

Agilent Converting 8924C software for the E8285A CDMA Mobile Station Test Set

Product Note

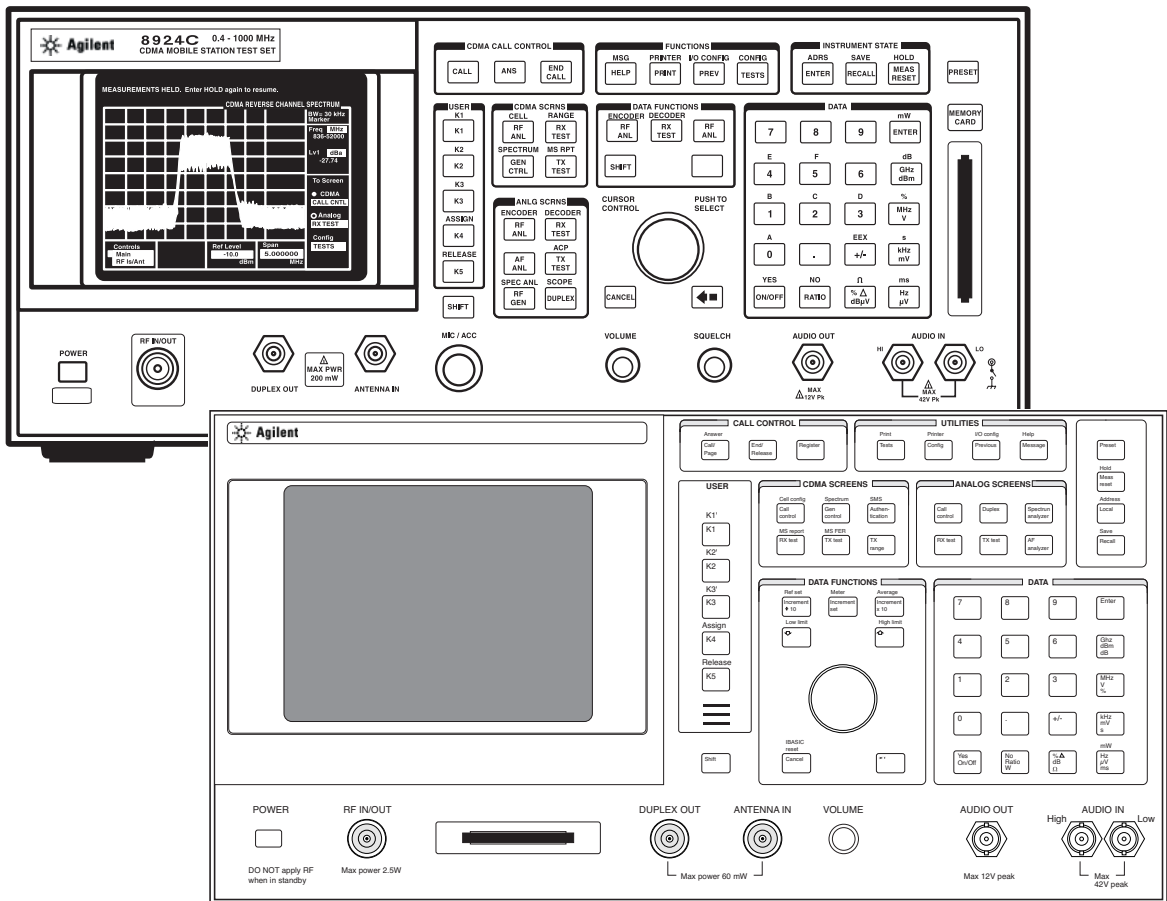


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Introduction

This Product Note assumes you are converting software originally written for the Agilent Technologies 8924C, for use with the Agilent E8285A. Ideas are also included for modifying your software to function interchangeably with both the 8924C and the E8285A.

What if you just want to replace 8924C's with E8285A's, with minimum conversion effort? See Table 1, and look for the column labeled: "What must I change in my code for minimum re-coding effort?"

This Product Note is meant to supplement the information in the *E8285A Condensed Programming Reference Guide*; Part Number E8285-90020.

This Product Note does not include information about differences between serial port implementations of the 8924C and E8285A.

For more information about the differences between the 8924C and E8285A, read the following Agilent Product Note: *Product Comparison: the E8285A CDMA Mobile Station Test Set Versus the 8924C CDMA Mobile Station Test Set*; Part Number 5968-4464E. Information in the Product Comparison will help you decide which product best fits your needs.

Some front-panel keys used to access screens on the 8924C have been removed from the E8285A keyboard. All of the screens are still accessible on the E8285A using the following methods:

- Manually using the knob via the To Screen menu at the lower right of the display; and
- Remotely through GP-IB commands.

Conventions used in this Product Note

- The words "*Original Code*" will be used to refer to your original 8924C software. The words "*New Code*" will describe software modified to be compatible with the E8285A (and 8924C whenever feasible).
- The words "test set" will be used to refer to either the 8924C or E8285A.
- Programming examples written in HP BASIC illustrate this Note (specifically, E2060A HP BASIC for Windows available from Agilent Technologies).
- GP-IB indicates the IEEE-488 interface bus for remote instrument control.
- The GP-IB default address is 14 for both the 8924C and E8285A.
- Upper case letters in commands must be sent; lower case letters are optional. (Using the minimum number of characters minimizes GP-IB command transmission time).

Example of two identical command strings:

```
CSP:OUTP [All characters must be sent]
```

```
CSPepectrum:OUTPut [Only the upper case characters must be sent]
```

NOTE: Upper case letters are used in this Note to indicate required characters; the actual command string may use upper or lower case letters, or a mixture. For example, all of the following strings will be executed by the test set identically:

```
CSP:OUTP
```

```
Csp:Outp
```

```
cSP:oUtp
```

```
csp:outp
```

```
cspectrum:outp
```

```
cspectrum:output
```

Assumptions

- This Product Note assumes your *Original Code* is used for manufacturing test (or a similar complex test procedure) of CDMA phones using the 8924C.
- Your *Original Code* is assumed to run on a computer connected to the test set via the GP-IB interface.
- Commands not described explicitly in the sections of this Product Note should function identically on both the 8924C and E8285A.
- 8924C features described in this Product Note apply to firmware revision A.06.33.
- E8285A features described in this Product Note apply to firmware revision A.01.29.

Table 1. Comprehensive Cross Reference for 8924C Functions

If you use these 8924C functions:	Review these Sections for E8285A conversion:	What must I change in my code for minimum re-coding effort?
General Topics		
Query *IDN? to determine model number, serial number, and firmware revision	1	☹
Query *OPT? to determine installed features	2	☹
Query PRINT:DESTINATION to determine the selected printer port	3	☹
8924C screens not found on E8285A front panel keys	4	
WAIT statements in your <i>Original Code</i>	5	
Adjust screen intensity	6	☹
Timeout subroutine in <i>Original Code</i> to avoid GP-IB bus lockup due to "----" (four dashes) measurement response	7	☹
Operator manually depresses POWER On/Off switch to reset (reboot) test set	14	
RF Ports and Attenuators		
PCS RF frequencies (83236B PCS Interface Control ON)	8	☹
8924C RF ports: DUPLEX OUT or ANTENNA IN	9	☹
83236B RF port: RF OUT Only	9	☹
RF Offset level mode	10	☹
Automatic RF frequency tuning	11	☹
Attenuator hold functions used to prevent the mechanical attenuator in the 83236B from switching	12	☹
Direct control of RF input attenuator settings	13	☹
Calibration		
PCB_CAL calibration program	14	
CDMA Channel Power calibration	15	☹
PCS RF Generator level calibration for 83236B	16	☹
CDMA Measurements		
MS FER (Mobile Station Reported FER from the CDMA Mobile Reporting screen)	17	☹
Time Offset field on the Configuration screen	18	☹
FER measurement functions	19	☹
Analog Measurements		
AMPS SAT deviation measurement	20	
RX TEST or RF GENERATOR screens, using the 8924C PRESET value of 'AFGen1 To FM' deviation of 3 kHz.	21	☹
DC current measurement	22	☹
RF frequency measurement	23	☹
Analog spectrum analyzer	24	
Non-RF Connectors		
External time base reference input	25	☹
Front-panel MICrophone/ACCessory input with pre-emphasis	26	☹

General Topics

1. Determining the test set Model Number

Description:

If your *New Code* must function with both the 8924C and the E8285A, the following example illustrates an implementation technique for interchangeability.

Example Program Changes for the E8285A:

REMOVE:

No Changes

ADD:

No Changes

Practical Considerations:

The *IDN? command functions identically on both the 8924C and E8285A. The returned string will contain unique data for each test set, in the following format:

Manufacturer,Model Number,Serial Number,Firmware Revision

Example returned string: Hewlett-Packard,E8285A,US38350012,A.01.05

The following example program determines which model is present. In this example, the information is used to send the PCS mode command only if an 8924C responds.

```
380 ! The following queries the test set to determine which model is
390 ! present, and sets a common variable for use throughout
    the program.
400 !
410   Model$="Unknown"
420     OUTPUT 714;"*IDN?"
430     ENTER 714;Device$
440     A=POS(Device$,"8924C")
450     IF A<>0 THEN Model$="8924C"
460     B=POS(Device$,"E8285A")
470     IF B<>0 THEN Model$="E8285A"
480   PRINT Model$," = test set model found on GP-IB at 714"
490   IF Model$="8924C" THEN OUTPUT 714;"CONF:PCSM 'ON'" ! PCS command for
500                                                         ! 8924C only
```

2. Determining the test set Options

Description:

If your *New Code* must function with both the 8924C and the E8285A, the following example illustrates an implementation technique for interchangeability.

Example Program Changes for the E8285A:

REMOVE:

No Changes

ADD:

No Changes

Practical Considerations:

The *OPT? command functions identically on both the 8924C and E8285A. The returned string may contain different data for each model and individual test set. Also, the results may differ for test sets with different firmware or of different serial number ranges. The term *option* is used here to describe a generic variable feature in a test set, and does not necessarily correlate with a test set option specified upon purchase (such as 8924C Option 011).

Example E8285A return string:

```
SPECTRUM ANALYZER,C MESSAGE,6KHZ BPF,0
```

Example 8924C return string:

```
C MESSAGE,6KHZ BPF,ELECTRONIC ATTEN,PCS-83236B-WIDE_BAND
```

The following example program determines which options are present.

```
10                ! This program queries and displays the options
20                ! in an E8285A or an 8924C.
30                !
40    DIM Opt$[255] ! Dimensions a string variable for the result
50    OUTPUT 714;"*OPT?"
60    ENTER 714;Opt$
70    PRINT Opt$
80    END
```

3. Setting and determining the printer port

Description:

The commands to set the printer port are different for the 8924C and E8285A. These fields are found on the PRINT CONFIGURE screen of the 8924C, and on the PRINTER CONFIGURE screen of the E8285A.

Also, when the current printer port is queried, the string responses are different from the 8924C and E8285A.

Example Program Changes for the E8285A:

REMOVE:

```
CONFigure:PRINT:PORTs 'Serial'
CONF:PRIN:PORT 'HPIB'
CONF:PRIN:PORT 'Parallel'

CONFigure:PRINT:DESTination 'Serial'
CONF:PRIN:DEST 'HPIB'
CONF:PRIN:DEST 'Parallel'
```

ADD:

```
CONFigure:PRINt:PORTs 'Serial 9'  
CONF:PRIN:PORT 'HP-IB'  
CONF:PRIN:PORT 'Parallel 15'  
CONFigure:PRINt:DESTination 'Serial 9'  
CONF:PRIN:DEST 'HP-IB'  
CONF:PRIN:DEST 'Parallel 15'
```

Practical Considerations:

The printer setting commands CONF:PRIN:PORT and CONF:PRIN:DEST function identically (as do the querying commands CONF:PRIN:PORT? and CONF:PRIN:DEST?).

The test sets ignore the case of the printer port string, so CONF:PRIN:PORT 'HP-IB' is identical to CONF:PRIN:PORT 'hp-ib'.

If you query the printer port on the 8924C, the returned strings will contain the following data, including the quotation marks:

```
"SERIAL "  
"HPIB "  
"PARALLEL "
```

If you query the printer port on the E8285A, the returned strings will contain the following data, including the quotation marks:

```
"SERIAL 9 "  
"HP-IB "  
"PARALLEL 15 "
```

4. Accessing the screens

Description:

The E8285A front panel is different than the 8924C. Some of the screen-access keys were removed from the E8285A keypad to make it simpler for users. All of the 8924C screens are still available in the E8285A, and the programming commands to access them are identical.

Example Program Changes for the E8285A:

REMOVE:

No changes

ADD:

No changes

Practical Considerations:

The E8285A adds one more screen: CDMA Mobile Reported FER, accessed with the MS FER key (see Section 17 of this Product Note).

To manually access E8285A screens without using the front-panel keys, use the knob to select from the "To Screen" menu in the lower right-hand corner of each screen.

5. WAIT statements during program execution; measurement speed improvements

Description:

The E8285A operates faster overall than the 8924C. Therefore, if WAIT statements are used in your *Original Code* for the 8924C, you may be able to shorten the WAIT times. (WAIT statements delay the computer program for specific time periods while the test set performs an operation).

The E8285A speed improvements are attributed to the following:

- Faster host microprocessor
- Faster internal LAN communication
- Faster GP-IB operation
- Improved DSP algorithms for faster rho, average power, channel power, and access probe power measurements
- Quicker start-up at power on
- Improved frequency switching time above 1 GHz due to integrated PCS hardware

Example Program Changes for the E8285A:

REMOVE:

Some WAIT statements may be unnecessary

ADD:

No changes

CHANGE:

Decrease the time of some WAIT statements

Practical Considerations:

It is often valuable to experiment until you find the minimum WAIT time necessary for a section of code to function accurately and repeatably. Typically, WAIT statements are used to optimize a section of code when one element limits test speed. Some elements of test speed to consider are:

- Time for the *Phone* to switch modes, process a test-mode command, or reach a steady-state condition
- Time for the *Test Set* to change screens, RF frequency, or modulation setting
- Time for a *Robot or Automated Phone Test Fixture* to change position

During the calibration of CDMA phones in manufacturing, the RF output power of the transmitter is often measured many times at many frequencies.

- Typically, the E8285A will switch RF frequencies faster than the 8924C, which can shorten the overall calibration time.
- The channel power measurement is often used to measure power. If the transmitted CDMA signal is at full rate, reducing the channel power measurement interval may shorten the test time significantly. To shorten the normal 10 millisecond channel power measurement interval:
 - Go to the CDMA TX Test screen (CDMA Cellular Mobile Transmitter Test screen)
 - Enable the Channel Power measurement
 - Set the Traffic Data Mode field to Service Option 2 or Service Option 9
 - Set the Data Rate field to Full
 - Adjust the Chan Power Meas Intrvl field (default 10 ms; range 0.1 ms to 10 ms)

6. Screen intensity

Description:

The intensity of the E8285A electroluminescent (EL) display cannot be adjusted. The intensity of the 8924C CRT display is adjustable.

Example Program Changes for the E8285A:

REMOVE:

```
CONF:INTensity [integer from 1 to 8]
```

ADD:

No Changes

Practical Considerations:

The Remote Display lock and unlock function operates the same for the E8285A as for the 8924C.

7. Improved response to indeterminate measurements (often displayed as "----")

Description:

The E8285A will rapidly provide a unique numeric response over GP-IB if a measurement result is indeterminate, such as when "----" (four dashes) displays. For example, the four-dash display is often observed when the E8285A measures the RF power of an input signal which is below the test set's minimum measurement threshold. This is the default mode for all E8285A's.

For the 8924C, an indeterminate measurement result means that the test set will display "----" (four dashes) and wait indefinitely before providing a GP-IB response. To avoid this GP-IB bus "lockup", a timeout recovery subroutine in the *Original Code* is often used (see *Example #3* below).

[Important Notes: For the default 8924C mode, there are two exceptions to this. On the CDMA Transmitter Power Range Test Screen, both the Min Power field and Max Power field will return the real value $1.79769...e^{+308}$ if queried remotely and if no valid measurement is available.

If you install 8924C firmware \geq A.07.06, the 8924C will include Indeterminate Measurement functionality identical to the E8285A. There is one difference, however: the E8285A default mode is Indeterminate Measurement=On; but the 8924C default mode (for firmware \geq A.07.06) is Indeterminate Measurement=Off.]

Typically, an *indeterminate measurement timeout recovery subroutine* performs the following steps (see *Example #3* below):

- Wait about five seconds for a valid response from the test set
- Continue the program if a valid response is received

- clear the GP-IB bus if no valid response is received
- continue the program.

Example Program Changes for the E8285A:

REMOVE:

No Changes

[If you already have an *indeterminate measurement timeout recovery subroutine* in your *Original Code*, then it is good practice to retain it. This protects your program from unforeseen errors during execution.]

ADD:

```
CONF:MEASure:INDeterminate 'On'
```

[This is the default E8285A mode, and is much faster than the default 8924C mode. Since it is the default mode at E8285A power-up, the command

CONF:MEAS:IND 'On' need only be sent if you have set it 'Off'].

```
CONF:MEAS:IND 'Off'
```

[This command causes the E8285A to operate the same as the 8924C default mode; you should only use this if you want the E8285A to operate like the 8924C default mode, requiring a *timeout recovery subroutine*; see *Example #3* below].

Practical Considerations:

The E8285A default setting is CONF:MEAS:IND 'On'. When set to 'On', the following values will be returned in the case of an indeterminate measurement:

- Real value = $1.7976931348623157e^{+308}$
- Integer value = 2147483647 [equal to $2^{31} - 1$]

You probably want to add an error trapping subroutine to your *New Code* to check all measurement results for the real and integer values above. Depending on the goals of a section of your program, you may want to repeat a measurement, or go to a special error subroutine, or simply continue on to the next section of the program.

When the E8285A setting is CONF:MEAS:IND 'Off', then the E8285A will operate the same as the 8924C default mode (and Agilent Technologies recommends you use a *timeout recovery subroutine*; see *Example #3* below).

Example 1: REAL Indeterminate Value

The following example program segment checks for indeterminate RF power measurement results (for REAL values; when the E8285A setting is CONF:MEAS:IND 'On'). If a channel power measurement is queried and the display shows "—" (four dashes), this is an indeterminate real value, so the E8285A will return 1.797...e⁺³⁰⁸. Note that with some GP-IB controllers or programming languages, it may be necessary to explicitly declare a real variable (also known as a floating point variable) to support this very large real number.

```
30 ! Example program segment for measurements returning REAL values.
40 ! This is a portion of a program to measure CDMA channel power. If
50 ! no signal is present, the test set will return 1.7...E+308, and
60 ! the program will print a message saying 'no power'. If a
70 ! measurable signal is present, the channel power will be printed.
80 !
90 OUTPUT 714;"CDMA:TX:POW:MEAS 'Chan Power'"
100 OUTPUT 714;"MEAS:CDM:CHAN:UNIT DBM" ! Measure power in dBm units
110 OUTPUT 714;"TRIG"
120 OUTPUT 714;"MEAS:CDM:CHAN?"
130 REAL Chpow ! Define a real variable
140 ENTER 714;Chpow
150 IF Chpow>+1.E+307 THEN ! Check if 4-dash value is returned
160 PRINT "No measurable E8285A channel power"
170 ELSE
180 PRINT "Channel Power =";PROUND(Chpow,-1);"dBm" ! Prints power
190 ! rounded to 0.1dB
200 END IF
210 END
```

Example 2: INTEGER Indeterminate Value

The following example program segment checks for indeterminate FER frame-error counts (for INTEGER values; when the E8285A setting is CONF:MEAS:IND 'On'). If an FER frame-errors counted measurement is queried and the display shows "—" (four dashes), this is an indeterminate integer value, so the E8285A will return 2147483647. Note that with some GP-IB controllers or programming languages, it may be necessary to read this very large integer value as a REAL variable (also known as a floating point variable).

```
30 ! Example program segment for measurements which return INTEGER values.
40 ! This is a portion of a program to measure CDMA receiver FER.
50 ! If no frame-error count is available, the test set will
60 ! return the integer value 2147483647, and the program will
70 ! print 'No frame-error count available'. If a frame-error
80 ! count is available, the result will be returned and printed.
90 ! (NOTE: The HP BASIC programming language does not allow integer
100 ! variables larger than 32767. Thus, a default REAL variable will
110 ! be used in the following program to ENTER the data from the
120 ! test set).
130 !
140 OUTPUT 714;"DISP CRXTest"
```

```

150 OUTPUT 714;"DISP:FER:INT:RES 'YES'"      ! Interim FER display 'on'
160 OUTPUT 714;"MEAS:CDM:FER:ERR?"          ! Query frame error count
170 ENTER 714;Fer_err                        ! Uses default REAL variable
180     IF Fer_err=2147483647 THEN           ! Check if 4-dashes returned
190         PRINT "No frame-error count available"
200     ELSE
210         PRINT "Frame Error Count =";Fer_err ! Prints frame error count
220     END IF
230 END

```

Example 3: Indeterminate Measurement Timeout Recovery Subroutine

The following example program segment checks for indeterminate RF power measurement results if you use the command `CONF:MEAS:IND 'Off'` with the E8285A (which is identical to the 8924C default mode). (NOTE: Agilent Technologies does not recommend this method because it is inefficient). If a channel power measurement is queried and the display shows "—" (four dashes), this is an indeterminate value, so the E8285A will wait indefinitely until a valid measurement occurs. The subroutine waits 5 seconds, resets the test set, and then returns control of the program to the instrument controller.

```

30  ! Example timeout recovery subroutine.
40  ! This is a portion of a generic program. If a measurement is queried,
50  ! but the test set does not return a result within 5 seconds, then the
60  ! timeout subroutine will regain control of the program. Program
70  ! execution will continue at the next line after the one which caused
80  ! the program to timeout. Specific commands will vary depending on the
81  ! GP-IB interface and programming language used.
190 ! Put line 200 at beginning of program;
191 ! Whenever the action of a program line
192 ! takes more than 5 seconds, line 200
193 ! takes control.
200 ON TIMEOUT 7,5 CALL Timeout ! Sets 5 sec timeout on GPIB interface 7.
210 ! If interface receives no response to a
211 ! query in 5 sec, then program continues
212 ! at Timeout subroutine.
300 !
301
302 !           Main body of program goes here
400 !
500 !
1020 Timeout: SUB Timeout recovery subroutine
1030 PRINT " PROGRAM TIMED OUT "
1040 CLEAR 7           ! Clear GPIB interface 7
1050 CLEAR 714        ! Clear GPIB of test set (at 714 address)
1060 OUTPUT 714;"TRIG:ABORT" ! Abort any pending test set triggers
1070 SUBEND           ! Return to line number in program
1080                 ! following the line which caused program
1090                 ! to timeout; continue program execution.

```

RF Ports and Attenuators

8. PCS Mode command unnecessary

Description:

The E8285A covers both the 800 - 1000 MHz cellular bands and the 1700 - 1900 MHz PCS CDMA bands. (The 8924C covers the 800 - 1000 MHz bands in the standard configuration, and adds the 1700 - 1900 MHz CDMA bands only when mated with an Agilent Technologies 83236B PCS Interface).

Example Program Changes for the E8285A:

REMOVE:

```
CONFigure:PCSMODE 'ON'
```

```
CONF:PCSM 'OFF'
```

ADD:

No Changes

Practical Considerations:

The E8285A does not execute `CONF:PCSM` commands. For fastest program execution, `CONF:PCSM` commands should not be sent to the E8285A. After receiving this command, the E8285A Message Screen displays "HP-IB Error: -113 Undefined header". It will also beep to alert the operator to an incorrect command.

9. Selecting RF input and output ports

Description:

The 83236B PCS Interface is not used with the E8285A. Therefore, `CONF` commands to select the RF OUT Only port (on the 83236B) are removed for the `CONFIGURATION` screen. Commands related to other screens used to select the RF OUT Only port are also removed.

The Practical Considerations section below shows the different screens and fields that can be used to select the RF input and output ports.

The Practical Considerations section also describes input and output level differences.

Example Program Changes for the E8285A:

REMOVE:

```
CONFigure:OUTPut 'Only'
```

```
CSpectrum:OUTPut 'Only'
```

```
RFGenerator:OUTPut 'Only'
```

```
SANalyzer:TGenerator:DEStination 'Only'
```

ADD:

No Changes

Practical Considerations:

Setting the RF input or output port with any command (or on any screen) changes the test set configuration for all following screens and measurements. Once set, the RF input and output ports will remain fixed. Listed below are example commands:

Example commands to select the RF input:

```
CONFigure:INPut 'RF In' [Configure screen]
```

```
CONF:INP 'Ant'
```

```
CSpectrum:INPut 'RF In' [CDMA Reverse Channel Spectrum screen]
```

```
CSP:INP 'Ant'
```

```
RFANalyzer:INPut 'RF In' [analog RF Analyzer screen]
```

```
RFAN:INP 'Ant'
```

```
SANalyzer:INPut 'RF In' [analog Spectrum Analyzer screen]
```

```
SAN:INP 'Ant'
```

Example commands to select the RF output:

```
CONFigure:OUTPut 'RF Out'
```

```
CONF:OUTP 'Dupl'
```

```
CSPectrum:OUTPut 'RF Out'
```

```
CSP:OUTP 'Dupl'
```

```
RFGenerator:OUTPut 'RF Out'
```

```
RFG:OUTP 'Dupl'
```

The E8285A RF block diagram is significantly different than the 8924C. Therefore, the E8285A ANTENNA IN port is *typically* more sensitive to low-level signals and has a lower noise floor than the 8924C. Also, the E8285A DUPLEX OUT port can *typically* provide about a 5 dB higher RF output level than the equivalent 8924C port.

10. Separate offset settings for RF input and output ports

Description:

A unique RF level offset can now be entered separately for the selected input port and output port. This capability enables more accurate measurements if your test system has different losses in the forward and reverse channels.

Example Program Changes for the E8285A:

REMOVE:

```
CONFigure:OFLevel:RFINout [real value] [Notes: (1) see the first paragraph in Practical
```

Considerations below

(2) Notice that this command has no colon between RF and IN; it adjusts both the RF In and Out offsets]

ADD:

```
CONFigure:OFLevel:RF:IN [real value] [Notice that this command has a colon between RF and IN; it  
adusts only the RF In offset]
```

```
CONF:OFL:RF:OUT [real value]
```

Practical Considerations:

If using an identical offset value for the forward and reverse links is sufficient for your test setup, then you can use the 8924C commands in your *Original Code* to program the E8285A. If the E8285A receives the 8924C command CONF:OFL:RFINout [real value], the E8285A loads the [real value] into both the RF OUT and RF IN fields.

The commands CONF:OFL:MODE 'On' and CONF:OFL:MODE 'Off' are required to enable and disable the RF level offset function for both the 8924C and E8285A.

The commands CONF:OFL:ANTenna [real value] and CONF:OFL:DUPLex [real value] function for both the 8924C and E8285A.

The valid numeric offset range is -100.0 to +100.0 dB for both the 8924C and E8285A.

11. No RF frequency autotuning

Description:

The E8285A receiver cannot automatically tune to any type of RF signal. You must enter the desired receiver channel or frequency.

The 8924C without 83236B can be configured to autotune to *analog* input signals at or below 1 GHz.

Example Program Changes for the E8285A:

REMOVE:

```
RFANalyzer:TMODe 'Auto'
```

```
RFAN:TMOD 'Manual'
```

MEASure:RFfrequency:FREQuency:ABSolute

[Also remove any code that assumes the test set will autotune].

ADD:

MEAS:RFR:SElect 'Freq Error' [Enables relative frequency mode]

MEAS:RFR:FREQ:ERR? [Measure relative RF frequency]

MEAS:RFR:SElect 'Frequency' [Enable Absolute Freq mode]

MEAS:RFR:FREQ:ABS? [Measure absolute RF frequency]

Practical Considerations:

For related information, refer to Section 23: RF frequency measurement.

When the E8285A is on an analog Call Control screen, the current channel number provides a frequency reference for an RF frequency error measurement.

12. Using attenuator hold functions for the RF signal generator

Description:

E8285A

The attenuator for the RF signal generator in the E8285A is electronic, using solid-state components. It switches level in about 15 microseconds, so any switching transient should not affect open-loop power control of a CDMA phone. Although the Output Atten Hold function still operates on the E8285A, Agilent Technologies strongly recommends you remove these commands from your *New Code*.

8924C

The attenuator for the RF signal generator in the 8924C is also electronic. However, the attenuators in the 83236B PCS Interface are mechanical, typically switching in about 30 milliseconds. Thus, when the 8924C is used with the 83236B, switching transients may affect the open-loop power control of a CDMA phone. Typically, this does not negatively affect CDMA phone tests because they are performed under closed-loop power control.

However, to ensure proper testing of open-loop power control functionality with the 8924C / 83236B combination, the Output Atten Hold function should be used. When selected, the Hold function causes the 83236B attenuator to "freeze" its mechanical attenuators at the current output level setting. Then, the 8924C electronic attenuator varies the RF level up to 50 dB below the "freeze" output level.

Example Program Changes for the E8285A:

REMOVE:

RFGenerator:ATTenuator 'On'

RFG:ATT 'Off'

RFG:ATT?

ADD:

No Changes

Practical Considerations:

The Output Atten Hold function is most often used during tests such as "Time Response of Open Loop Power Control" with the 8924C / 83236B combination.

13. Setting the RF input attenuator

Description:

The E8285A RF input attenuator adjusts the level from 0 to 35 dB in 5 dB steps.

The 8924C RF input attenuator adjusts the level from 0 to 40 dB in 20 dB steps. (The 8924C with 83236B RF input attenuators adjust the level from 0 to 60 dB in 20 dB steps, with an extra step labeled 20 dB LC. Optimum RF input attenuator settings for the 8924C / 83236B combination are chosen by a complex algorithm in the 8924C firmware, providing accurate measurement of both high-power and low-power input signals. The integrated RF input attenuators of the E8285A use a simpler algorithm).

Example Program Changes for the E8285A:

REMOVE:

```
RFAnalyzer:ATTenuator '[value]' [valid values: 0 dB, 20 dB, 40 dB,
```

ADD:

```
RFAnalyzer:ATTenuator '[value]' [valid values: 0, 5, 10, 15, 20, 25, 30,  
35 dB]
```

```
CDMA:MOBile:POWer:MODE 'User' [on CDMA Transmitter Power Range Test screen]
```

```
CDMA:MOB:POW:MODE 'Normal'
```

```
CDMA:MOB:POW:MODE?
```

```
CDMA:MOB:POW:MPower [valid: real values from +30 to -110 dBm]
```

```
CDMA:MOB:POW:MPower?
```

Practical Considerations:

If your *Original Code* includes direct control of the 8924C RF input attenuator, then your *New Code* may need to change to use new values.

Note: Agilent Technologies strongly recommends that the User Mode be utilized to control CDMA RF input levels versus direct control of the RF input attenuator. This ensures that other test set settings will be set correctly for measurements made with or without an active call.

8924C Example for an expected RF input level = +4 dBm:

Non-preferred: Directly set RF input attenuator to 20 dB.

Preferred: Set Mobile Power Mode to User; enter +4 dBm in the Mobile Pwr field.

E8285A Example for an expected RF input level = +4 dBm:

Non-preferred: Directly set RF input attenuator to 15 dB.

Preferred: Set Mobile Power Mode to User; enter +4 dBm in the Mobile Pwr field.

Calibration

14. PCB_CAL calibration program runs remotely

Description:

The calibration program PCB_CAL, stored in the E8285A ROM memory, must be run periodically. PCB_CAL calibrates the Physical Channel Baseband circuits in the test set to ensure the relative and absolute Walsh code levels of the CDMA generator meet the stringent accuracy specifications in IS-98-A, J-STD-018, and ARIB T-53. After the program runs, the test set must be restarted (rebooted) to use the new calibration data.

Agilent Technologies recommends this program be run once per month to maintain the Relative CDMA Channel Level Accuracy listed in the Specifications. (Or, if the ambient temperature changes more than $\pm 5^\circ\text{C}$ from the temperature at which PCB_CAL was last run, then PCB_CAL should be run again).

On the E8285A, PCB_CAL is not required after installing a different firmware revision. (This is required on the 8924C).

On the E8285A, the PCB_CAL program stops immediately if a failure occurs. On the 8924C, the PCB_CAL program runs until completion, and then indicates a failure occurred during execution.

Restart test set remotely (identical to manually cycling power switch)

On the E8285A, PCB_CAL can be run remotely, and then the test set can be restarted remotely. Restarting enables the new calibration data. (On the 8924C, PCB_CAL can be run remotely, but the user must manually cycle the power switch to restart).

Example Program Changes for the E8285A:

REMOVE:

No Changes

ADD:

```
TEST:PROCEDURE:LOCATION 'ROM' [Memory location for PCB_CAL program]
TEST:PROC:NAME 'PCB_CAL' [Program name to load]
TEST:PROC:RUNTest [Run the program]
SYSTEM:REStart [Reboots E8285A; equivalent to power-cycling]
```

Practical Considerations:

The E8285A PCB_CAL program makes an internal connection to the front-panel ANTENNA IN port, with 35 dB of attenuation to the front-panel connector. Do not apply a signal to the ANTENNA IN connector while the PCB_CAL program is running.

The PROGRAM:STATe? command checks IBASIC program status, verifying program progress (running or stopped). The STAT:OPER:COND command can also be used to check if an IBASIC program is running. For optimum operation, it is recommended these commands to poll the test set be repeated at intervals ≥ 1 second.

The E8285A PCB_CAL ROM program typically requires about 6 minutes to complete.

A SYSTEM:REStart typically requires a minimum of 50 seconds to complete. Do not send any GP-IB commands to the test set during the restart process; the test set will ignore these commands.

The following example program includes all steps normally required for PCB calibration, and typically completes in about 7 minutes.

```
50          ! This E8285A example program demonstrates a method to
60          ! remotely run the PCB_CAL program, followed by a RESTART
70          ! to reboot the test set with the new calibration data.
80 ! This procedure typically completes in about 7 minutes.
81 ! Remember to disconnect any cable on the ANTENNA IN
82          ! connector, or turn off any signal source on ANTENNA IN.
90          !
100         ! (A) Prepare test set to run PCB_CAL
110         !
```

```

120 T=TIMEDATE
130 PRINT TIME$(TIMEDATE), "= PCB_CAL procedure start time"
140 OUTPUT 714;"CDMA:CALL:END" ! Disconnect any active CDMA call.
150 CLEAR 714 ! Clear the GP-IB interface.
160 OUTPUT 714;"TRIG:ABOR" ! Clear any pending trigger.
170 INTEGER Opc_value !
180 OUTPUT 714;"*RST;*OPC?" ! Reset the test set.
190 ENTER 714;Opc_value
200 OUTPUT 714;"*CLS" ! Clear status registers.
210 Ibas=0
220 Pcb=0
230 !
240 ! (B) Run PCB_CAL
250 !
260 OUTPUT 714;"DISP TEST"
270 OUTPUT 714;"TEST:PROCEDURE:LOCATION 'ROM'"
280 OUTPUT 714;"TEST:PROC:NAME 'PCB_CAL'"
290 OUTPUT 714;"TEST:PROC:RUNTest"
300 !
310 ! (C) Repeat the following loop until 8 MINUTES elapses.
320 ! It polls the test set every 5 sec. to determine when
330 ! PCB_CAL stops, and if the PCB_CAL program should fail.
340 !
350 REPEAT
360 WAIT 5
370 OUTPUT 714;"PROG:STAT?" ! (D) Poll to verify PCB_CAL program runs
380 ENTER 714;Prog_stat$
390 IF Prog_stat$<>"RUN" THEN
400 PRINT "PCB_CAL program has stopped"
410 PRINT TIME$(TIMEDATE), "= PCB_CAL program stop time"
420 Ibas=1
430 ELSE
440 Ibas=0
450 END IF
460 OUTPUT 714;"STAT:CAL:EVEN?" ! (E) Poll to verify if PCB_CAL fails
470 ENTER 714;Cal_poll
480 IF BIT(Cal_poll,8) THEN
490 PRINT "Poll shows PCB_CAL has failed"
500 Pcb=1
510 ELSE
520 Pcb=0
530 END IF
540 SELECT 1

```

```

550     CASE Ibas           ! (F) When Ibas=1, then PCB_CAL program stopped
560         IF Pcb=1 THEN  !      If PCB_CAL failed, then go to end
570             GOTO Failure
580         ELSE           !      If PCB_CAL finished running normally,
590                 !      continue on to restart
600                 !
610             OUTPUT 714;"SYSTem:REStart" ! (G) Restart (reboot) E8285A
620             WAIT 60           !      Wait 60 seconds while
630                 !      E8285A restarts.
640                 !      Do not send GP-IB commands
650                 !      during restart.
660             !
670             ! (H) To verify proper restart, check for default Handoff
680             !      System Type on CDMA Call Control screen.
690             !      (You may need to choose a different field if your
700             !      program changes the POWERON Recall register).
710             !
720             Sys_type$=" "
730             OUTPUT 714;"CDMA:CALL:AHAN:STYPe?"
740             ENTER 714;Sys_type$
750             IF POS(Sys_type$, "AMPS")<>0 THEN
760                 PRINT "E8285A successfully restarted."
770             ELSE
780                 PRINT "E8285A failed to restart."
790             END IF
800             PRINT TIME$(TIMEDATE), "= PCB_CAL procedure stop time"
810             STOP           ! (I) This is the normal end of the program after
820                 !      PCB_CAL and System Restart are complete.
830         END IF
840     CASE Pcb           ! (J) If Pcb=1, then PCB_CAL program has failed.
850         GOTO Failure
860     END SELECT
870 UNTIL TIMEDATE-T>480 ! Go back to repeat until 480 seconds elapses
880     PRINT "PCB_CAL program failed to finish in <8 minutes."
890 Failure: !
900     PRINT "PCB_CAL program failed."
910     PRINT " Program stopped. Cycle test set power; check test set"
920     PRINT " for possible failures. Repeat this program."
930 END

```

15. Channel power and access probe power calibration improvements

Description:

Channel power and access probe power calibration of the 8924C requires the user to connect an external RF cable. Also, installing an 8924C firmware upgrade requires re-calibration.

Channel power and access probe power calibration of the E8285A requires NO external connections. Also, installing an E8285A firmware upgrade does NOT require re-calibration.

For both the 8924C and E8285A, channel power calibration is equivalent to access probe power calibration. Thus, if you performed channel power calibration, it is not necessary to perform access probe power calibration for the same channel standard.

For both the 8924C and E8285A, if channel power or access probe power calibration has not been performed on the current RF Channel Standard, an "Uncal" annunciator will flash on the display below the Chan Power or Acc Prb Pwr measurement fields.

For the E8285A only, the "Uncal" annunciator will also flash if the temperature sensor in the test set senses more than a 10° C lower or higher ambient temperature change (from the temperature of last channel power or access probe power calibration).

Ambient temperature change of 10 °C changes Power Status register

A new Power Status register to remotely determine power calibration conditions is available in the E8285A, but not the 8924C. On the E8285A, Power Status register bits indicate:

- Calibration has not been performed at the current channel standard (bit 0);
- The ambient temperature has decreased more than 10° C from the temperature at last calibration (bit 1); and
- The ambient temperature has increased more than 10° C from the temperature at last calibration (bit 2).

Power Status register bits 3 through 15 are not used.

Example Program Changes for the E8285A:

REMOVE:

[Any code that prompts the user to connect or remove external RF cables for calibration].

ADD:

```
STATus:POWer:CONDition?  
STAT:POW:ENABle [integer value]  
STAT:POW:ENABle?  
STAT:POW:[event]?  
STAT:POW:NTRansition [integer value]  
STAT:POW:NTRansition?  
STAT:POW:PTRansition [integer value]  
STAT:POW:PTRansition?
```

Practical Considerations:

No external RF cable is required for the E8285A channel power calibration; an internal switch connects the input and output for calibration.

When channel power calibration is started manually from the front panel, a message on the E8285A display will show the estimated time required for calibration completion. This information cannot be read remotely via GPIB.

When channel power calibration is performed via GPIB or from the front panel, a message on the E8285A display will show a calibration progress message indicating percentage completion. This information cannot be read remotely via GPIB.

The entire frequency range of the chosen RF Chan Std is calibrated when Channel / Access Probe Power Calibration is performed.

Channel power calibration for a single RF channel standard

If you perform Channel / Access Probe Power Calibration with the Alt Pwr Ms Cal Bands field set to None, then only the data for that RF Chan Std will be stored. If you change the RF Chan Std and re-calibrate, only the data for this new RF Chan Std will be stored; the data for the previous RF Chan Std will be erased

The following example program: (A) verifies if channel / access probe power calibration is needed for the selected single RF Channel Standard; and (B) performs calibration if needed:

```
30 ! In (A), this program verifies if Channel Power and Access Probe
40 ! Power are calibrated for a single selected RF Channel Standard.
50 ! In (B), this data is used to re-calibrate when necessary.
60 !
70 ON TIMEOUT 7,5 CALL Timeout ! Set up timeout recovery subroutine
80 !
90 ! (A) Check if channel/access probe power calibration required
100 !
110 OUTPUT 714;"*CLS" ! Clear status registers
120 ! Faster if set Pwr. Meas. mode before setting RF Chan Std
130 OUTPUT 714;"CDMA:TX:POW:MEAS 'Chan Power'"
140 OUTPUT 714;"CONF:RFCS 'MS AMPS';*OPC" ! Set RF Chan. Std. to use
150 REPEAT ! Set up a loop which repeats
160 OUTPUT 714;"*ESR?" ! until the OPC value indicates
170 ENTER 714;Opc_check ! the channel standard has
180 WAIT .1 ! changed and is stable
190 UNTIL Opc_check=1 !
200 OUTPUT 714;"STAT:POW:COND?" ! Query power status condition
210 ENTER 714;Pow_cond ! Read power status condition bit
220 SELECT Pow_cond ! Compare Pow_cond variable to CASE value; equality
230 CASE 0 ! determines status of power calibration; program
240 ! line after matching CASE will be executed;
250 ! then program continues after END SELECT
260 PRINT "Channel/Access Probe Power for RF Chan. Std. CALIBRATED"
270 GOTO End
280 CASE 1
290 PRINT "Channel/Access Probe Power for RF Chan. Std. NOT CALIBRATED"
300 CALL Calibrate ! Go to Calibrate subroutine of section (B)
310 CASE 2
320 PRINT "NOT CALIBRATED: Temp. drift >10 deg C below last calibration"
330 CALL Calibrate
340 CASE 4
350 PRINT "NOT CALIBRATED: Temp. drift >10 deg C above last calibration"
360 CALL Calibrate
370 CASE ELSE
380 PRINT "Unknown Channel Power Calibration status bit error"
390 GOTO End
400 END SELECT
```

```

410 End:          !
420  END          ! End of program
430              !
440 Timeout:     SUB Timeout    ! Timeout recovery subroutine
450              PRINT "PROGRAM TIMED OUT"
460              CLEAR 7
470              CLEAR 714
480              OUTPUT 714;"TRIG:ABORT"
490  SUBEND
500  !
510  ! (B) Calibrate channel/access probe power, if required, at
520  !      current RF Channel Standard
530  !
540 Calibrate:   SUB Calibrate ! Chan./access probe power calibration sub
550             PRINT "Channel/Access Probe Power calibration IN PROCESS"
560             OUTPUT 714;"CONF:APMC 'None'" ! Calibrate only current RF Ch Std
570             OUTPUT 714;"MEAS:CDM:CHAN:CAL" ! Calibrate chan./access probe pwr.
580             OFF TIMEOUT 7 ! Disables timeout recovery subroutine until the
590                 ! Ch. Pwr. Calibrate subroutine completes; timeout
600                 ! recovery sub automatically re-initiates in HPBASIC
610                 ! at completion of Ch. Pwr. Calibrate subroutine
620             OUTPUT 714;"STAT:CAL:EVEN?" ! Poll to verify if Ch Pwr Cal fails
630             ENTER 714;Cal_pol2
640             IF BIT(Cal_pol2,6) THEN
650                 PRINT "Channel/Access Probe Power Calibration FAILED"
660                 GOTO End
670             ELSE
680                 PRINT "Channel/Access Probe Power Calibration COMPLETE"
690             END IF
700  SUBEND

```

Channel power calibration for multiple RF channel standards

If you are testing phones which function on different RF Channel Standards, multiple RF Channel Standard's can be calibrated simultaneously by choosing an Alternate Power Measurement Calibration Band (using the Alt Pwr Ms Cal Bands field on the Configure screen).

Calibration linkages between RF channel standards

When a specific RF channel standard is calibrated, other related channel standards are also calibrated simultaneously. For example, if you perform channel power calibration on the Japan CDMA RF Channel Standard, the following standards are also calibrated: MS TACS, MS ETACS, MS NTACS, MS JTACS. These calibration linkages apply for both the primary RF Chan Std field and the Alt Pwr Ms Cal Bands field. Here is a listing of these linkages:

- MS AMPS: MSL NAMPS, MSM NAMPS, MSU NAMPS
- US PCS (no linkage)
- Kor PCS P0: Kor PCS P1

- Kor PCS P1: Kor PCS P0
- Japan CDMA: MS TACS, MS ETACS, MS NTACS, MS JTACS
- MSL NAMPS: MS AMPS, MSM NAMPS, MSU NAMPS
- MSM NAMPS: MS AMPS, MSL NAMPS, MSU NAMPS
- MSU NAMPS: MS AMPS, MSL NAMPS, MSM NAMPS
- MS TACS: MS ETACS
- MS ETACS: MS TACS
- MS NTACS: Japan CDMA, MS TACS, MS ETACS, MS JTACS
- MS JTACS: Japan CDMA, MS TACS, MS ETACS, MS NTACS
- USER-DEF: Typically, no linkages are created. (However, linkages may occur if your USER-DEF band overlaps a standard band. You can experiment to observe when these linkages are created by the test set's algorithm).
- None: (no linkage)
- Cell Bands: MS AMPS, Japan CDMA, MSL NAMPS, MSM NAMPS, MSU NAMPS, MS TACS, MS ETACS, MS NTACS, MS JTACS
- PCS Bands: US PCS, Kor PCS P0, Kor PCS P1
- All Bands: All RF channel standards, including USER-DEF if one is defined

The following example program: (A) verifies if channel / access probe power calibration is needed for the selected RF Channel Standards; and (B) performs calibration if needed:

```

30  ! In (A), this program verifies if Channel Power and Access Probe
40  ! Power are calibrated for multiple selected RF Channel Standards.
50  ! In (B), this data is used to re-calibrate the chosen standards
60  ! when necessary.
70  !
80  ON TIMEOUT 7,5 CALL Timeout ! Set up timeout recovery subroutine
90      !
100     ! (A) Check if channel/access probe power calibration required
110     !     for selected RF channel standards
120     !
130  OUTPUT 714;"CDMA:TX:POW:MEAS 'Chan Power'"
140     ! Faster if set Pwr. Meas. mode before setting RF Chan Std
150  OPTION BASE 1
160  COM /Com_vars/Rf_ch_std$(3)[30],Count ! Sets up common variables to
170     ! pass into subroutines, and dimensions the RF Ch Std data array
180     ! for up to 3 stds, up to 30 characters
190  ! Insert primary RF Ch. Std. as Rf_ch_std$(1)
200  Rf_ch_std$(1)="CONF:RFCS 'US PCS';*OPC"      ! 1st RF Ch Std to check
210  Rf_ch_std$(2)="CONF:RFCS 'MS AMPS';*OPC"    ! 2nd RF Ch Std to check
220  Rf_ch_std$(3)="CONF:RFCS 'MSL NAMPS';*OPC"  ! 3rd RF Ch Std to check
230  FOR Count=1 TO 3
240     OUTPUT 714;"*CLS"          ! Clear status registers
250     OUTPUT 714;Rf_ch_std$(Count) ! Set RF Chan Std to check
260     REPEAT                    ! Set up a loop which repeats
270         OUTPUT 714;"*ESR?"    ! until the OPC value indicates
280         ENTER 714;Opc_check   ! the 1st channel standard is active

```

```

290         WAIT .1                ! and is stable
300         UNTIL Opc_check=1      !
310     OUTPUT 714;"STAT:POW:COND?" ! Query power status condition
320     ENTER 714;Pow_cond        ! Read power status condition bit
330     SELECT Pow_cond ! Compare Pow_cond variable to CASE value; equality
340     CASE 0                ! determines status of power calibration; program
350                         ! line after matching CASE will be executed;
360                         ! then program continues after END SELECT
370     PRINT "Ch./Acc. Pr. Pwr. for RF Chan. Std. #";Count;" CALIBRATED"
380     GOTO Next
390     CASE 1
400     PRINT "Ch./Acc. Pr. Pwr. for RF Chan. Std. #";Count;" NOT CALIB'D"
410     CALL Calibrate          ! Go to Calibrate subroutine of section (B)
420     GOTO End
430     CASE 2
440     PRINT "RF Ch. Std. #";Count;" NOT CALIB'D: Temp. >10 deg C below"
450     CALL Calibrate
460     GOTO End
470     CASE 4
480     PRINT "RF Ch. Std. #";Count;" NOT CALIB'D: Temp. >10 deg C above"
490     CALL Calibrate
500     GOTO End
510     CASE ELSE
520     PRINT "Unknown Channel Power Calibration status bit error"
530     GOTO End
540     END SELECT
550 Next:    !
560     NEXT Count
570 End:     !
580     END          ! End of program
590             !
600 Timeout:  SUB Timeout    ! Timeout recovery subroutine
610             PRINT "PROGRAM TIMED OUT"
620             CLEAR 7
630             CLEAR 714
640             OUTPUT 714;"TRIG:ABORT"
650     SUBEND
660     !
670     ! (B) Calibrate channel/access probe power, if required, for
680     !     selected multiple RF Channel Standards
690     !
700 Calibrate:  SUB Calibrate ! Ch./acc. pr. pwr. calibration subroutine
710     COM /Com_vars/Rf_ch_std$(*),Count
720     PRINT "Multiple Channel/Access Probe Power calibration IN PROCESS"
730     IF Rf_ch_std$(Count)<>Rf_ch_std$(1) THEN
740     OUTPUT 714;"*CLS"          ! Clear status registers

```



```

750     OUTPUT 714;Rf_ch_std$(1)      ! Set primary RF Chan Std to calibrate
760     REPEAT                        ! Set up a loop which repeats
770         OUTPUT 714;"*ESR?"        ! until the OPC value indicates the
780         ENTER 714;Opc_check       ! primary channel standard is active
790         WAIT .1                   ! and is stable
800     UNTIL Opc_check=1             !
810 ELSE
820 END IF
830 OUTPUT 714;"CONF:APMC 'MS AMPS'" ! Select Alt Pwr Ms Calib Band(s)
840 OUTPUT 714;"CONF:APMC?"          ! Query selected Alt Pwr Ms Calib Band(s)
850 ENTER 714;Alt_cal_band$          ! to verify the selection is active
860 OUTPUT 714;"MEAS:CDM:CHAN:CAL"  ! Calibrate ch./acc. pr. pwr. for
870                                ! primary & alternate chan. stds.
880 OFF TIMEOUT 7 ! Disables timeout recovery subroutine until the
890                ! Ch. Pwr. Calibrate subroutine completes; timeout
900                ! recovery sub automatically re-initiates in HPBASIC
910                ! at completion of Ch. Pwr. Calibrate subroutine
920 OUTPUT 714;"STAT:CAL:EVEN?"     ! Poll to verify if Ch Pwr Cal fails
930 ENTER 714;Cal_pol2
940 IF BIT(Cal_pol2,6) THEN
950     PRINT "Channel/Access Probe Power Calibration FAILED"
960     GOTO End
970 ELSE
980     PRINT "Channel/Access Probe Power Calibration COMPLETE"
990 END IF
1000 SUBEND

```

16. PCS RF generator level calibration

Description:

When the 8924C is used with the 83236B PCS Interface, calibration of the RF generator level through the 83236B must be performed periodically.

For the E8285A, no RF generator level calibration is required.

Example Program Changes for the E8285A:

REMOVE:

CONFigure:RFSource:CALibrate

ADD:

No Changes

Practical Considerations:

None

CDMA Measurements

17. CDMA Mobile-Reported FER screen

Description:

On the 8924C, the CDMA Mobile Reporting screen displays data provided by the phone for both mobile-reported pilot strength and mobile-reported FER.

On the E8285A, two separate screens provide more flexibility and easier viewing: the CDMA Mobile Reported Pilot Strength screen and the CDMA Mobile Reported FER screen.

Note: Mobile-reported FER provides data from the phone's own measurement of its receiver's FER (sent via over-the-air messages from the phone to the test set). This is **not** the common FER measurement of receiver sensitivity performed by the test set (found on the CDMA Cellular Mobile Receiver Test screen).

Example Program Changes for the E8285A:

REMOVE:

No Changes

ADD:

CDMA:MOBile:PILOt:CLEar [clears mobile pilot strength data table on CDMA Mobile Reported Pilot Strength screen]

CDMA:MOB:FERasure:REPort:CLE [clears mobile FER data on CDMA Mobile Reported FER screen]

Practical Considerations:

Your *Original Code* written for the 8924C CDMA Mobile Reporting screen may run without modification on the E8285A. You can set fields and read measurement results on the E8285A CDMA Mobile Reported FER screen without displaying the screen.

On the 8924C, the command `CDMA:MOBile:REPort:CLEar` clears both the mobile pilot strength data table and the mobile FER data on the CDMA Mobile Reporting screen.

On the E8285A, the command `CDMA:MOBile:REPort:CLEar` functions identically as on the 8924C. It clears the mobile pilot strength data table on the CDMA Mobile Reported Pilot Strength screen, and it clears mobile FER data on the CDMA Mobile Reported FER screen. To clear the data on only one screen, use the E8285A-only commands in the ADD: command list above.

For more information about how to interpret the mobile-reported pilot strength data, see: *E8285A Reference Guide* (Agilent Part Number E8285-90016); Chapter 4, Description of Fields; Field = Status.

The following example program includes:

(A) a code segment designed for both the 8924C and E8285A;

(B) a code segment designed for the E8285A only.

```
20 ! This is a portion of a program to check a phone for mobile-reported
30 ! pilot strength and FER. It assumes a CDMA call is connected. You
40 ! will need to modify the location of the CLEar commands for your code.
50 !
60 ! (A) First section of code works for both 8924C & E8285A.
70 !
80 !Display 8924C CDMA Mobile Reporting screen or !
90 ! E8285A CDMA Mobile Reported Pilot Strength screen!
100 !
110 OUTPUT 714;"DISP CMOB;DISP?" ! DISP? makes sure the screen is up
120 ! before the program continues on
130 ENTER 714;Screen$
140 OUTPUT 714;"CDMA:MOB:REPort:CLEar" ! Clears all mobile data
150 OUTPUT 714;"CDMA:MOB:FER:REP:INT '40 Frames'"
```

```

160 OUTPUT 714;"CDMA:MOB:FER:REP:BY:ERR:STAT 'ON'"
170 OUTPUT 714;"CDMA:MOB:FER:REP:BY:ERR 5"
180 OUTPUT 714;"CDMA:MOB:FER:REP:BY:FRAM:STAT 'ON'"
190 OUTPUT 714;"CDMA:MOB:FER:REP:BY:FRAM:STAT?" ! Query state to ensure
200 ENTER 714;Fram_stat$ ! all MOB:FER commands
210 ! are completed
220 WAIT .8 ! Wait 0.8 sec for 40 frames of 20 msec data
230 OUTPUT 714;"CDMA:MOB:FER?"
240 ENTER 714;Fer
250 PRINT Fer;"% = Mobile-reported FER"
260 OUTPUT 714;"CDMA:MOB:FER:ERR?"
270 ENTER 714;Error
280 PRINT Error;"= Number of Mobile-reported errors"
290 DIM Pilot$[500]
300 OUTPUT 714;"CDMA:MOB:PIlot:STrength?"
310 ENTER 714;Pilot$
320 IF Pilot$="" THEN Pilot$="No Data"
330 PRINT Pilot$;"= Mobile-reported pilot strength data"
340 !
350 !
360 ! (B) Second section of code works for only E8285A, displaying
370 ! two separate screens
380 !
390 !Display E8285A CDMA Mobile Reported Pilot Strength screen!
400 !
410 OUTPUT 714;"DISP CMOB;DISP?" ! DISP? ensures screen displays
420 ! before the program continues on
430 ENTER 714;Screen$
440 OUTPUT 714;"CDMA:MOB:PIlot:CLear" ! Clears mob. rep. pilot data
450 DIM Pilot2$[500] ! Prepares a pilot data array
460 OUTPUT 714;"CDMA:MOB:PIlot:STrength?"
470 ENTER 714;Pilot2$
480 IF Pilot2$="" THEN Pilot2$="No Data" ! Checks for no results
490 PRINT Pilot2$;"= Mobile-reported pilot strength data"
500 !
510 !Display E8285A CDMA Mobile Reported FER screen!
520 !
530 OUTPUT 714;"DISP CFER;DISP?"
540 ENTER 714;Screen$
550 OUTPUT 714;"CDMA:MOB:FER:REPort:CLear" ! Clears mob. rep. FER data
560 OUTPUT 714;"CDMA:MOB:FER:REP:INT '40 Frames'"
570 OUTPUT 714;"CDMA:MOB:FER:REP:BY:ERR:STATE 'ON'"
580 OUTPUT 714;"CDMA:MOB:FER:REP:BY:ERR 5"
590 OUTPUT 714;"CDMA:MOB:FER:REP:BY:FRAM:STATE 'ON'"
600 OUTPUT 714;"CDMA:MOB:FER:REP:BY:FRAM:STAT?" ! Query state to ensure
610 ENTER 714;Fram_stat$ ! all MOB:FER commands

```

```

620                                     ! are completed
630  WAIT .8                             ! Wait 0.8 sec for 40 frames of 20 msec data
640  OUTPUT 714;"CDMA:MOB:FER?"
650  ENTER 714;Fer2
660  PRINT Fer2;"% = Mobile-reported FER"
670  OUTPUT 714;"CDMA:MOB:FER:ERR?"
680  ENTER 714;Err2
690  PRINT Err2;"= # of Mobile-reported errors"

```

18. Time offset field

Description:

The 8924C with firmware revision A.06.25 or later includes a Time Offset field on the Configure screen. With the Time Offset field set to Normal, the 8924C approximates the normal operation of a CDMA base station, accepting phone transmissions from approximately -1.5 to +50 microseconds static transmit time error (τ)¹. The Time Offset field can also be set to -5 ms and -10 μ s, allowing the 8924C to accept mobile transmissions at up to -5 and -10 ms transmit time error. CDMA phones with negative time offsets greater than -1 μ s may be encountered during manufacturing or during phone repair.

The E8285A accepts phone transmissions from approximately -10 to +50 μ s static transmit time error (τ) as a standard feature. The E8285A has no Time Offset field.

Example Program Changes for the E8285A:

REMOVE:

```

CONFigure:MMToffset 'NORMAL'
CONF:MMT '-5 us'
CONF:MMT '-10 us'
CONF:MMToffset?

```

ADD:

No Changes

Practical Considerations:

Time Offset is measured on the CDMA Cellular Mobile Transmitter Test screen on both the 8924C and E8285A.

For the E8285A, a time offset of approximately 10 μ s exists between

- (1) the pilot transmission at the front-panel RF IN/OUT port and
- (2) the rear-panel Even Second Clock output (available from the CDMA Clock Mux Output).

For the 8924C, if the Time Offset field is set to Normal, time alignment with approximately zero time offset exists between

- (1) the pilot transmission at the front-panel RF IN/OUT port and
- (2) the rear-panel Even Second Clock signal (from the CDMA Clock Mux Output).

If the 8924C Time Offset field is set to -5 or -10 μ s, then a time offset of about 5 or 10 μ s exists.

¹ Refer to Section 10.3.1 Time Reference, in *TIA IS-98-A*,

Recommended Minimum Performance Standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations.

19. FER measurement functions

Description:

The FER measurement for both the E8285A and 8924C is located on the CDMA Cellular Mobile Receiver Test screen. The FER algorithm is slightly different in the E8285A than in the 8924C.

- In the E8285A, the algorithm calculates the number of failures allowable per number of frames measured. If at any time the number of failures exceeds the maximum allowable for the chosen confidence percentage, the test will end immediately, and the Failed indicator will illuminate. The E8285A algorithm will probably detect a defective phone quicker than the 8924C, reducing test time to a minimum.
- In the 8924C, the algorithm calculates the minimum number of frames necessary to verify the chosen confidence percentage. The test will not end until this minimum number of frames is tested.

Example Program Changes for the E8285A:

REMOVE:

No changes

ADD:

It may be necessary to add WAIT statements to delay program execution until the phone transmit level and E8285A input attenuators are stable.

Practical Considerations:

It is important to ensure that the phone's transmitted output level is stable before beginning the FER measurement. If the output level is changing, the E8285A or the 8924C may automatically change internal attenuators to ensure optimum measurement conditions. If the attenuators switch during an FER measurement, it is possible that frame errors will occur because of the loss of signal while the attenuators switch.

Analog Measurements

20. DSP-based AMPS SAT FM deviation measurement

Description:

The SAT (Supervisory Audio Tone) Deviation measurement provides a faster method to measure AMPS SAT deviation. Also, the DSP-based deviation measurement has better specified accuracy than the analog-based deviation measurement.

This measurement is found on several screens.

- For the Analog CALL CONTROL screen, set the Display field to Meas. Then select the FM Deviation field, and choose SAT Deviation.
- For the ANALOG MEAS, AF ANALYZER, DUPLEX, and TX TEST screens, set the AF ANL IN field to FM Demod. Then select the FM Deviation field, and choose SAT Deviation.
- To see the FM Deviation and SAT Deviation fields on the RF ANALYZER screen, you must first go to a screen which includes the AF ANL IN field. Set it to FM Demod. Then go back to the RF ANALYZER screen, select the FM Deviation field, and choose SAT Deviation.

The measurement uses DSP (digital signal processing) to quickly and accurately measure the SAT, while digitally filtering out any other signals or noise.

Example Program Changes for the E8285A:

REMOVE:

AFAN:FILTER2 '6khz BPF' [when measuring SAT deviation]

ADD:

MEASure:AFrequency:MODulation:SElect 'SAT Deviation' [to select the DSP-based SAT Deviation measurement]

MEAS:AFR:SATDeviation? [to query a DSP-based SAT Deviation measurement]

MEAS:AFR:MOD:SEL 'FM Deviation' [to select the analog-based FM measurement]

MEAS:AFR:FM? [to query an analog-based FM measurement]

MEAS:AFR:MOD:SEL? [to query the current FM measurement mode]

Practical Considerations:

The DSP SAT Deviation measurement bypasses the audio analog measurement circuitry of the E8285A.

Therefore, selecting the 6 kHz bandpass filter or any other audio filter will not affect the SAT Deviation measurement.

It is interesting to compare results of the DSP-based SAT Deviation measurement of the E8285A to results of a traditional SAT deviation measurement made with a tuned receiver and 6 kHz bandpass filter. Often, the E8285A DSP-based SAT will measure a lower deviation value. (For instance, this is usually true if you compare E8285A DSP-based SAT with E8285A analog SAT, or with analog SAT measured on an Agilent 8920B, 8924C, 8901A, 8901B, or 8902A. The Agilent 8901A, 8901B, and 8902A are often used as industry-standards for FM measurements). The higher readings are typically caused by the residual FM noise in both the cellular phone transmitter and the local oscillator in the test set's receiver. If you subtract the proper amount of this peak residual FM from the analog SAT measurement, you should see the same result as the E8285A DSP measurement.

For more information about calculating the effect of peak residual FM, refer to:

"Accounting for Peak Residuals," *Applications and Operation of the 8901A Modulation Analyzer*, Application Note 286-1 (Agilent Publication No. 5952-8208), pp. 21-22.

The analog FM deviation measurement functions of the E8285A are identical to those in the 8924C. Thus, if you have written a procedure in your *Original Code* to measure SAT deviation with the 8924C, it should run without modification in the E8285A. (However, the analog measurement may sacrifice accuracy and speed).

The following E8285A example program connects an AMPS phone call, measures SAT Deviation, and releases the call:

[Note: The CALLP: command is recommended for analog call processing because it can also be used to query status registers. For example, STAT:CALLP: is a valid command sequence. Although the command CPR: can be used for analog call processing, the command sequence STAT:CPR: is **not** valid.]

```

30      ! This E8285A example program demonstrates a method
40      ! to measure DSP-based SAT Deviation of an AMPS cellular
50      ! phone. The program registers the phone, connects a
60      ! call, measures SAT deviation, and terminates the call.
70      ! The program includes error handling using the status
80      ! registers and other techniques.
90      !
100     ! (A) Initialize test set
110     !
120     Start_time=TIMEDATE
130     OUTPUT 714;"CALLP:REL"          ! Disconnect any active AMPS call
140     CLEAR 714                      ! Clear the GP-IB interface
150     OUTPUT 714;"TRIG:ABOR"        ! Clear any pending trigger
160     INTEGER Opc_value
170     OUTPUT 714;"*RST;*OPC?"       ! Reset the test set
180     ENTER 714;Opc_value
190     OUTPUT 714;"*CLS"             ! Clear status registers
200     ON TIMEOUT 7,5 CALL Timeout    ! Sets 5 second timeout on GPIB interface 7
210     !
220     ! (B) Adjust the following variables to match the phone under test;
230     !       this program assumes the MS AMPS RF Channel Standard is used
240     !
250     Ana_cntl_chan=325              ! AMPS A-system control channel
260     Ana_voic_chan=250              ! AMPS A-system voice channel
270     !
280     ! (C) Register the AMPS phone, with status checking
290     !
300     OUTPUT 714;"DISP ACNT;DISP?"  ! DISP? makes sure the screen is up
310     !                               ! before the program continues on
320     ENTER 714;Screen$
330     OUTPUT 714;"CALLP:CCH ";Ana_cntl_chan
340     OUTPUT 714;"CALLP:VCH ";Ana_voic_chan
350     OUTPUT 714;"CALLP:VMAC 7"     ! Sets phone's TX power to level 7
360     WAIT 5                         ! Wait 5 seconds for phone to see service
370     OUTPUT 714;"STAT:CALLP:PTR 0;NTR 2" ! Arm analog call proc. status
380     !                               ! register, waiting for
390     !                               ! Register light to change
395     !                               ! from on to off
400     OUTPUT 714;"*CLS"             ! Clear status reg.
410     OUTPUT 714;"CALLP:REG"
420     REPEAT                          ! Set up a loop: continue if
430     !                               ! phone registers; stop if
435     !                               ! error occurs
440     OUTPUT 714;"*ESR?;:STAT:CALLP:EVEN?" ! Check *ESR for test set
450     !                               ! execution error, and analog
460     !                               ! call processing event

```

```

470                                     ! register for Registration
475                                     ! light turning off
480     ENTER 714;Esr_exec_err,Reg_done
490     WAIT .2                          ! Wait 0.2 sec between polls
500     UNTIL Reg_done OR Esr_exec_err    ! Returns a 0 until one of
510                                     ! these variables has result
520     IF Esr_exec_err THEN
530         PRINT "ERROR DURING REGISTRATION"
540         STOP
550     ELSE                              ! Continue if phone registers
560     END IF
570     !
580     ! (D) Page the phone to make an AMPS analog call
590     !
600     PRINT ""
610     PRINT "When the phone rings..."
620     PRINT ""
630     PRINT "                Press the phone's SEND key to answer the call"
640     PRINT ""
650     OUTPUT 714;"STAT:CALLP:PTR 32;NTR 0"    ! Set to monitor connect light
660     OUTPUT 714;"*CLS"                      ! Clear status registers
670     OUTPUT 714;"CALLP:PAGE"
680     REPEAT                              ! Set up loop: continue if
690                                     ! connects; stop if error
700     OUTPUT 714;"*ESR?::STAT:CALLP:EVEN?"    ! Check *ESR for test set
710     ENTER 714;Esr_exec_err,Connect        ! execution error; and analog
720     WAIT .2                              ! call proc. event register
730                                     ! for connect light going on
740     UNTIL Connect OR Esr_exec_err          ! Returns a 0 until one of
750                                     ! these variables has result
760     IF Esr_exec_err THEN
770         PRINT "                ERROR DURING Call connection"
780         STOP
790     ELSE                              ! Continue if call connects
800     END IF
810     !
820     ! (E) Measure DSP-based SAT deviation
830     !
840     OUTPUT 714;"CALLP:MODE 'MEAS'"
850     OUTPUT 714;"MEASure:AFRequency:MODulation:SElect 'SAT Deviation'"
860     OUTPUT 714;"TRIG:MODE:RETR SING"        ! Use single triggering
870     OUTPUT 714;"TRIG"
880     OUTPUT 714;"MEAS:AFR:SATD?"            ! Measure SAT deviation
890     ENTER 714;Sat_dev                      ! Read SAT deviation result
900     PRINT PROUND(Sat_dev,0);"Hz = SAT Deviation (E8285A)" ! Print the result
910                                     ! rounded to the
915                                     ! nearest
integer
920     OUTPUT 714;"CALLP:REL"

```



```

930 Total_time=TIMEDATE-Start_time
940 PRINT ""
950 PRINT "SAT Deviation Test Time =",PROUND(Total_time,-1),"seconds"
960 PRINT ""
970 END ! End of program
980 !
990 ! (F) Timeout subroutine to return GPIB control to computer if
1000 ! a measurement or phone malfunction occurs
1010 !
1020 Timeout: SUB Timeout recovery subroutine
1030 PRINT " PROGRAM TIMED OUT! "
1040 CLEAR 7 ! Clear GPIB interface 7
1050 CLEAR 714 ! Clear GPIB of test set
1060 OUTPUT 714;"TRIG:ABORT" ! Abort any pending test set triggers
1070 SUBEND

```

21. Default FM deviation on RX TEST and RF GENERATOR screens

Description:

For the E8285A, the default setting of the AFGen1 To FM field is *Off*.

For the 8924C, the default setting of the AFGen1 To FM field is *3 kHz*.

Example Program Changes for the E8285A:

REMOVE:

No Changes

ADD:

AFGENERATOR1 : FM <real value> [optional unit of measure]

AFG1 : FM : STAT ON

Practical Considerations:

You must turn on and set the FM deviation for the E8285A.

22. No DC current measurement

Description:

The 8924C includes rear-panel connectors and measurement functions for direct current measurement.

The E8285A contains no dc current measurement capability.

Agilent Technologies can provide many different suitable dc power supplies with built-in current measurement capability. The following GP-IB programmable models may suit your needs:

- 66311B Mobile Communications dc Source 45W
- 66312A Dynamic Measurement Single-Output System 40W
- 66332A Dynamic Measurement Single-Output System 100W
- 6611C Precision Measurement Single-Output System 40W
- 6612C Precision Measurement Single-Output System 40W
- 6631B Precision Measurement Single-Output System 80W
- 6641A Single-Output System 160W
- E3631A Triple-Output 80W
- E3632A Single-Output 120W

Example Program Changes for the E8285A:

REMOVE:

```
AFANalyzer:CURRENT:ZERO
MEASure:SElect 'Current'
MEAS:AFrequency:CURRENT [settings]
MEAS:AFR:CURR?
```

ADD:

No Changes

Practical Considerations:

None

23. RF frequency measurement

Description:

The E8285A receiver cannot automatically tune to any type of RF signal. You must enter the desired receiver channel or frequency. (The 8924C without 83236B can be configured to autotune to *analog* input signals at or below 1 GHz).

Example Program Changes for the E8285A:

REMOVE:

```
RFANalyzer:TMODe 'Auto'
RFAN:TMOD 'Manual'
MEASure:RFrequency:FREQuency:ABSolute
[Any code that assumes the test set will autotune].
```

ADD:

```
MEAS:RFR:SElect 'Freq Error' [Enables relative frequency mode]
MEAS:RFR:FREQ:ERR? [Measure relative RF frequency]
MEAS:RFR:SElect 'Frequency' [Enable Absolute Freq mode]
MEAS:RFR:FREQ:ABS? [Measure absolute RF frequency]
```

Practical Considerations:

For related information, refer to Section 11: No RF frequency autotuning.

When the E8285A is on an analog Call Control screen, the current channel number provides a frequency reference for an RF frequency error measurement.

The following E8285A example program subroutines measure relative and absolute RF frequency.

```
10      ! These E8285A example subroutines demonstrate methods
20      ! to measure (A) relative and (B) absolute RF frequency.
30      !
40      ! (A) Measure relative RF frequency
50      !
60      OUTPUT 714;"CALLP:MODE 'MEAS'" ! Frequency Error is default RF
70      ! frequency measurement mode for
80      ! Analog Call Control Meas screen
90      OUTPUT 714;"MEAS:RFR:SElect 'Freq Error'" ! Specifically selects
100     ! Frequency Error mode
110     ! (redundant with line 890)
120     OUTPUT 714;"TRIG:MODE:RETR SING" ! Use single triggering
130     OUTPUT 714;"TRIG"
140     OUTPUT 714;"MEAS:RFR:FREQ:ERR?" ! Analog Call Control screen measures
150     ! RF frequency error automatically
160     ! using the frequency of the current
```

```

170                                     ! channel number
180 ENTER 714;Err_freq
190 PRINT PROUND(Err_freq,0);"Hz = Frequency Error" ! Print the result
200                                     ! rounded to the
210                                     ! nearest integer
220 !
230 ! (B) Measure absolute RF frequency
240 !
250 OUTPUT 714;"MEAS:RFR:SElect 'Frequency'" ! Select Absolute Freq mode
260 OUTPUT 714;"TRIG"
270 OUTPUT 714;"MEAS:RFR:FREQ:ABS?" ! Measure Absolute RF Frequency
280 ENTER 714;Freq
290 PRINT Freq;" Hz = Absolute Frequency"

```

24. Analog spectrum analyzer; wider spans possible

Description:

The E8285A permits the analog Spectrum Analyzer Span field to be set to over 200 MHz.

The 8924C without 83236B PCS Interface permits the analog Spectrum Analyzer Span field to be set to over 200 MHz.

The 8924C with 83236B analog Spectrum Analyzer Span field maximum setting is 1.5 MHz.

Example Program Changes for the E8285A:

REMOVE:

No Changes

ADD:

SAN:SPAN <real number> [Value may be greater than 1.5 MHz]

Practical Considerations:

None

Non-RF Connectors

25. External time base reference input

Description:

Each 8924C is supplied with a rectangular metal "jumper cable" to connect the rear-panel 10 MHz OVEN OUT connector to the REF INPUT connector. The signal from the internal high-stability 10 MHz oven-controlled crystal oscillator connects only to the rear-panel 10 MHz OVEN OUT connector. When an external time base signal is used, the jumper is removed, and connection is made to the REF INPUT. The 8924C cannot "switch" back to the internal reference if the external time base signal level is too small.

The E8285A connects its internal high stability time base with cables inside the test set; no rear-panel jumper is required. Also, an external time base signal can be connected and selected. If the external signal level drops too low, the E8285A automatically switches back to the internal reference.

Example Program Changes for the E8285A:

REMOVE:

CONFigure:EXTernal:REFerence:FREQuency [string] [Example string: '10.0000 MHz']

CONF:EXT:REF:FREQ?

ADD:

CONFigure:TBASe:MODE `Int`

CONF:TBAS:MODE `Auto`

CONFigure:TBASe:MODE? [Returns quoted string; AUTO or INT]

CONFigure:TBASe:STATUs? [Returns quoted string; INTERNAL or EXTERNAL]

Practical Considerations:

For the E8285A, if the TimeBase field on the Configure screen is set to **Int**:

- only the internal high-stability time base will be used.

For the E8285A, if the TimeBase field on the Configure screen is set to **Auto**:

- an external reference signal on the rear-panel EXT REF INPUT will be used if its signal level is high enough (specified at >0.15 Vrms into a 50 Ω load; for 1, 2, 5, or 10 MHz \pm 10ppm; duty cycle \geq 90%)
- if the signal level of the external reference drops (typically below 0.02 Vrms), the test set will automatically switch to the internal high-stability time base
- **NOTE:** if the frequency of the external reference drifts too far from the nominal frequency, the test set will **not** automatically switch to the internal high-stability time base
- **NOTE:** if the frequency of the external reference drifts too far from the nominal frequency, the E8285A will display "Reference Out of Lock" at the top left corner of the screen, and an audible beep will occur. This condition should be corrected, because the RF output of the test set may not be phase-locked, and may be modulated with unwanted noise or discrete spurious signals.
- If the reference is out of lock, bit 12 of the Hardware2 Status Register will be set.
- If an external reference is in use, bit 12 of the Operation Status Register will be set.

The following E8285A example program demonstrates some of the time base functionality.

```
20      !
30      ! This is a simple program to check E8285A time base functions.
40      !
50      OUTPUT 714;"*CLS"           ! Clear status registers
60      OUTPUT 714;"CONF:TBASe:MODE?" ! Query setting: Auto or Int
70      ENTER 714;Mode$
80      PRINT "Mode = ",Mode$
90      OUTPUT 714;"CONF:TBAS:STATUS?" ! Query source: internal or external
100     ENTER 714;Int_or_ext$
110     PRINT "Time base source = ",Int_or_ext$
120     OUTPUT 714;"STAT:HARD2:COND?" ! Check Hardware2 status register bit 12
130                                     ! for time base reference out of lock
140     ENTER 714;Ref_unlock
150     IF BIT(Ref_unlock,12) THEN
160         PRINT "Time base reference out of lock"
170     ELSE
180         PRINT "Time base reference OK"
190     END IF
200     OUTPUT 714;"STAT:OPER:COND?" ! Check Operation status register bit 12
210                                     ! for external or internal source
220     ENTER 714;Ext_ref_bit
230     IF BIT(Ext_ref_bit,12) THEN
240         PRINT "External reference in use"
250     ELSE
260         PRINT "Internal reference in use"
270     END IF
280     END
```

26. No MIC / ACC (Microphone / Accessory) input

Description:

The E8285A has no MIC / ACC connector, and does not provide the 8924C functions.

The 8924C includes a front-panel MIC / ACC connector. This connector allows a microphone to be used for general-purpose two-way radio test. This connector also provides access to:

- a pre-emphasized audio input
- SPST (single-pole single-throw) relay contacts for control of external equipment
- remote-control switching between the TX TEST and RX TEST screens.

Example Program Changes for the E8285A:

```
REMOVE:
CONFigure:ARTSwitching 'Auto'
CONF:ARTS 'Manual'
CONF:ARTS?
CONF:RTSwitching 'Carrier'
CONF:RTSW 'PTT'
CONF:RFSW?
RFANalyzer:TKEY 'On'
RFAN:TKEY 'Off'
RFAN:TKEY?
RFGenerator:MODulation:EXTernal:PEMPhasis 'On'
RFG:MOD:EXT:PEMP 'Off'
RFG:MOD:EXT:PEMP?
RFG:MOD:EXT:PEMP:MODE 'Auto'
RFG:MOD:EXT:PEMP:MODE 'Hold'
RFG:MOD:EXT:PEMP:MODE?
ADD:
```

(varies depending on your application)

Practical Considerations:

For the E8285A, the rear-panel MODULATION INPUT can be used for external modulation signals, but no pre-emphasis of the signal is available.

E8285A Frequently Used Commands and Status Registers (compared to the 8924C)

This section lists the new commands for the E8285A, as well as 8924C commands and fields which have changed or been deleted. This command information is meant to supplement the information in the *E8285A Condensed Programming Reference* Guide; Part Number E8285-90020.

1. New E8285A GP-IB Commands

```
CONFigure:TBASe:MODE      'Int'
                          'Auto'
```

CONFigure:TBASe:MODE? (returns quoted string)

These commands set/query the operating mode of the timebase. When set to 'Int', the timebase will always use the internal control setting to determine its frequency. When set to 'Auto', the timebase may use either the internal source or the external source, depending on the signal quality of the external source. The external source is connected to the REF INPUT port. This command corresponds to the Timebase field of the CONFIGURE screen.

CONFigure:TBASe:STATUs? (returns quoted string)

This command queries the status of the label that appears below the Timebase field. This label indicates whether the test set is using the 'Internal' or 'External' source.

```
CONFigure:APMCbands      <string>
```

CONFigure:APMCbands?

The APMC commands are identical to the ACST commands on the 8924C. These commands correspond to the Configure screen field Alt Pwr Meas Cal Bands.

NOTE: For the E8285A, use either APMC or ACST. For the 8924C, use only the command ACST.

```
CONFigure:MEASure:INDeterminate 'On'
                                'Off'
```

CONFigure:MEASure:INDeterminate ?

These commands set/query the Indeterminate measurement method. When set to "On", indeterminate measurement results satisfy GP-IB measurement queries. When set to 'Off', the test set must obtain valid measurement data to satisfy a GP-IB request for a measurement.

Note: Setting this value to 'Off' will make the E8285A perform the same as the 8924C with respect to indeterminate measurement results over GP-IB. The default value is 'On'. When set to 'On', the following values will be returned in the case of an indeterminate measurement:

- **Real value expected: +1.7976931348623157e⁺³⁰⁸**
- **Integer value expected: 2147483647**

```
STATus:POWer:CONDition?
```

```
STATus:POWer:ENABle <integer value>
```

```
STATus:POWer:ENABle?
```

```
STATus:POWer:[EVENT]?
```

```
STATus:POWer:NTRansition <integer value>
```

```
STATus:POWer:NTRansition?
```

```
STATus:POWer:PTRansition <integer value>
```

```
STATus:POWer:PTRansition?
```

These commands access the Power status register.

Bit definitions are as follows:

Bit	Decimal Value Returned	Type	Description / Event / Condition
15	--	N/A	Not Used (Always 0) as defined by SCPI version 1994.0
3...14	--	N/A	Not used in test set
2	4	Condition	Temperature has drifted by more than 10 degrees C above temperature at calibration.
1	2	Condition	Temperature has drifted by more than 10 degrees C below temperature at calibration.
0	1	Condition	Power measurement has NOT been calibrated for the current test set RF Chan Std.
0	0	Condition	Power measurement has been calibrated for the current test set RF Chan Std.

SYSTem:REStart

This command resets the test set remotely. It is equivalent to a manual power cycle (depressing the power switch to OFF, then back to ON).

MEASure:AFrequency:MODulation:SElect 'SAT Deviation'
'FM Deviation'

MEASure:AFrequency:MODulation:SElect?

This command selects/queries the modulation measurement to be displayed on the test set's screen.

MEASure:AFrequency:SATDeviation

(See Number Measurement Syntax in the E8285A Condensed Programming Reference Guide)

This command returns the real number value of the SAT Deviation measurement. This measurement is displayed in the analog measurement screens.

CDMA:MOBile:PILot:CLEar

This command clears the mobile pilot strength data table on the CDMA Mobile Reported Pilot Strength screen.

CDMA:MOB:FERasure:REPort:CLE

This command clears the mobile FER data on the CDMA Mobile Reported FER screen.

2. 8924C Commands and Fields that are changed or deleted

NOTE: -- (two dashes) in the table below indicates command is deleted for E8285A

8924C		E8285A	
Command	Field	Command	Field
CONFigure:PRINt:PORTs 'Serial'	Printer Port	CONFigure:PRINt:PORTs 'Serial'9'	Printer Port
CONF:PRIN:PORT 'HPIB'	"	CONF:PRIN:PORT 'HP-IB'	"
CONF:PRIN:PORT 'Parallel'	"	CONF:PRIN:PORT 'Parallel 15'	"
CONF:PRIN:DESTination 'Serial'	"	CONF:PRIN:DESTination 'Serial 9'	"
CONF:PRIN:DEST 'HPIB'	"	CONF:PRIN:DEST 'HP-IB'	"
CONF:PRIN:DEST 'Parallel'	"	CONF:PRIN:DEST 'Parallel 15'	"
CONFigure:INTensity [integer from 1 to 8]	Intensity	--	--
CONFigure:PCSMODE 'ON'	PCS Interfc Control	--	--
CONF:PCSM 'OFF'	"	--	--
CONFigure:OUTPut 'Only'	Output Port	--	--
CSPectrum:OUTPut 'Only'	"	--	--
RFGenerator:OUTPut 'Only'	"	--	--
SANalyzer:TGENerator:DESTination 'Only'	"	--	--
CONFigure:OFLevel:RFINout [real]	RF In/Out	CONFigure:OFLevel:RF:IN [real] CONF:OFL:RF:OUT [real]	RF In RF Out
RFANalyzer:TMODE 'Auto' Frequency	Tune Mode	MEAS:RFR:SElect 'Frequency'	Freq Error
MEASure:RFFrequency:FREQUENCY:ABSolute	"	MEAS:RFR:FREQ:ABS?	"
RFAN:TMOD 'Manual'	"	MEAS:RFR:SElect 'Freq Error' MEAS:RFR:FREQ:ERR?	" "
RFGenerator:ATTenuator 'On'	Output Atten Hold	[Command is functional; but not recommended for use]	Output Atten Hold
RFG:ATT 'Off'	"	"	"
RFG:ATT?	"	"	"
RFANalyzer:ATTenuator '[value]' [valid	Input Atten	RFANalyzer:ATTenuator '[value]' [valid values: 0, 5, 10, 15,	Input Atten

values: 0dB, 20dB,
40dB,60dB, 20dB LC]

20, 25, 30, 35 dB]

CONFigure:RFSource: CALibrate	RF Gen Lvl	--	--
CONFigure:MMTOffset	Time	--	--
'NORMAL'	Offset		
CONF:MMT '-5 us'	"	--	--

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Command	Field	Command	Field
CONF:MMT '-10 us'	"	--	--
CONF:MMTOffset?	"	--	--
AFANalyzer:CURRENT:ZERO	DC Current	--	--
MEASure:SElect 'Current'	Current	--	--
MEAS:AFRequency:CURRENT [settings]	"	--	--
MEAS:AFR:CURR?	"	--	--
CONFigure:ARTSwitching 'Auto'	RX/TX Cntl	--	--
CONF:ARTS 'Manual'	"	--	--
CONF:ARTS?	"	--	--
CONF:RTSwitching 'Carrier'	"	--	--
CONF:RTSW 'PTT'	"	--	--
CONF:RFSW?	"	--	--
RFANalyzer:TKEY 'On'	Ext TX Key	--	--
RFAN:TKEY 'Off'	"	--	--
RFAN:TKEY?	"	--	--
RFGenerator:MODulation: EXTErnal:PEMPhasis 'On'	Mic Pre-Emp	--	--
RFG:MOD:EXT:PEMP 'Off'	"	--	--
RFG:MOD:EXT:PEMP?	"	--	--
RFG:MOD:EXT:PEMP:MODE 'Auto'	"	--	--
RFG:MOD:EXT:PEMP:MODE 'Hold'	"	--	--
RFG:MOD:EXT:PEMP:MODE?	"	--	--
CONFigure:EXTErnal: REFerence:FREQuency [string; example '10.0000 MHz']	External Reference "	CONFigure:TBASe:MODE 'Int' CONF:TBAS:MODE 'Auto'	TimeBase
CONF:EXT:REF:FREQ?	"	CONF:TBAS:MODE?	"

3. Status Register Changes

Register Name	Bit	Description
Hardware 2	12	Indicates timebase out of lock
Operation	12	External reference is being used
Power Status register	All bits are new	See STAT:POW command
Questionable Status register	3	Indicates Power Status register transition
	13	Indicates indeterminate measurement result

E8285A Command List

1. New Commands

(compared to 8924C commands listed in the 8924C Condensed Programming Reference Guide)

```
:CPRocess | CALLP
  :VSYStem <command> string
  :VSYStem? <query> Returns: string quoted

:CONFigure
  :APMCbands <command> string
  :APMCbands? <query> Returns: string quoted
  :TBASe
    [:MODE] <command> string
    [:MODE?] <query> Returns: string quoted
    :STATus? <query> Returns: string quoted
  :DISPlay
    :MES | MESSAgEs <command> string
    :MES? | MESSAgEs? <query> Returns: string quoted
  :CANCel <command> string
  :CANCel? <query> Returns: string quoted
  :ANNunCiate <command> string
  :ANNunCiate? <query> Returns: string quoted
  :MEASure
    :INDeterminate <command> string
    :INDeterminate? <query> Returns: string quoted
  :OFLevel
    :RF
      :IN <command> float64 hpib_units | OPTIONAL
      :IN? <query> Returns: float64 NR3
      :IN
        :DUNits <command> enum disp_units
        :DUNits? <query> Returns: enum normal disp_units
        :UNITs <command> enum disp_units
        :UNITs? <query> Returns: enum normal disp_units
        :INCRement <command> enum incr_parms | float64 hpib_units |
OPTIONAL
      :INCRement? <query> Returns: float64 NR3
      :INCRement
        :DUNits <command> enum disp_units
        :DUNits? <query> Returns: enum normal disp_units
        :MODE <command> enum imode_parm
        :MODE? <query> Returns: enum normal imode_parm
        :MULTiPLY <command>
        :DIVide <command>
      :OUT <command> float64 hpib_units | OPTIONAL
      :OUT? <query> Returns: float64 NR3
      :OUT
        :DUNits <command> enum disp_units
        :DUNits? <query> Returns: enum normal disp_units
        :UNITs <command> enum disp_units
        :UNITs? <query> Returns: enum normal disp_units
        :INCRement <command> enum incr_parms | float64 hpib_units |
```

OPTIONAL

```

:INCRement? <query> Returns: float64 NR3
:INCRement
  :DUNits <command> enum disp_units
  :DUNits? <query> Returns: enum normal disp_units
  :MODE <command> enum imode_parm
  :MODE? <query> Returns: enum normal imode_parm
  :MULTiply <command>
  :DIVide <command>
:PCMCia
  :CARD
    :STATus? <query> Returns: string quoted
    :TYPE? <query> Returns: string quoted
    :SIZE? <query> Returns: string quoted
  :SPSselect <command> string
  :SPSselect? <query> Returns: string quoted
:SPOR9 | SPORT9 | SB9 | SP9
  :FCONTrol | FLOW <command> string
  :FCONTrol? | FLOW? <query> Returns: string quoted
  :STATus
    :LINE? <query> Returns: int32 NR1
    :MODem? <query> Returns: int32 NR1
:SPOR10 | SPORT10 | SB10 | SP10
  :BAUD <command> string
  :BAUD? <query> Returns: string quoted
  :PARity <command> string
  :PARity? <query> Returns: string quoted
  :DATA (88) <command> string
  :DATA (88)? <query> Returns: string quoted
  :STOP (91) <command> string
  :STOP (91)? <query> Returns: string quoted
  :FCONTrol | FLOW (90) <command> string
  :FCONTrol? | FLOW (90)? <query> Returns: string quoted
  :STATus
    :LINE (129)? <query> Returns: int32 NR1
    :MODem (136)? <query> Returns: int32 NR1
:SPOR11 | SPORT11 | SB11 | SP11
  :BAUD (92) <command> string
  :BAUD (92)? <query> Returns: string quoted
  :PARity (94) <command> string
  :PARity (94)? <query> Returns: string quoted
  :DATA (93) <command> string
  :DATA (93)? <query> Returns: string quoted
  :STOP (96) <command> string
  :STOP (96)? <query> Returns: string quoted
  :FCONTrol | FLOW (95) <command> string
  :FCONTrol? | FLOW (95)? <query> Returns: string quoted
  :STATus
    :LINE (130)? <query> Returns: int32 NR1
    :MODem (137)? <query> Returns: int32 NR1
:SPOR14 | SPORT14 | SB14 | SP14
  :BAUD (78) <command> string
  :BAUD (78)? <query> Returns: string quoted

```

```

:PARity (80) <command> string
:PARity (80)? <query> Returns: string quoted
:DATA (79) <command> string
:DATA (79)? <query> Returns: string quoted
:STOP (82) <command> string
:STOP (82)? <query> Returns: string quoted
:FCOnTrol | FLOW (81) <command> string
:FCOnTrol? | FLOW (81)? <query> Returns: string quoted
:STATus
  :LINE (133)? <query> Returns: int32 NR1
  :MODem (140)? <query> Returns: int32 NR1

:MEASure
:RFRequency
  :SELEct (86) <command> string
  :SELEct (86)? <query> Returns: string quoted
:AFRequency
:MODulation (62)
  [:SELEct] <command> string
  [:SELEct?] <query> Returns: string quoted
:SATDeviAtion (46)? <query> Returns: float64 NR3
:SATDeviAtion (46)
  :STATe <command> boolean
  :STATe? <query> Returns: boolean normal
  :DUNits <command> enum disp_units
  :DUNits? <query> Returns: enum normal disp_units
  :UNITs <command> enum disp_units
  :UNITs? <query> Returns: enum normal disp_units
  :AUNits <command> enum disp_units
  :AUNits? <query> Returns: enum normal disp_units
:AVERage
  [:VALue] <command> float64
  [:VALue?] <query> Returns: float64 NR3
  :RESEt <command>
  :STATe <command> boolean
  :STATe? <query> Returns: boolean normal
:REFerence
  [:VALue] <command> float64 hpib_units | OPTIONAL
  [:VALue?] <query> Returns: float64 NR3
  :DUNits <command> enum disp_units
  :DUNits? <query> Returns: enum normal disp_units
  :STATe <command> boolean
  :STATe? <query> Returns: boolean normal
:HLIMit
  [:VALue] <command> float64 hpib_units | OPTIONAL
  [:VALue?] <query> Returns: float64 NR3
  :DUNits <command> enum disp_units
  :DUNits? <query> Returns: enum normal disp_units
  :RESEt <command>
  :EXCeeded? <query> Returns: boolean normal
  :STATe <command> boolean
  :STATe? <query> Returns: boolean normal
:LLIMit

```

```

[:VALue] <command> float64 hpib_units | OPTIONAL
[:VALue?] <query> Returns: float64 NR3
:DUNits <command> enum disp_units
:DUNits? <query> Returns: enum normal disp_units
:RESet <command>
:EXCeeded? <query> Returns: boolean normal
:STATe <command> boolean
:STATe? <query> Returns: boolean normal
:METer
[:STATe] <command> boolean
[:STATe?] <query> Returns: boolean normal
:HEND <command> float64 hpib_units | OPTIONAL
:HEND? <query> Returns: float64 NR3
:HEND
:DUNits <command> enum disp_units
:DUNits? <query> Returns: enum normal disp_units
:LEND <command> float64 hpib_units | OPTIONAL
:LEND? <query> Returns: float64 NR3
:LEND
:DUNits <command> enum disp_units
:DUNits? <query> Returns: enum normal disp_units
:INTerval <command> int32
:INTerval? <query> Returns: int32 NR1
:RFRequency
:SElect (86) <command> string
:SElect (86)? <query> Returns: string quoted

:RFANalyzer
:PMEasurement
:ZERO (6)
:MODE (24) <command> string
:MODE (24)? <query> Returns: string quoted

:SANalyzer
:MARKer
:MODE (16) <command> string
:MODE (16)? <query> Returns: string quoted

:STATus
:POWer (19)
:CONDition? <query> Returns: int16 NR1
:ENABle <command> int16
:ENABle? <query> Returns: int16 NR1
[:EVENT?] <query> Returns: int16 NR1
:NTRansition <command> int16
:NTRansition? <query> Returns: int16 NR1
:PTRansition <command> int16
:PTRansition? <query> Returns: int16 NR1
:IBASic (13)
:CONDition? <query> Returns: int16 NR1
:ENABle <command> int16
:ENABle? <query> Returns: int16 NR1
[:EVENT?] <query> Returns: int16 NR1

```

```

:NTRansition <command> int16
:NTRansition? <query> Returns: int16 NR1
:PTRansition <command> int16
:PTRansition? <query> Returns: int16 NR1

```

```
:SYSTem
```

```
:REStart <command>
```

```
:CDMA
```

```
:MOBile
```

```
:PILOt
```

```
:CLEar (41) <command>
```

```
:FERasure
```

```
:REPOrt
```

```
:CLEar (42) <command>
```

2. Changed Commands

(compared to 8924C commands listed in the 8924C Condensed Programming Reference Guide)

8924C

E8285A

```
:CONFIgure
```

```
:SPORt
```

```
:PRINt
```

```
:PORTs 'Serial'
```

```
:PORT 'HPIB'
```

```
:PORT 'Parallel'
```

```
:DESTination 'Serial'
```

```
:DEST 'HPIB'
```

```
:DEST 'Parallel'
```

```
:MEASure
```

```
:SANAlyzer
```

```
:MARKer
```

```
:FREQuency
```

```
...
```

```
:SANAlyzer
```

```
:MARKer
```

```
:CFREquency
```

```
...
```

```
:CONFIgure
```

```
:SPOR9 | SPORT9 | SB9 | SP9
```

```
:PRINt
```

```
:PORTs 'Serial 9'
```

```
:PORT 'HP-IB'
```

```
:PORT 'Parallel 15'
```

```
:DESTination 'Serial 9'
```

```
:DEST 'HP-IB'
```

```
:DEST 'Parallel 15'
```

```
:MEASure
```

```
:SANAlyzer
```

```
:MARKer
```

```
:DELTA
```

```
:FREQuency
```

```
...
```

```
:SANAlyzer
```

```
:MARKer
```

```
:DELTA
```

```
:CFREquency
```

```
...
```

3. Deleted Commands

(compared to 8924C commands listed in the 8924C Condensed Programming Reference Guide)

```
:AFANalyzer:CURRENT:ZERO
:CONFigure
  :OUTPut 'Only'
  :ARTSwitching (31) <command> string
  :ARTSwitching (31)? <query> Returns: string quoted
  :INTensity (1) <command> int32 | non_decimal
  :INTensity (1)? <query> Returns: int32 NR1
  :INTensity (1)
    :INCRement <command> enum incr_parms | int32
    :INCRement? <query> Returns: int32 NR1
  :PDOWn (2) <command> string
  :PDOWn (2)? <query> Returns: string quoted
  :RTSwitching (32) <command> string
  :RTSwitching (32)? <query> Returns: string quoted
:SPORT
  :RPACe (6) <command> string
  :RPACe (6)? <query> Returns: string quoted
  :XPACe (8) <command> string
  :XPACe (8)? <query> Returns: string quoted
:SPB
  :BAUD (78) <command> string
  :BAUD (78)? <query> Returns: string quoted
  :PARity (80) <command> string
  :PARity (80)? <query> Returns: string quoted
  :DATA (79) <command> string
  :DATA (79)? <query> Returns: string quoted
  :STOP (82) <command> string
  :STOP (82)? <query> Returns: string quoted
  :RPACe (81) <command> string
  :RPACe (81)? <query> Returns: string quoted
  :XPACe (83) <command> string
  :XPACe (83)? <query> Returns: string quoted
:EXTernal
  :REFerence (158)
    [:FREQuency] <command> string
    [:FREQuency?] <query> Returns: string quoted
:PCSMoDe
:PCSMoDe?
:RFSource:CALibrate
:MMToffset 'NORMAL'
:MMT '-5 us'
:MMT '-10 us'
:MMToffset?
:CALLP
:NAMPS
  :MRIMessage | NMRI
    :TYPE | T1T2 (151) <command> string
    :TYPE? | T1T2 (151)? <query> Returns: string quoted
    :DSCCode (152) <command> string
    :DSCCode (152)? <query> Returns: string quoted
    :PDCCCode | PDSCcode (153) <command> string
    :PDCCCode? | PDSCcode (153)? <query> Returns: string quoted
```

```

:EFcIndicator | EF (154) <command> string
:EFcIndicator? | EF (154)? <query> Returns: string quoted
:RSSI (155) <command> string
:RSSI (155)? <query> Returns: string quoted
:BERate (156) <command> string
:BERate (156)? <query> Returns: string quoted
:OEVEN | OE (157) <command> string
:OEVEN? | OE (157)? <query> Returns: string quoted
:BLsBit | BERLsb (158) <command> string
:BLsBit? | BERLsb (158)? <query> Returns: string quoted
:OQU | ORDQ (159) <command> string
:OQU? | ORDQ (159)? <query> Returns: string quoted
:ORDer (160) <command> string
:ORDer (160)? <query> Returns: string quoted
:PARity (90)? <query> Returns: string quoted
:CSpectrum:OUTPut 'Only'
:MEASure
:SElect 'Current'
:AFRequency:CURRent [settings]
:AFR:CURR?
:RFANalyzer
:PMEasurement
:MIlevel (213) <command> string
:MIlevel (213)? <query> Returns: string quoted
:TMOde (19) <command> string
:TMOde (19)? <query> Returns: string quoted
:TKEY 'On'
:TKEY 'Off'
:TKEY?
:RFGenerator
:MODulation
:EXTernal
:PEMphasis (24) <command> string
:PEMphasis (24)? <query> Returns: string quoted
:PEMphasis (24)
:MODE (25) <command> string
:MODE (25)? <query> Returns: string quoted
:OUTPut 'Only'
:ATTenuator 'On'
:ATT 'Off'
:ATT?
:SANalyzer:TGENERator:DESTination 'Only'
:CDMA
:MOBILE
:MASK (152) <command> string
:MASK (152)? <query> Returns: string quoted
:SETids (153) <command> string
:SETids (153)? <query> Returns: string quoted
:LOOPback (174)
[:DELay] <command> int32 | non_decimal
[:DELay?] <query> Returns: int32 NR1
[:DELay]
:INCRement <command> enum incr_parms | int32
:INCRement? <query> Returns: int32 NR1

```

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Printed in USA 7/00
5968-4610E**



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