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Agilent
8970B Error Messages
Data Sheet

The error messages are displayed on the front panel of the noise figure meter in the format **E XX** or **EXXX** where **XX** is between **01** and **80** and **XXX** is between **100** and **106**. These errors are described in section 3 of the Operating Manual and in the Service Manual. This pulls together all the information into one document. The errors will be grouped into functional groups. **Special 99.1** can be used to read back the last displayed error message GPIB

GPIB/SIB Check

Switch the instrument off then on and press the **PRESET** key. Connect the **SIB** to the **GPIB** using a GPIB cable. Ensure that there are no other instruments connected to either the GPIB or SIB. Initiate the self-test by pressing **98.1 Special**. The display will show **SIB tESt** for about 10 seconds. The result of the test will be an error number. The manual has a lot of references to using signature analysis to fault find these problems. It is highly unlikely that the signatures used are out of date and are not to be trusted.

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Error	Description
E00	No Error self test completed successfully
E01	**REN** or **ATN** line failure. Replace A14U42, U11, U14 and U43 in order. Check each time that the failure is fixed. If problem still persists change A14 assembly.
E02	Defective data path between **GPIB** and **SIB** chips. Replace A14U42, U26, U1, U11 and U43. Check each time that the failure has been fixed. If problem still exists change A14 assembly.
E03	**SIB** Message to Main **GPIB** message failed. Replace A14 assembly.
E04	**SRQ** line not being set by **GPIB** chip or not being deleted by SIB chip. Replace A14U42, U11 and U43. Check each time that the failure has been fixed. If problem still exists change A14 assembly.
E05	**SIB** chip could not serial poll Main **GPIB** chip. Replace A14U42, U11, U28 and U43. Check each time that the failure has been fixed. If problem still exists change A14 assembly.
E06	**SIB** collision detection failure. Replace A14U3, U13, and U12. Check each time that the failure has been fixed. If problem still exists change A14 assembly.
E07	Main **GPIB** chip could not address **SIB** chip. Replace A14U2 and U28. Check each time that the failure has been fixed. If problem still exists change A14 assembly.
E08	Main **GPIB** Message to **SIB** failed. Replace A14U2 and U28. Check each time that the failure has been fixed. If problem still exists change A14 assembly.
E75	**GPIB** chip or interface hardware failure. Replace A14U42, U11, U28 and U43. Check each time that the failure has been fixed. If problem still exists change A14 assembly.
E74	**SIB** chip or interface hardware failure. (Interface to **GPIB** chip is good). Replace A14U42, U11, U28 and U43. Check each time that the failure has been fixed. If problem still exists change A14 assembly.

Power Up Errors

When the instrument is powered on a number of self tests are done. If these fail then an error message will be displayed to indicate the nature of the failure. The signature analysis listed in the manual is probably out of date and of little use.

Error	Description
E70	**ROM 1** failure. Replace A14U5. If this does not fix the problem replace the A14 assembly.
E71	**ROM 2** failure. Replace A14U7. If this does not fix the problem replace the A14 assembly.
E72	Non-volatile **RAM** failure. Check the **PON (L)** signal is low at A14U8 pin 20. If it is not, check the power up detector circuit on SS12. If problem persists replace A14U8 and then the A14 assembly.
E74	**SIB** chip or interface hardware failure. (Interface to **GPIB** chip is good). Replace A14U42, U11, U28 and U43. Check each time that the failure has been fixed. If problem still persists change A14 assembly.
E75	**GPIB** chip or interface hardware failure. Replace A14U42, U11, U28 and U43. Check each time that the failure has been fixed. If problem still persists change A14 assembly.
E76	**PIA2** chip or data path failure. Replace A14U33. If the error still persists then replace the A14 assembly.
E77	**PIA1** chip or data path failure. Replace A14U35. If the error still persists then replace the A14 assembly.
E78	**PIA2** cannot drive hardware on **PA0-PA7**. Replace A14U32 or A14U33. If the error still persists then replace the A14 assembly.
E79	**PIA1** cannot drive hardware on **PA0-PA7**. Replace A14U31, U46, U30 and 35 in order until the error clears. If the error still persists then replace the A14 assembly.

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Hardware Errors

The general remedy for clearing these errors is to press **PRESET** and check that the input signal is within the specified amplitude and frequency range.

Error 10: Analog to Digital Conversion Field

The error is displayed because the time between the **CVT** starting the conversion and the **ECVT** line ending the conversion is > 1 second. The time is normally 20 to 30 mS.

Check for 4 MHz at A13TP3. If there is a problem check **A13W5** and the timing generator circuitry consisting of **A14U51** and **A14Y1**.

If the 4 MHz is there, then check that the **CVT** line (**A14U33** pin 17) goes low to start a conversion. If this is wrong then the problem is on the **A14** controller assembly.
If the **CVT** line is functioning correctly then check that the **ECVT** line (**A13TP20**) goes low to indicate the end of conversion. If this is not the case then the problem is on the **A13** voltmeter assembly.

Error 11: Analog to Digital Converter Overflow

Note: Error 11 will be generated if **Special 92.1** (Tune to 0 MHz input frequency) has been selected. This error can be caused because the IF attenuators have been set in to a particular configuration using **Special 70.X** or because the IF attenuators have been inhibited from auto ranging using **Special 72.0**. If a conversion results in the OVFL line going high then the noise figure meter will try and put in more attenuation to prevent this. However if the attenuators are set using one of the above methods then the error will occur.

If the IF attenuators are at a maximum then the CPU will try and lower the gain on the input assembly. If the RF gain is at a minimum already then the error will be generated.

To troubleshoot Error 11 remove the input signal, **PRESET** and select 0 dB IF attenuation with **Special 70.1**. If Error 11 is cleared then check that the IF and RF attenuators are switching correctly using the procedures in Sections 4 and 5 of the details in the Service Sheet BD1. If Error 11 is still there then check the **DET** output and ensure that the voltage is indeed > 1.2 V. If it is then it is necessary to trace the signal through the complete down conversion path. If it is not, then it is necessary to check that the **OVFL** line goes low indicating an overflow condition. If it does go low then look at SS5 and SS6 at the source of the problem. If it doesn't then the CPU is the source of the problem.

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Error 12: Input Overflow

The CPU changes the input gain in order to maintain a constant signal level at the first converter. The detector on the A6 assembly measures the input level and feeds the voltage to the CPU. If the input level is so high that switching in all of the attenuation does not get the signal into the required window Error 12 will be indicated.

To troubleshoot this error disconnect everything from the Noise Figure Meter input and select Special 60.1 (20 dB input again). If the error clears then check **the Input Power Detector Offset and Gain Adjustment** and also verify that the input gain is switching correctly.

If the error does not clear then measure the detector voltage at **A14TP12**. If the voltage > 6.8V the problem is likely to be with the input section. If it is < 6.8 V the problem is likely to be on the CPU board.

Error 13: IF Attenuator Calibration Failed

Special 33.1 can be used to calibrate the IF Attenuators. **Note that this reduces the Gain Measurement Uncertainty Spec. to ± 0.25 dB.** The preferred method for doing the calibration is in the **Performance Test** section of the Operating Manual. The calibration compares the 5, 10, 15 (5 + 10) and 10 dB attenuator settings with the 0 dB value. The error will be displayed of one of the four following conditions occurs:

- If the **OVFL** line is set high while the calibration is taking place.
- If the voltage measured during the 0 dB setting is too low.
- If there is > 20% error in any of the comparison.
- If the Noise source has an ENR < 15 dB.

Error 14: Cannot Select Proper IF or RF Attenuators

The Noise Figure Meter varies the RF and IF attenuators until the voltage at the Noise Power Detector is between 0.52 and 1.1 V. The instrument will try to do this 10 times and then report the error.

Error 18: Frequency Calibration Failed

The frequency calibration tunes the first LO to 2050 MHz. The LO feeds through the first mixer and is converted to the 20 MHz IF. The Frequency cal. Detector is tuned to measure a peak at 20 MHz which corresponds to an LO frequency of 1050 MHz. The LO tuning DAC's are programmed until a peak is found after 3 attempts the Error is displayed.

To troubleshoot **PRESET** the 8970B and measure the voltage at **A14TP8**. There should be a pulse with a peak value of > +2 V. If the pulse is < 2 V the problem is with the RF path. In checking the RF path it may be necessary to do all of the adjustments to ensure that all of the components of the down-conversion chain are lined up correctly. If it is > 2 V the problem is with the sample and hold or comparator.

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Error 19: Noise Figure Test Set YIG calibration failed

The SSB3 path in the Noise Figure Test set has a YIG Tuned Filter (YTF) to ensure that the measurement is Single Sideband. The filter is a bandpass filter whose centre frequency and bandwidth are tuned by driving current through it. This current is programmed through the YTF tune DAC's in the Noise Figure Test Set. The YTF can either be coarse peaked using **64.X Special** or Fine Peaked using **36.X Special**. The Coarse Peak is required when the Noise Figure System (8970B, 8971C and LO) is configured. The Fine Peak is recommended when a calibration is done. The Coarse Peak gets the YTF at approximately the right frequency and the Fine Peak gets it more accurately and is therefore more sensitive and subject to drift with time and temperature. Both of these calibrations require a good quality signal at the input to the Noise Figure Test Set. If there is a failure the first thing to do is to check all of the cabling. It is **NOT RECEOMMENDED** to use a 346A noise source without a preamplifier as the signal level is too low. The minimum recommended ENR is 12 dB. The 8971C Option 002 does not have an RF preamp so using a preamp for calibration is a must as this will **NOT** work otherwise.

By connecting an oscilloscope to the 8970B it is possible to view the Coarse and fine tuning taking place. **97.1 Special** sets up the scope and **8.3/8.4 Special** sets up the limits. The lower limit should be set to 120 dB and the upper limit should be set for 500 dB. Higher values will be required if a preamp is used. Expect to see some sort of peak on the screen. If the error persists then consult the 8971C Service Manual. It is possible to program the tune DAC's directly and see the effect.

Calibration Errors

Error 20: Not Calibrated

If **Corrected Noise Figure and Gain** is selected and a calibration has not been done this error will appear. The solution is to do the calibration.

Error 21: Current Frequency is out of calibrated range or not a calibrated point in Modes 1.5-1.9

Measurement modes 1.5 to 1.9 use the 8971C Noise Figure Test Set. The calibration frequencies are determined by **START, STOP and STEP** frequencies. I a measurement is made outwith **START** and **STOP** or is not one of the increments determined by **STEP** then the error will occur. Special 39.1 allows measurements at interpolated frequencies between **START** and **STOP**.

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Error 22: Current RF Attenuation not calibrated

The RF attenuator/amplifier setting is determined by the input level to the detector on the input board. When the 8970B is being calibrated with the Noise Source at the input the input section is at it's most sensitive with the gain is at 20 dB. The calibration takes place at 20 dB, 10 dB and 0 dB. If the device being measured sets the gain level lower than this then the error will appear. **Special 61** shows the RF attenuator settings and the level at which the calibration must take place. Use **Special 32.X** to set the range at which the calibration takes place. Be aware that at some settings there will be an error because the signal level is too low at the noise detector.

Error 23: Not calibrated in the current measurement and sideband modes

A mode has been chosen which has not been calibrated and a calibration must be done.

Error 24: Not calibrated for the current IF (Mode 1.1, 1.3, 1.6 and 1.8)

In these modes the IF into the noise Figure Meter or the Noise Figure Test is fixed. The devices that are tested in these modes either operate at a frequency greater than the range of the Noise Figure Meter or Nose figure Test set (**Mode 1.1 or 1.6**) or they are mixers with a fixed IF. **Special 3.0** specifies the IF for these modes. If the IF has not been calibrated then this error will appear. **Note** that **Special 19.X** sets the IF for the Noise Figure Test set in SSB2, SSB3 and DSB.

Error 25: Not calibrated at the current LO frequency (Mode 1.2 and 1.7)

In these modes the DUT has a frequency range greater than the input frequency of the Noise Figure Meter or the Noise Figure Test set. The DUT output frequency is mixed down to a range of frequencies, which are within the range of the noise figure meter or noise figure test set. The LO is at a fixed frequency. If the LO frequency is changed then the input frequencies to the Noise Figure Meter or Noise Figure Test set will change so a calibration will need to be done.

Error 26: IF Attenuators not calibrated

The most common reason for this happening is a continuous memory failure, which would also show **Error 80**. The IF attenuator data is stored in battery backed up memory and will therefore be lost if the battery runs down. The solution to this problem is to re-calibrate the IF. See the notes for **Error 13**.

Error 27: Overflow while calibrating

This indicates that there is too much loss in the system. Some reasons for this are that the noise source being used has not had enough ENR (e.g. 346A) or that **Special 32.X** has been used to set the input attenuation. One of the most common reasons is that the front end has been damaged in some way resulting in the excessive loss. It is possible to recover from this error by including a preamp as part of the measurement system.

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Error 28: Noise Figure Test Set Fine Tuning Calibration Required

If the calibration range is changed by **START, STOP** and **STEP** frequencies then the YTF will need to be re-calibrated for the new range. If an interpolated frequency point is used then the error will indicate that the YTF must be fine tuned at that interpolated point. **Special 36.4** allows calibration at spot points. The error will also be generated if the temperature drifts more than 5 degrees from the calibration temperature. **Special 36.3** will calibrate at the points defined by **START, STOP and STEP** frequency. This is the main way to recover from the error. **Special 36.0** is the default state. This enables a fine tune before every calibration, which can be quite lengthy. **Special 36.2** disables fine tuning calibration and **Error 28**. This should only be used if the measurement error is associated with this are understood.

Error 29: Noise Figure Test Set Coarse Tuning calibration required
This is generated when the system is first put together. **Special 64.0** runs the calibration and **Special 64.1** determines the upper frequency for the Coarse calibration. This error is very prone to losses in the system. See **Error 19** for more details.

Setup Errors

Error 30: Start Frequency > Stop Frequency

Ensure that the data are entered correctly. This error also indicates a possible entry problem for lower and upper limits (Noise Figure and Gain) when plotting.

Error 31: Number of calibration points exceed 181

$$\frac{\text{STOP_FREQUENCY - START_FREQUENCY}}{\text{STEP_SIZE}} \leq 181$$

Error 32: LO set by Special 3.1 will be out of range

With the settings for **START FREQUENCY, STOP FREQUENCY or IF** the LO will tune to 0 MHz.

Error 33: IF into Noise Figure Meter will be out of range

Choose an IF that is within the range of the noise Figure Meter or the Noise Figure Test Set.

Error 34: DSB not allowed in Modes 1.2 or 1.7

These modes require a mixer to mix down into the frequency range of the noise figure meter and the noise figure test set. This is a single sideband measurement and a filter is used to select the appropriate sideband.

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Entry Errors

Error 35: Entered value is out of range
Enter a new value.

Error 36: Unspecified Special Function
Check THE Special Function entered.

Error 37: Cannot enter specified parameter
Select the proper function that allows entry of this parameter.

Error 38: Noise Figure Test Set IF will be out of range
The signal into the 8971C Noise Figure Test Set should be within the range 10 MHz to 26500 MHz. This will be determined by **START FREQ, STOP FREQ, IF for modes 1.1, 1.3, 1.6 and 1.8 (Special 3.0), LO for modes 1.2, 1.4, 1.7 and 1.9 (Special 3.1) and the Sideband Selected (Special 2.X)**. If these parameters are set up incorrectly then the error will occur.

Error 39: The number of plot points exceeds 251
The number of plot points is determined by:

$$\frac{\text{STOP_FREQUENCY - START_FREQUENCY}}{\text{STEP_SIZE}} + 1 \leq 251$$

This is unusual since the number of calibration points is fixed to 181 by a very similar equation.

GP-IB Errors

Error 40: Undefined GPIB Code
Check the code and try again.

Error 41: Invalid GP-IB Characters
Check the entry string and try again.

Error 42: System LO not found on SIB
The system LO is set up on the bus using Special 40.1 and enabled with Special 46. It is worth checking that these functions are set up as well as the integrity of the GPIB cable connected to the SIB. If the Noise Figure Meter is not going to control the System LO then the error can be avoided with Special 46.1.

Error 43: Codes received while in talk mode only
The 8970B can be set up as Talk Only using Special 4.2. If commands are sent to the 8970B when it is in this mode the error will occur.

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Error 44: Noise Figure Test Set not found on SIB

The Noise Figure Test Set is set up on the bus using **Special 45 or 45.1**. The address is set up with **Special 40.2**. Ensure that the Noise Figure Test set is connected to the SIB. If the test set is not found then the error will occur. If the Noise Figure Test set will not be controlled by the Noise Figure meter then the error can be avoided with **Special 45.2**.

Error 45: Plotter or 8757 Network Analyzer not found on SIB
Ensure that the plotter **(Special 40.3)** or the Network Analyzer **(Special 47.4)** are set up correctly. Also ensure that the plotter or Network Analyzer are connected to the **SIB. Special 47.2** enables Network Analyzer commands on the SIB.

Error 46: Pass through device not found on SIB
It is possible to control a device that is connected to the SIB using an external controller. This device is a **pass through** device. The noise figure meter has a pass through address, which can be viewed with **Special 40.7**. This is determined by the Noise Figure Meter address. The pass through device address is set up with **Special 40.6**. The device should be connected to the **SIB**.

Error 47: Controller not found on the SIB
It is possible to pass control of the **SIB** between an external controller and the noise Figure Meter. This is set up with **Special 49.1**. If this is incorrectly set up then the error will occur. If this functionally is required then ensure that the controller is connected to **SIB**.

Error 48: Two or more controllers are on the SIB
If the Noise Figure Meter is set up as the controller with Special 48 the error will appear if another controller is found on the SIB. The 8757 Network Analyzer can sometime cause a problem. This can be cleared with **Special 47.2**.

Error 80: Continuous Memory Failure
This indicates that the battery will no longer sustain stored data as the IF attenuator calibration data. **Error 26** will also appear. If the attenuators are re-calibrated valid measurements can still be made but if the instrument is switched off it will need to be re-calibrated.

Noise Figure Test Set Errors

Error 100: Noise Figure Test Set fine tune table will overflow

Error 101: Noise Figure Test Set self-test failed

Special 98.7 will initiate a self-test for the 8971C. If there is a failure then it can be decoded by both the Front Panel annunciators and the Status LED on the A2 assembly internal to the 8971C. What these mean can be found in the 8971C Service Manual.

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Error 102: Auto Sweep was aborted to protest the Test Set switches

If noise figure measurements are made that cross a number of bands SSB1 thru SSB3 then the input switches will switch for every band change. If the Noise Figure Meter is set up in **AUTO** mode then it would carry on endlessly and wear out the switches. The Noise Figure Meter is programmed to only let this happen 100 times before the error is reported. **Special 97.3** disables the error and the **AUTO** Sweep being aborted.

Error 103: Noise Figure Test Set cannot perform an SSB measurement at this frequency

The manual indicates select **Special 17.1 (DSB)**.

Error 104: Interpolating across the Noise Figure Test Set bands is not allowed

The three bands are 10 MHz to 1600 MHz (**SSB1**), 1601 MHz to 2400 MHz (**SSB2**), and 2401 MHz to 26500 MHz (**SSB3**). **Special 39.1** allows interpolation between calibration points in modes 1.5 to 1.9. It is not possible to interpolate between points in 2 different bands e.g. 1500 MHz and 1700 MHz.

Error 105: The YTF temperature control loop will not lock

The YTF temperature is regulated to 16 degrees above ambient. This is done with a closed loop system. If this loop cannot change the internal temperature for a change in ambient then the error will be reported. An instrument self check can also produce information from the status LED's on the CPU board.

Error 106: User selected LO not on the SIB

The user controlled LO is used in modes 1.6 thru 1.9 where the signal has to be mixed down to the frequency range of the Noise Figure Test Set. The user controlled LO is connected to the **SIB** and is enabled with **Special 96.1**, the GPIB address is programmed with **Special 96.2** and the control program (**Special 41.X**) is set by **Special 96.3**.



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Printed in USA, February 14, 2005
5989-2456EN



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