DTC test operating mode is available via MUI and RUI.

DTC test operating mode is used for digital testing of mobile stations without signaling. A DTC is generated on the forward channel. DTC test operating mode allows the user to set the following parameters for generation by the test set.

- Cell power level
- MS TX level

## Revision Information

- DTC band (cellular 800 MHz or PCS 1900 MHz)
- DTC channel number or frequency
- DTC timeslot (1 and 4, 2 and 5, or 3 and 6)
- DTC DVCC
- DTC burst size (normal or shortened)
- Vocoder type (VSELP or ACELP) (RUI only)

DTC test operating mode also allows the user to set up the test set's receiver. The following parameters can be set.

- Receiver power control
- Receiver measurement frequency control
- Receiver uplink frequency control

DTC test operating mode includes an MUI window titled Current Digital Traffic Channel Information. This window displays the following parameters

- Digital MS TX level
- DTC channel
- DTC band
- DTC timeslot
- DTC DVCC
- Vocoder type

## CW Operating Mode

CW operating mode is available via MUI and RUI.

CW operating mode is used to provide a CW RF signal from the test set. CW operating mode allows the user to set the following parameters.

- Cell power level
- RF generator frequency

CW operating mode also allows the user to set up the test set's receiver. The following parameters can be set.

- Expected CW power
- Receiver measurement frequency
- Receiver uplink frequency

CW operating mode includes an MUI window titled CW Parameters. This window displays the following parameters.

- RF generator frequency
- Cell power
- Cell power state

## Test Application Switching

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**WARNING** Test application switching is only possible between GSM Mobile Test firmware revision A.04.00 and newer and AMPS/136 Mobile Test firmware revision A.01.01 and newer. Using older firmware for either test application causes you to switch from one test application and then not be able to switch back.

---

The following MUI and RUI functionality is available to allow a user to switch between the GSM and AMPS/136 test applications. Switching test applications requires a re-boot of the instrument which is performed automatically as part of the switching process.

To access test application switching from the front panel, press the System Config hardkey. Pressing the Test Application Setup softkey F3 allows a user to select a specific revision of a test application. Pressing the Test Application Setup softkey F2 allows a user to select and switch to a test application.

To switch test applications remotely, refer to the GPIB command list. The commands are part of the SYSTEM subsystem.

## MUI Screens

### System Config Screen

- Instrument information (includes current test application, firmware revision, last calibration date, serial number, current GPIB address, current LAN IP address, current subnet mask, current default gateway)
- Options installed information
- Instrument setup (includes GPIB address, LAN IP address, subnet mask, default gateway, display mode, display brightness, beeper state, maskable message display state)
- Test application information (displays name and revision of each test application licensed to be in instrument)
- Test application setup allows for switching between test applications
- RF IN/OUT amplitude offset allows for setup of frequency-dependent offsets to account for system losses and gains
- Message log

### Instrument Status Screen (lower center window of every screen)

- Indication of call status in active cell operating mode
- Indication of measurements running in the background
- GPIB annunciators (R for remote, L for listen, T for talk and S for SRQ)
- Indication of amplitude offset usage
- Indication of SHIFT hardkey usage
- Indication of internal or external reference

### Call Setup Screen

- Operating mode (active cell, DTC test, AVC test or CW)
- Originate or end call in active cell operating mode
- Paging number in active cell operating mode
- Call/Handoff setup allows setup of call parameters for paging, origination and handoffs in active cell operating mode

## Revision Information

- Register mobile in active cell operating mode
- Mobile station information in active cell operating mode
- Active cell status window in active cell operating mode
- Current traffic or voice channel information in active cell operating mode, DTC test operating mode and AVC test operating mode
- CW parameters window in CW operating mode

## Front Panel Hard Keys

The following front panel keys are functional as part of this release.

- Measurement
- Call Setup
- System Config
- Measurement Reset
- Start Single
- Continuous All
- Main Menus - Measurement Selection and Instrument Selection
- Data Entry
- Local
- Preset
- Full Preset
- AC Power on or off

## Status Subsystem

The following RUI functionality is available as part of the STATUS subsystem.

- STATUS:OPERation registers
- STATUS:OPERation:CALL registers
- STATUS:OPERation:NMRReady registers
- STATUS:QUESTionable registers
- STATUS:QUESTionable:CALL registers
- STATUS:QUESTionable:ERRors registers
- STATUS:QUESTionable:HARDware registers

## RUI Synchronization Features

The following RUI features allow for synchronization of control programs with test set functionality.

- The INITiate:DONE? query allows retrieval of measurement results when they are available without waiting for other initiated measurements to complete

- The CALL:CONNEcted series of commands and queries allow a user to know when a handoff has completed successfully or not
- The CALL:STATus[:STATe]? query allows a user to know what state the call is in (IDLE, SREQ, ALER, REL, HAND, REG, PAG or CONN)
- The CALL:MS:REPorted:MAHO:BERRor:NEW? and CALL:MS:REPorted:MAHO:RSSI:NEW? and CALL:MS:REPorted:MAHO:NEIGHbor:LIST[:ALL]:NEW? queries allow for retrieval of the next newly-reported MAHO results after a change in parameters (for example, a change in cell power level)
- The FETCh:<measurement mnemonic>:ICount? queries allow a user to determine how many measurements have completed (intermediate count) when multi-measurement count is chosen to be more than one

### **RUI-Specific-Features Not Already Listed**

The following RUI features provide specific information for programming ease.

- The SYSTem:ROSCillator:LOCKed? query allows a user to determine whether the reference oscillator is locked or not
- The CALibration:DATE? query allows retrieval of the last date the unit was calibrated (also found on the MUI on the System Config screen)

### **Features Not Implemented**

The following features are not implemented as part of this release.

- User-settable vocoder type using MUI in DTC test operating mode (defect resolved in next firmware revision)
- Help front panel key (not planned)
- Save front panel key (not planned)
- Save Single front panel key (not planned)
- Delete front panel key (not planned)
- Register Recall front panel key (not planned)
- Plug and play drivers (available Aug 00)



## Symbols

\*IDN?, 595

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