CNA 300/200 TEST MEASUREMENT SOFTWARE OPERATING MANUAL

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1 INTRODUCTION

The CNA (Crystal Network Analyzer) 300 and CNA 200 Test Measurement Systems are designed to quickly and accurately measure crystal devices. With their simple and intuitive operating menus, production tests can be completed quickly. Additional flexibility is provided for Engineering to aid in analyzing crystal characteristics and identifying production problems.

The CNA 300 performs both phase-locked and frequency-locked measurements, while the CNA 200 only performs frequency-locked measurements. In both the CNA 300 and CNA 200, crystal parameters and limit specifications can be saved in Setup files for future use. Test data can be printed and/or exported to industry standard DBF (dBASE) files.

1.1 Hardware and Software Requirements

The system software runs on a 486 computer with a minimum speed of 66 MHz. The system sofware requires:

- DOS 6.22 or higher, and at least 4 MB of RAM,
- A minimum of a hard disk and a 3 1/2" 1.44 MB floppy drive, and
- A VGA monitor.

1.2 Technical Specifications of the CNA 300

Frequency Range:	1 to 256 MHz
Ext Reference:	10 MHz into 50 Ohms at 50 mV (optional)
Sensitivity:	
Input Channel A:	3.7 uV - 240 mV rms 1 to 256 MHz
Input Channel B:	0.9 uV - 60 mV rms 1 to 256 MHz
Output:	0.05 to 2 V rms, 1 - 256 MHz
Power:	100/120/200/220/240 @ < 50 W

1.3 Technical Specifications of the CNA 200

Frequency Range:	1 to 200 MHz
Ext Reference:	10 MHz into 50 Ohms at 50 mV (optional)
Sensitivity:	
Input Channel A:	3.7 uV - 240 mV rms 1 to 200 MHz
Input Channel B:	0.9 uV - 60 mV rms 1 to 200 MHz
Output:	0.05 to 2 V rms, 1 - 200 MHz
Power:	100/120/200/220/240 @ < 50 W

1.4 CNA Software

The software is structured for two main operating modes:

- Production "test," designed for repetitive crystal tests and for use by unskilled operators. The tests can be set up by a skilled operator, for various formats and requirements, including PASS or FAIL limits. After a test is set up, it can be saved, so that the system can automatically be configured to perform the same test at a later time.

- Laboratory "Quick Measurements," designed for a variety of engineering measurements, including impedance measurements of electronic components other than crystal devices.

The software is located in the directory C:\TESTMEAS.

1.4.1 HARDWARE.CNA File

The **HARDWARE.CNA** file contains calibration data from the factory for this particular CNA. Each CNA has a unique **HARDWARE.CNA** file. **DO NOT CHANGE** this file.

If you have multiple CNAs, make sure that the appropriate HARDWARE.CNA file is used with each CNA.

2 CONVENTIONS

This chapter provides a guide to help users understand how to navigate the menus and how to modify parameters.

2.1 Choosing Menu Items

Menus contain numbered lists. The items in the list are functions that the software can perform. To cause a menu item to be performed, type its number at the prompt.

2.2 Function Keys

The following table describes the function keys that are always active in the system.

Press	To
<F1>	Display help information. Press <ESC> to exit Help.
<ALT-F9>	Temporarily shell to the DOS prompt to perform DOS related functions. To return back to the CNA software at the exact place where <ALT-F9> was pressed, type EXIT at the DOS prompt.
<ALT-F10>	Shut down the CNA software and return to DOS.

2.3 Entering/Modifying Parameters

To position the cursor to the desired location on data entry screens, press the <TAB>, <UP-ARROW>, or <DOWN-ARROW> keys repeatedly until the cursor is positioned on the desired field. The currently selected parameter will always be highlighted.

Some parameters are modified by entering the desired value directly, while others display a selection box from which the appropriate value may be selected. A message at the bottom of the screen indicates how to modify the currently selected parameter.

Examples of messages:

Press <SPACE> to select, then <RETURN> to confirm or <ESCAPE> to abort

Pressing <SPACE> displays a list of values that the parameter can be set to. Cursor through the list using either the <SPACE>, <UP-ARROW>, or <DOWN-ARROW> keys. When the desired value is highlighted, press <ENTER>.

Press <SPACE> to toggle value ON (1) or OFF (0)

Pressing <SPACE> causes the highlighted value to toggle between 0 and 1.

Enter the new value, then <ENTER> to confirm or <ESCAPE> to abort

Type in the new value. A data entry box automatically displays when you begin typing. Press <ENTER> when complete.

3 GETTING STARTED

To start, turn power on to the CNA System. After a few minutes, a screen titled "Verify Serial Number" appears. The serial number located on the front of the CNA should be identical to the serial number that appears on the screen. Because each CNA posses a unique calibaration file, unmatched serial numbers will generate incorrect results.

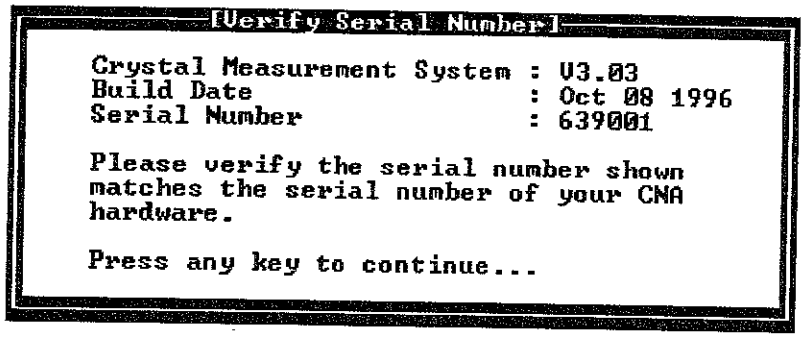


Figure 3.1 Verify Serial Number

After a key is pressed, the Main menu will display.

The test operator only needs to be concerned with the Test option. The other options should only be used by those responsible for configuring or maintaining the system. Except for the View Data option, all other options can be password protected to prevent inadvertent changes to setup parameters.

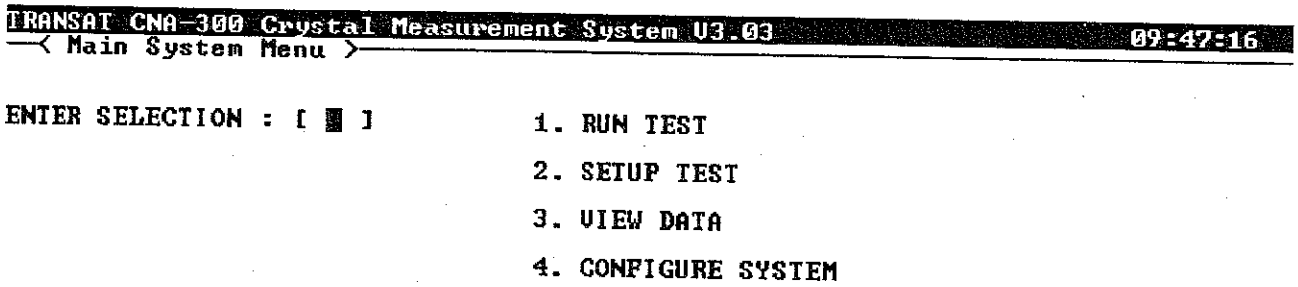


Figure 3.2 Main Menu Screen

The following table describes the menu options available from the Main Menu.

Press	To select	To
<1>	Run Test	Begin the test/measurement process. Allows the operator to modify parameters and perform measurements on crystals. Selecting this option enters the Test menu. See Chapter 5, "PERFORMING A TEST" for more information.
<2>	Setup Test	Allow the operator to create, modify, save, and delete Setup files from the disk. A Setup file contains information defining the test of a specific class of crystals. A Setup file should be created for each class of crystal you will be testing. Selecting this option enters the Setup Model menu. See Chapter 6, "SETUP TEST" for more information.

Press	To select	To
<3>	View Data	Allow the operator to view Log files from prior tests. Selecting this option enters the View menu. See Chapter 7, "WORKING WITH DATA FROM PREVIOUS TESTS" for more information.
<4>	Configure System	Allow the operator to modify system parameters. Selecting this option enters the Configure menu. See Chapter 8, "CONFIGURING THE SYSTEM" for more information.

4 A QUICK TUTORIAL ON USING THE CNA

This chapter takes you step-by-step through the process of selecting the tests to run and performing the test. See Chapter 5, "PERFORMING A TEST", for a thorough description on how to set up and perform tests and measurements. See Chapter 6, "SETUP TEST", for a complete description on how to create, modify, and delete Setup files.

Generally, before measuring a crystal, do the following:

- Provide some basic test information about the crystal.
- Select which tests to perform.
- Run the test.

4.1 Preparing To Measure a Crystal

In this example, we will be testing the Series Frequency and Resistance of a crystal.

To prepare to measure the crystal device

1. Place the crystal device in the PI Network. Be sure to place each leg of the crystal device on a different contact.

2. From the Main menu, press <1> to choose Run Test.

   The Run Test Menu screen displays. The screen is setup to either accept typing in the name of the file or pressing <ENTER> to show the list of files.

   In our example, the Run Test Menu file is named SYSFILE. SYSFILE is included with the system software. A later section describs how to create other test setups that can be used here.

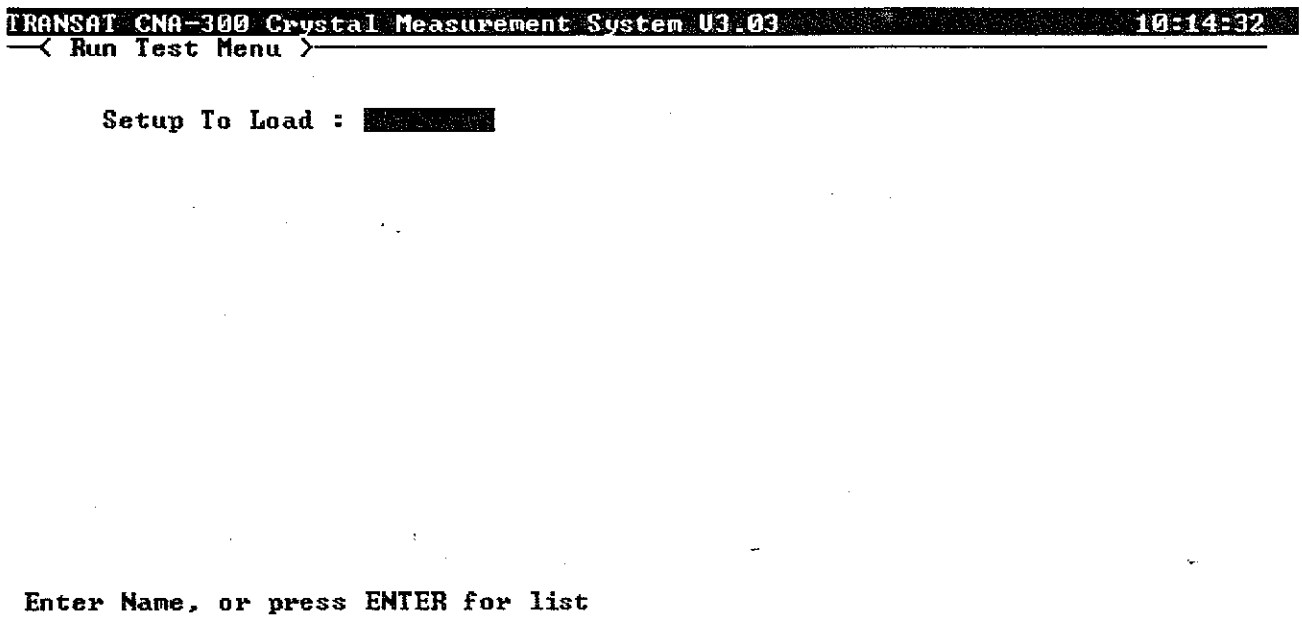


Figure 4.1 Test Setup Screen

3. Press <ENTER> to display a list, then press <ENTER> to accept SYSFILE.

   The Lot screen displays.

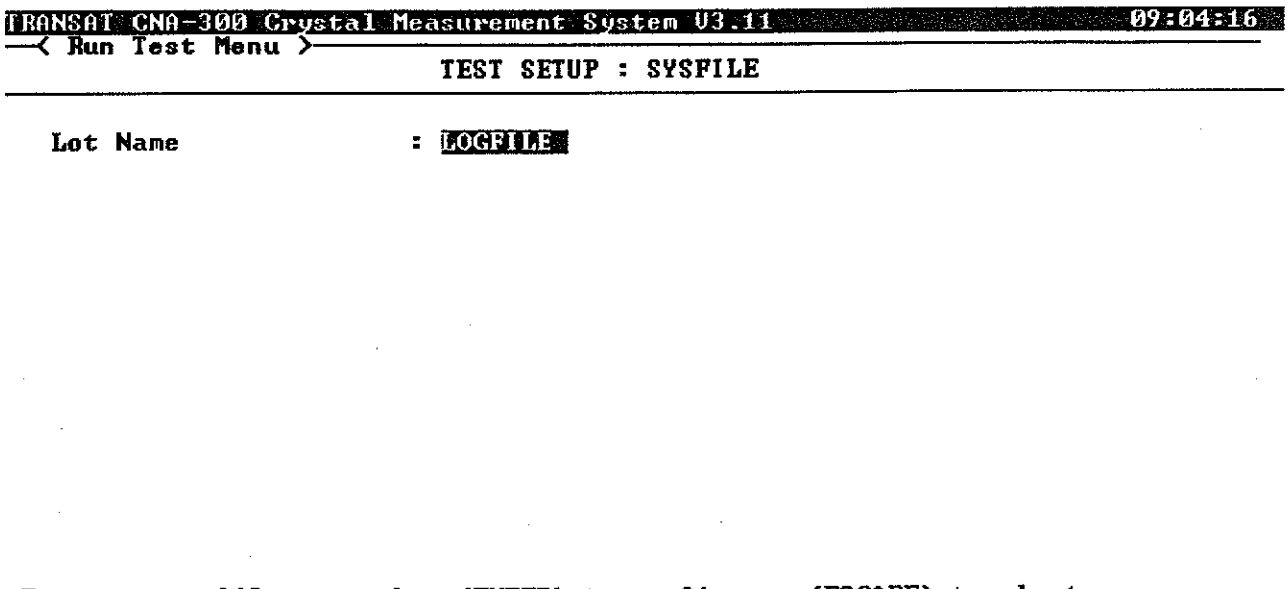


Figure 4.2 Lot Screen

4. Press <ENTER> to accept the Lot Name of LOGFILE.

   If LOGFILE already exists, you will be asked to press <1> to overwrite the existing data. Otherwise, the test will be aborted.

   The Current Test Setup screen displays.

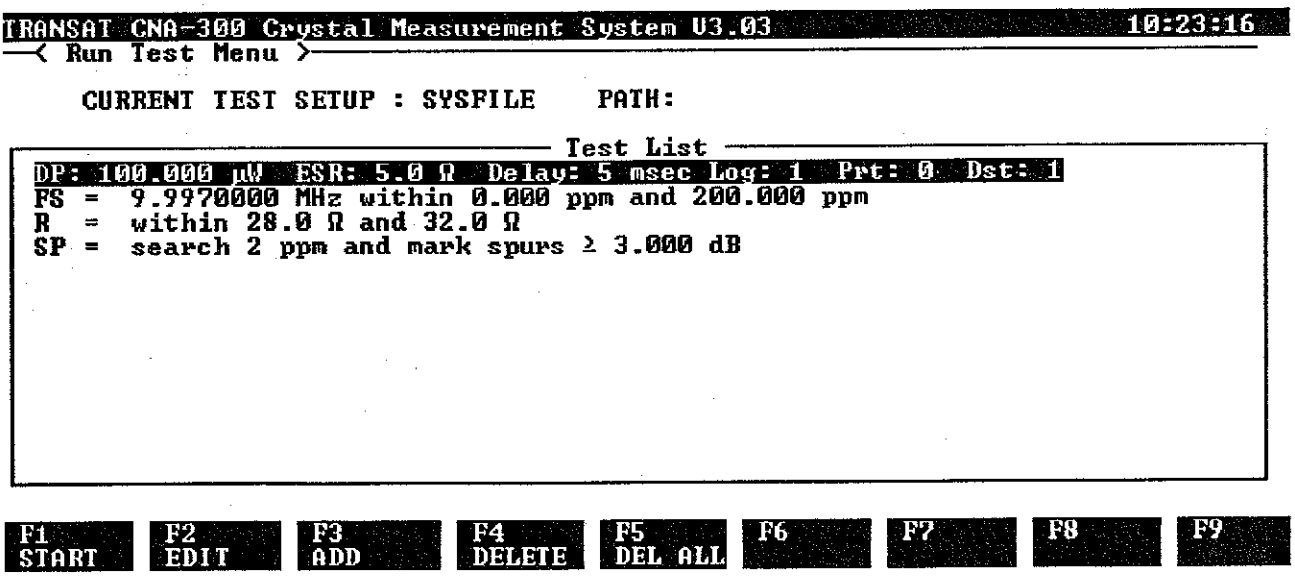


Figure 4.3 Current Test Setup Screen

4.2 Selecting the Tests to Run

The Setup file selected has a set of tests previously defined. These tests are shown in the Test List. The Test List can be modified per the user's test requirements.

To select the tests to be run

1. Press <F2> EDIT

   The Basic Test window displays

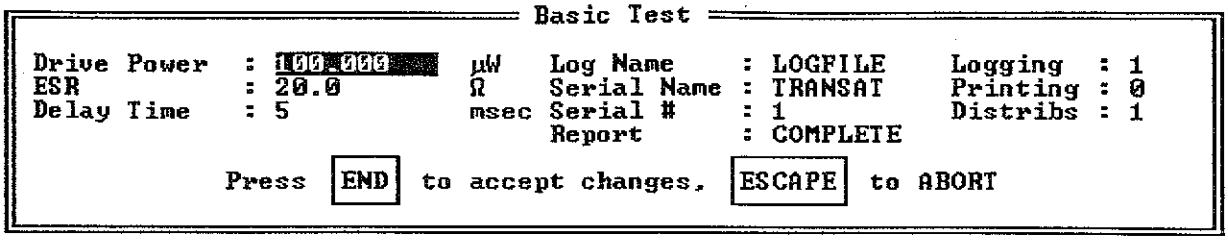


Figure 4.4 Basic Test Window

2. Enter these values in the Basic Test window:

   Drive Power: 100 uW,
   ESR: 20.0 ohms,
   Delay Time: 5 milliseconds.

NOTE Press <ENTER> after typing in a value. Pressing <Tab> or an arrow key causes the old value to display.

3. Press <END> to accept the changes and return to the Current Test Setup screen.

   The Test list will now contain the values you entered in the Basic Test window.

4. Use the Up- and Down-Arrow Keys to highlight FS, then press <ENTER>.

   The Fs (Series Frequency) Test window displays.

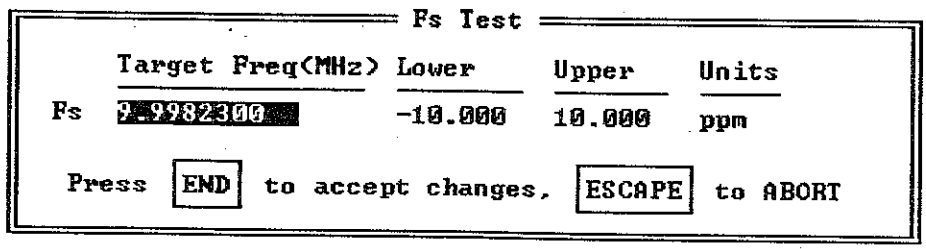


Figure 4.5 Fs Test Window

5. Enter these values in the Fs Test window:

   Target Frequency: 9.9982300 MHz
   Lower: -10.0
   Upper: 10.0
   Units: ppm

6. Press <END> to accept the changes and return to the Current Test Setup screen.

   The Test list will now contain the values you entered in the Fs Test window.

7. Use the Up- and Down-Arrow Keys to highlight R, then press <ENTER>.

   The R (Resistance) Test window displays.

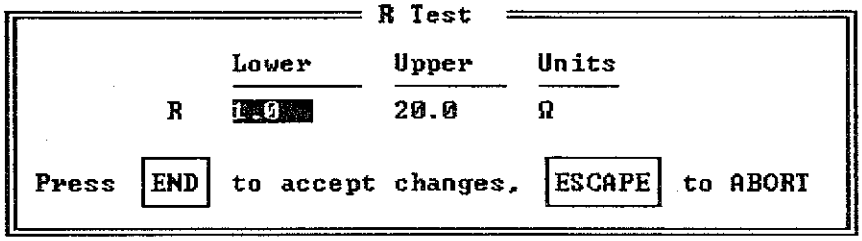


Figure 4.6 R Test Window

8. Enter these values in the R Test window:

   Lower: 1.0 ohms
   Upper: 20.0 ohms

9. Press <END> to accept the changes and return to the Current Test Setup screen.

   The Test list will now contain the values you entered in the R Test window.

4.3 Starting the Test

You are now ready to start testing. You can perform the test on as many crystals as you want, but please note that the tests you just selected, are not saved. For more information on saving Setup files, see Chapter 6, "SETUP TEST".

To perform the test

1. Press <F1> to choose Start.

   The Test screen displays.

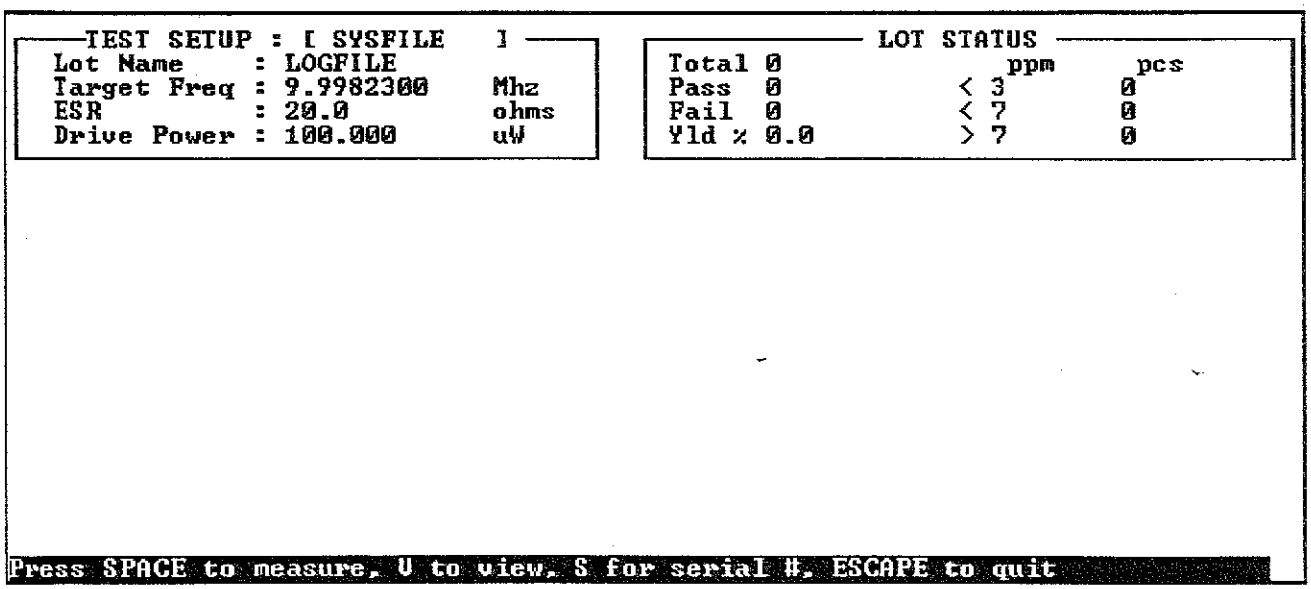


Figure 4.7 Test Screen

2. Press <SPACE> to perform the measurement.
   The crystal device is measured, and the results are placed on the screen.

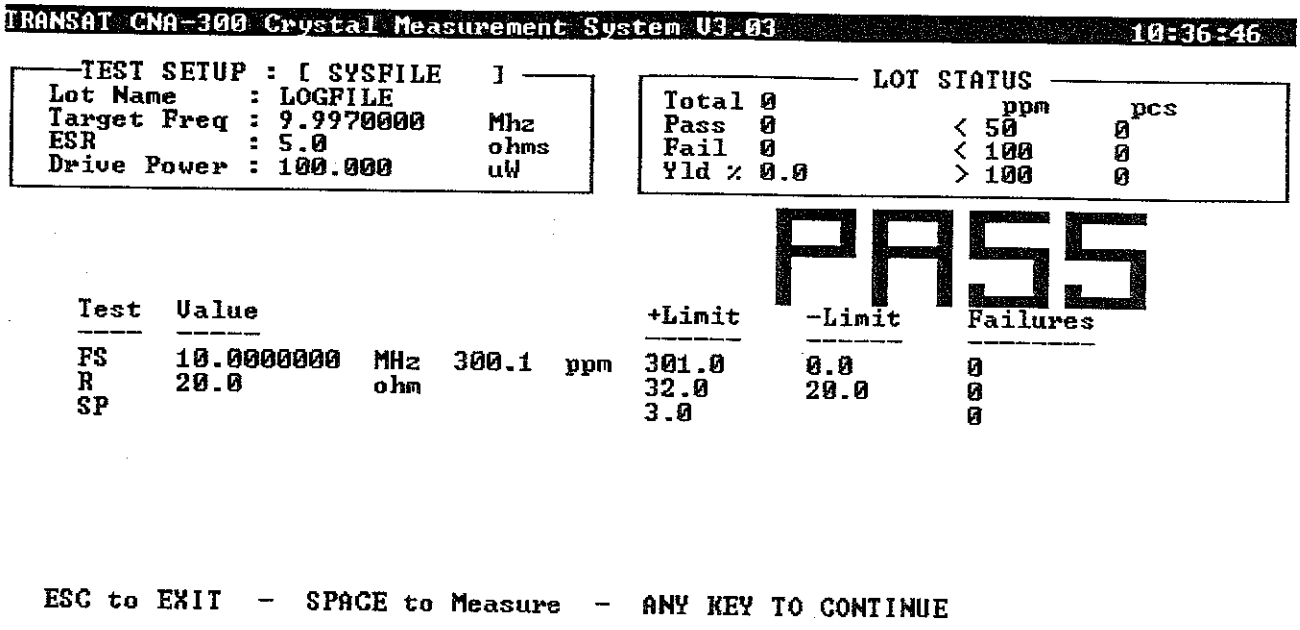


Figure 4.8 Test Screen After Measurement is Completed

To repeat the test on another crystal using the same test setup

1. Remove the crystal device that has been measured from the PI Network, and place a new crystal device in the PI Network.

2. Press <SPACE> to measure the crystal.

   The new crystal is measured, and the results are placed on the Test screen.

Repeat the above two steps for each crystal device in the lot.

The measurements made on each crystal device are recorded in the Log file, named after the Lot Name, if logging was enabled.

5 PERFORMING A TEST

This chapter describes how to setup and begin testing a group of crystals. The test setup can either be from a setup file (Setup Test) or defined at the start of the test.

The steps necessary for performing a test are as follows:

- Specify a test setup.
- Enter lot description.
- Modify the current test setup (optional).
- Start the test.

NOTE For maximum performance, allow the system to warm up 1 hour after it is powered up before making measurements.

5.1 Specify a Test Setup

To specify a test setup

- From the Main menu, press <1> to select RUN TEST.

The Test Setup screen is displayed similar to the following.

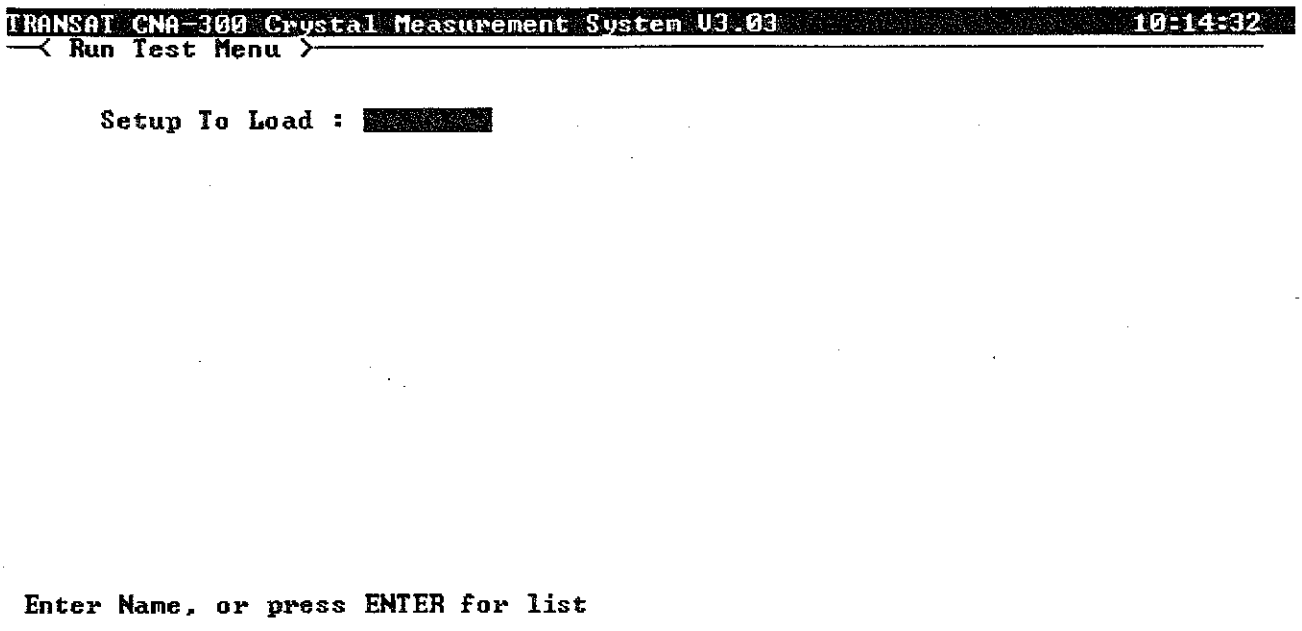


Figure 5.1 Test Setup Screen

You can use a pre-defined Setup Test or temporarily modify it for the test.

To select a Setup Test

1. Type in the name of the Setup Test.

   To load a Setup Test from a list, press <ENTER>. Use the Up- and Down-Arrow Keys to select from the list of Setup Tests.
2. Press <ENTER>.

5.2 Entering the Lot Description

The system needs to know the following information about the lot:

- A unique Lot Name for compiling test data.

When a Setup Test is selected in the Test Setup screen, the Lot Description screen is displayed.

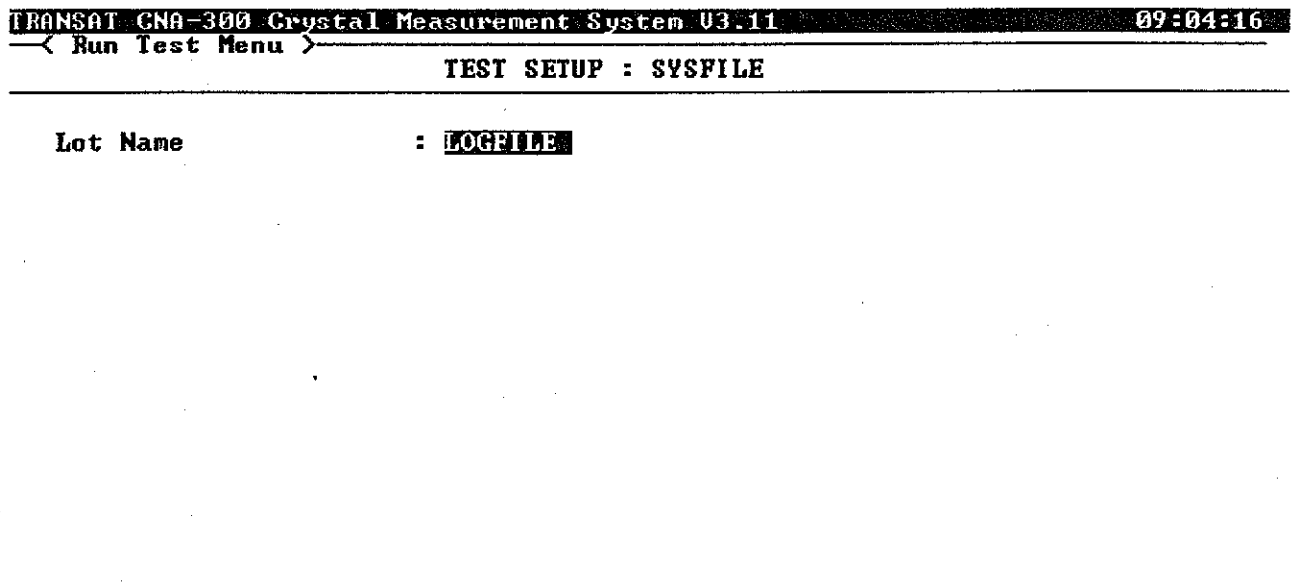


Figure 5.2 Lot Description Screen

The following table describes the parameters on the Lot Description screen.

Parameter	Description
Lot Name	The name that uniquely identifies the group of parts to be tested. This parameter has a maximum of 8 alpha-numeric characters. This is used as the name of the log file.
Measure Reference Crystal	If set to 1, the effective load capacitance is measured based on inserting a reference crystal before starting a test. This is a method for determining the value for Target Cap used in FL1, FL2, and FL3 tests.
	NOTE This is only displayed if FL1, FL2, or FL3 test is selected **AND** Load CL Mode is EQREACT. (See Appendix B, "LOAD CAPACITANCE MEASUREMENTS" for more information on the different load capacitance measurements.)

5.3 Modifying the Current Test Setup

After entering the information in the Lot Description screen, the Current Test Setup screen is displayed.

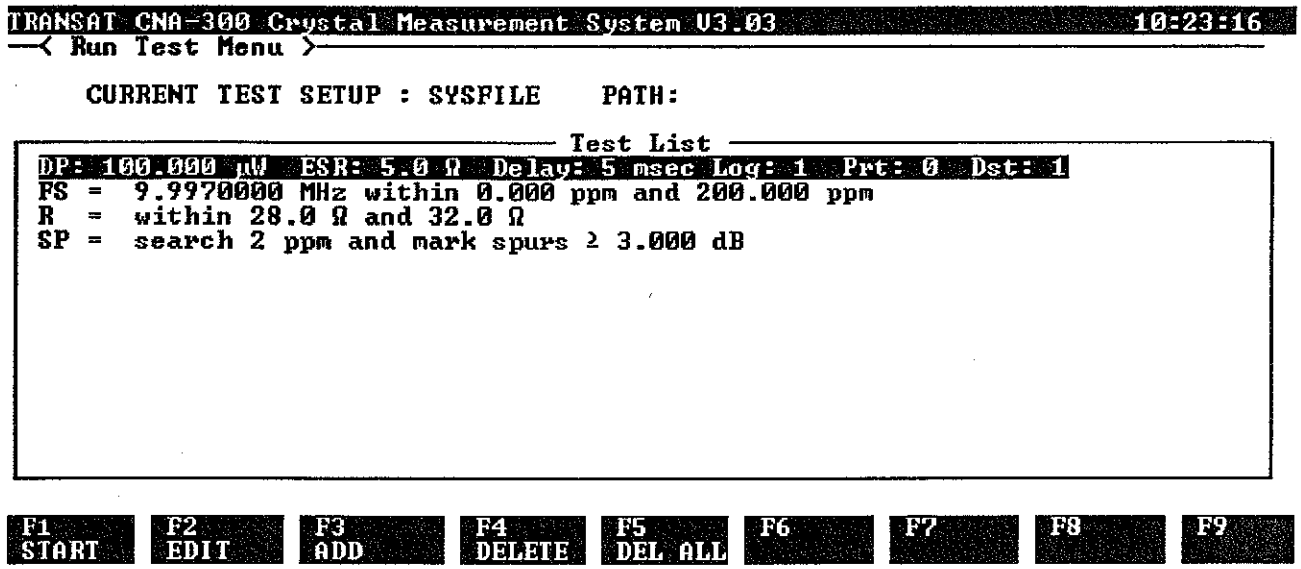


Figure 5.3 Current Test Setup Screen

In this screen you will be making a list of the tests you want to perform. The following table describes the options.

Choose	To
<F1> Start	Start the test. Select this option after you are done adding, modifying, and/or deleting tests to the list of tests you want to perform. Choosing this option causes the Test screen to display. Tests and measurements are performed from the Test screen. The Test screen is described in Section 5.4.
<F2> Edit	Edit an existing test. Use the Up- and Down-Arrow Keys to highlight the desired test. Press <F2>. When a test is selected, its window displays. Each test window is described in Section 5.3.
<F3> Add	Add a new test. When selected, a list of the tests not currently in the Test List box displays. Use the Up- and Down-Arrow Keys to highlight the desired test. Press <ENTER> to select the highlighted test. When a test is selected, its window displays. Each test window is described in Section 5.3.
<F4> Delete	Delete a test. Use the Up- and Down-Arrow Keys to highlight the desired test. Press <F4>. When a test is selected, a confirmation window displays with the name of the test.
<F5> Del All	Delete All tests except the BasicTest. Press <F5>. A confirmation window displays.

Before measuring a crystal, you must select the tests to be performed. The following table lists the different tests available and the section in which each test is described.

Test	Description	Section the test is explained
Basic Test	Setup information about the crystal needed before any tests are performed.	Section 5.3.1
FS	Series Frequency test	Section 5.3.2
R	Series Resistance test	Section 5.3.3

Test	Description	Section the test is explained
L1	Motional Inductance test	Section 5.3.4
C1	Motional Capacitance test	Section 5.3.5
C0	Static Capacitance test	Section 5.3.6
Q	Quality Factor test	Section 5.3.7
SP	Spur Search test	Section 5.3.8
DL	Drive Level test	Section 5.3.9
FL1	Load Frequency 1 test	Section 5.3.10
FL2	Load Frequency 2 test	Section 5.3.11
FL3	Load Frequency 3 test	Section 5.3.11
C0/C1	Ratio of C0 to C1 test	Selection 5.3.12

To edit a test

1. Use the Up- and Down-Arrow Keys to select a test.
2. Press <F2>.
3. Enter the parameters associated with the test chosen. See the following sections for descriptions of each test.
4. Press <END> to accept all parameters.
5. Repeat steps 1 through 4 for each test you want to edit.

To add a test

1. Press <F3>.
2. In the 'SELECT TEST' list box, use the Up- and Down-Arrow Keys to highlight the desired test to add.
3. Press <ENTER>.
4. Enter the parameters associated with the test chosen. See the following sections for descriptions of each test.
5. Press <END> to accept all parameters.
6. Repeat steps 1 through 5 for each test you want to add.

To delete a test

1. Use the Up- and Down-Arrow Keys to select a test.
2. Press <F4>.
3. A confirmation window appears with the name of the test.
4. Repeat steps 1 through 3 for each test you want to delete.

To delete all tests

1. Press <F5>.

2. A confirmation window appears.

The following sections describe each test and the associated parameters.

5.3.1 Basic Test Window

The parameters in this window MUST be set before any tests or measurements are performed. (The parameters in either the FS or the FL1 Test window must also be set before any tests or measurements are performed.)

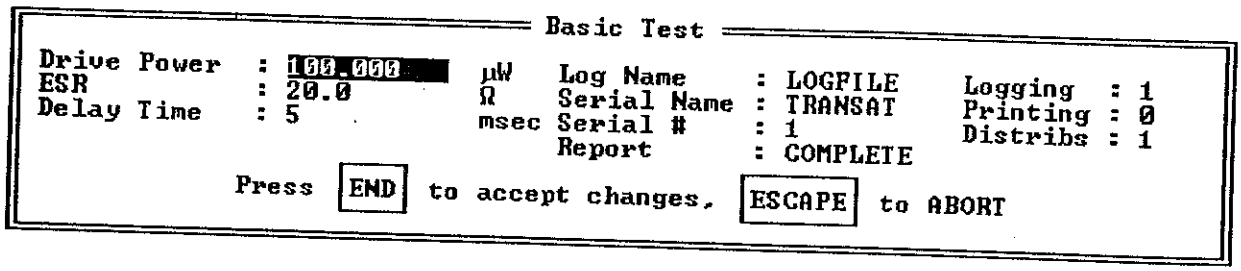


Figure 5.4 Basic Test Window

Selecting Basic Test does not perform any tests or measurements. It supplies the system with information common to all tests.

The parameters in the Basic Test Window are described in the following table.

Parameter	Description
Drive Power (uW)	The drive power applied to the crystal device. **NOTE** This value is also used as the high-drive level setting for the Drive-Level test.
ESR (ohms)	The expected series resistance of the crystal. ESR and Drive Power parameters are used to program the output of the CNA.
Delay Time (mSec)	Delay Time is the amount of time the system waits at each point while sweeping the part. A typical value to use is 10 ms. Crystals with a larger Q need a longer Delay Time. Delay Time (sec) = Expected Q / Frequency (Hz) If measurements are not the same (not repeatable) when making multiple measurements, increase the Delay Time. **NOTE** This parameter contains the same information as the Settling Time parameter in the various measurement parameters screens.
Log Name	The name of the file that contains the measurement results.
Serial Name	An 8-character name used to uniquely describe a specific lot of crystals.
Serial #	The starting number used to uniquely identify the first crystal in a lot. The Serial Name and Serial Number are concatenated to create the final Part Number. A valid starting serial number is in the range 0-99999. For example, if Serial Name is TRANSAT and Serial # is 1, the reference number of the third part in the log file would be "TRANSAT_3". See Appendix G, "SAMPLE REPORTS" for more examples.

Parameter	Description
Report	The type of report that is generated. **Complete** This report contains data for each item measured, and whether it passed or failed. **Failure Only** This report only contains data for each item measured that failed. **Passed Only** The report only contains data for each item measured that passed.
Logging	Set to 1 to enable logging to a Log file, 0 disables logging.
Printing	Set to 1 to enable printing, 0 disables printing.
Distribs	Set to 1 to enable statistical distributions, 0 to disable.

5.3.2 Fs Test Window (Series Frequency)

This test will check if the series frequency of the crystal is within the specified range.

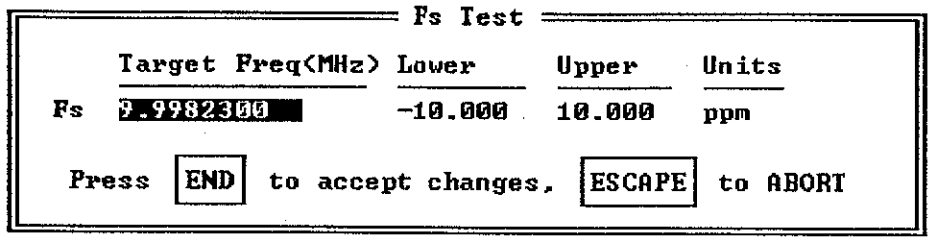


Figure 5.5 Fs Test Window

The parameters in this screen (or the FL1 Test Window), as well as parameters in the Basic Test window, MUST be set before any tests or measurements are performed.)

WARNING If both the Fs and FL1 tests are enabled, one of the tests will fail.

The parameters in the Fs Test Window are described in the following table.

Parameter	Description
Target Frequency	Frequency of the crystals to be measured. The maximum value for the CNA 200 is 200 MHz where the maximum value for a CNA 300 is 256 MHZ.
Lower	The allowed frequency deviation below the Target Frequency. **NOTE** The Lower parameter must be less than the Upper parameter.
Upper	The allowed frequency deviation above the Target Frequency.
Units	The measurement units of the Lower and Upper parameters. Valid values are either ppm or KHz.

5.3.3 R Test Window (Resistance)

This test will check if the resistance of the crystal is within the specified range.

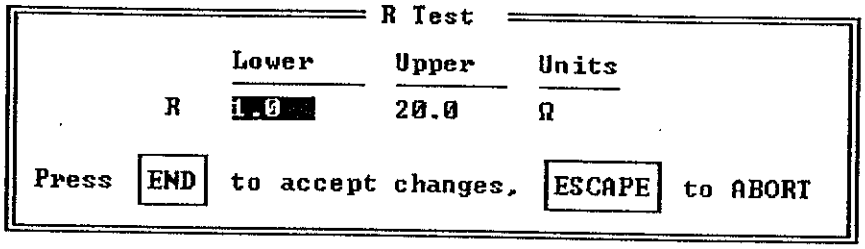


Figure 5.6 R Test Window

The parameters in the R Test Window are described in the following table.

Parameter	Description
Lower	The lowest resistance a crystal can have to pass this test.
Upper	The highest resistance a crystal can have to pass this test.
Units	Always set to ohms.

5.3.4 L1 Test Window (Motional Inductance)

This test will check if the motional inductance of the crystal is within the specified range.

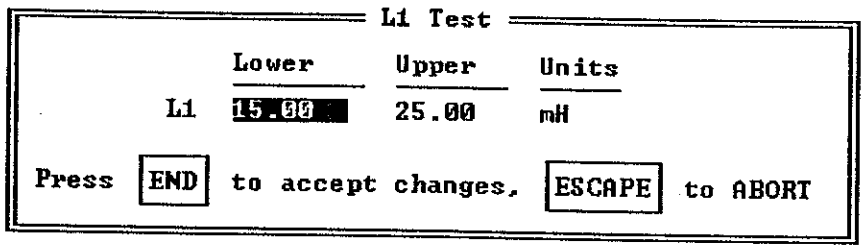


Figure 5.7 L1 Test Window

The parameters in the L1 Test Window are described in the following table.

Parameter	Description
Lower	The lowest motional inductance a crystal can have to pass this test.
Upper	The highest motional inductance a crystal can have to pass this test.
Units	Always set to mH.

5.3.5 C1 Test Window (Motional Capacitance)

This test will check if the motional capacitance of the crystal is within the specified range.

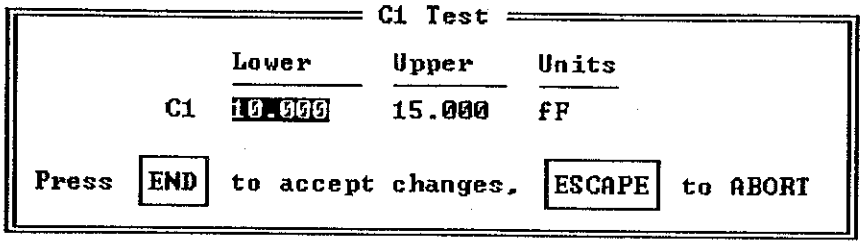


Figure 5.8 C1 Test Window

The parameters in the C1 Test Window are described in the following table.

Parameter	Description
Lower	The lowest motional capacitance a crystal can have to pass this test.
Upper	The highest motional capacitance a crystal can have to pass this test.
Units	Always set to fF.

5.3.6 C0 Test Window (Static Capacitance)

This test will check if the static capacitance of the crystal is within the specified range.

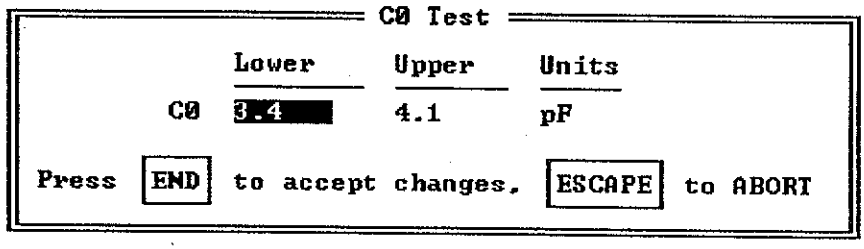


Figure 5.9 C0 Test Window

The parameters in the C0 Test Window are described in the following table.

Parameter	Description
Lower	The lowest static capacitance a crystal can have to pass this test.
Upper	The highest static capacitance a crystal can have to pass this test.
Units	Always set to pF.

5.3.7 Q Test Window (Quality Factor)

This test will check if the quality factor of the crystal is within the specified range.

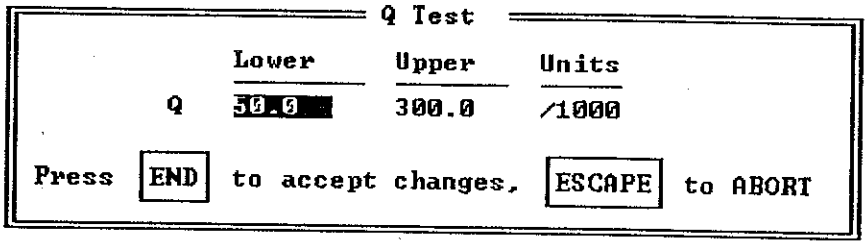


Figure 5.10 Q Test Window

The parameters in the Q Test Window are described in the following table.

Parameter	Description
Lower	The lowest quality factor a crystal can have to pass this test.
Upper	The highest quality factor a crystal can have to pass this test.
Units	Always set to Q/1000.

5.3.8 SP Test Window (Spurious Search)

This test will look for spurs which occur past the main resonance (Target frequency) of the crystal.

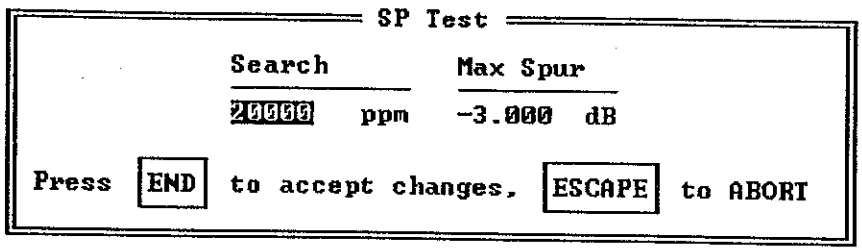


Figure 5.11 SP Test Window

The parameters in the SP Test Window are described in the following table. See Section 8.4.8 for parameters that configure how the Spurious Search test is performed.

Parameter	Description
Search	The distance that spurs are searched for beyond the main resonance.
Max Spur (dB)	The maximum allowable amplitude relative to the main response. Spurious responses larger than this will fail this test.
Units	The measurement unit of the search parameter. Valid values are either in ppm or khz of the main resonance using the same boundary.

5.3.9 DL Test Window (Drive Level)

This test determines and checks the change in frequency and resistance of the crystal at different drive levels

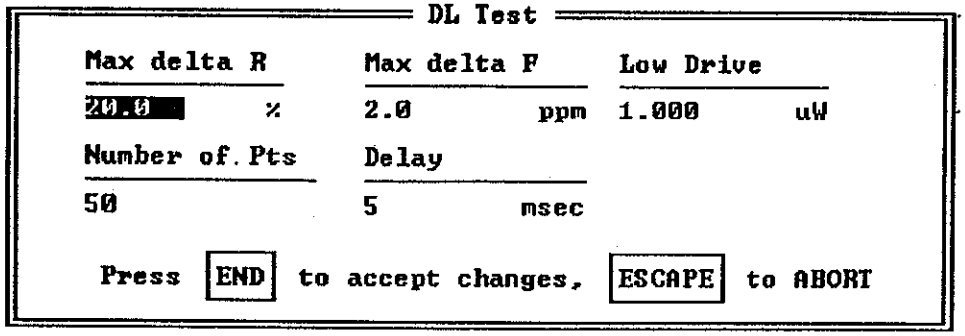


Figure 5.12 DL Test Window

The frequency and resistance are measured from low to high drive. The Number of Pts parameter determines how many measurements are made.

The parameters in the DL Test Window are described in the following table.

Parameter	Description
Max Delta R (%)	Maximum allowable change in resistance over the specified drive level range.
Max Delta F (ppm)	Maximum allowable change in frequency over the specified drive level range.
Low Drive (uW)	Low-drive level setting.
	NOTE The DL Test uses the drive level setting from the Basic Test window as the high-drive level setting (see Section 5.3.1).
Number of Pts	Number of measurements to make. The range is 0 to 100 points.
Delay (mSec)	Amount of time for the crystal to settle before each measurement.

5.3.10 FL1 Test Window (Load Frequency)

The FL1, FL2 and FL3 tests are used to measure load frequencies at desired Target capacitances. The user can specify a different Target capacitance for each of the FL tests (FL1, FL2, FL3).

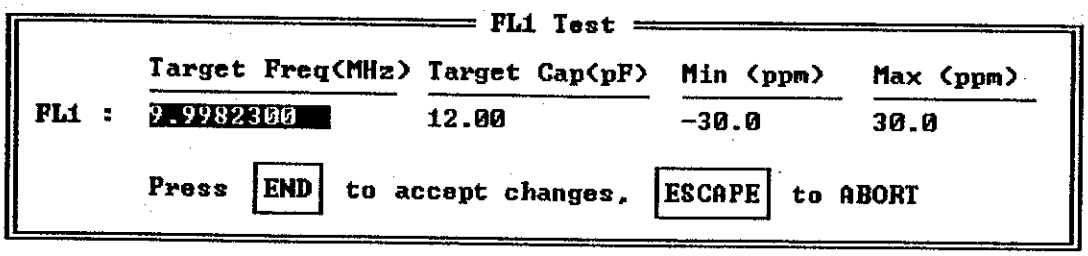


Figure 5.13 FL1 Test Window

In the FL1 test you specify a Target Load Frequency and the desired Target Capacitance.

In the FL1 test you specify a Target Load Frequency and the desired Target Capacitance.

WARNING If both the Fs and FL1 tests are enabled, one of the tests will fail.

The parameters in the FL1 Test Window are described in the following table.

Parameter	Description
Target Freq (MHz)	Expected load frequency of the crystal. The maximum value for the CNA 200 is 200 MHz where the maximum value for a CNA 300 is 256 MHZ.
Target Cap (pF)	Desired Load capacitance.
Min (ppm)	Allowed frequency deviation below the Target Frequency.
Max (ppm)	Allowed frequency deviation above the Target Frequency.

5.3.11 FL2 and FL3 Test Window (Load Frequency)

The FL1, FL2, and FL3 tests are used to measure load frequencies at desired Target capacitances. The user can specify a different Target Capacitance for each of the FL tests (FL1, FL2, FL3). The FL2 and FL3 test are identical to the FL1 test with the exception that they can be referenced relative to either the Target Frequency as specified in the FL1 test or the load frequency measured for the FL1 test.

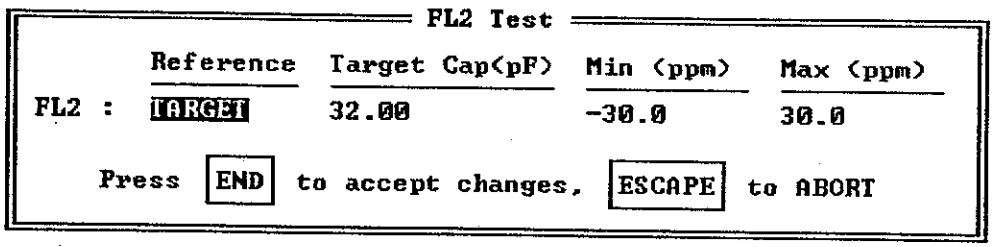


Figure 5.14 FL2 Test Window

The parameters in the FL2 Test Window and FL3 Test Window are described in the following table.

Parameter	Description
Reference (MHz)	If set to TARGET, the system uses the Target frequency that was specified in the Fs or FL1 test. If set to FL1, the system uses the measured frequency from the FL1 test.
Target Cap (pF)	The expected load capacitance.
Min (ppm)	The lower limit for the Target frequency.
Max (ppm)	The upper limit for the Target frequency.

5.3.12 C0/C1 Ratio Test

The C0/C1 test is used to measure the Ratio of C0 to C1

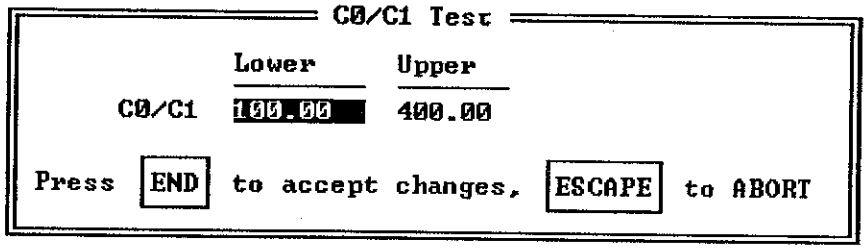


Figure 5.15 C0/C1 Ratio Test Window

The parameters in the C0/C1 is described in the following table.

Parameter	Description
Lower	The lowest ratio of static capacitance a crystal can have to pass this test.
Upper	The highest ration of static capacitance a crystal can have to pass this test.
Units	None

5.4 Starting a Test

After identifying the tests to perform, you can start the testing process.

To start testing

- Press <F1> to select the Start option.

The following screen is displayed while the tests are actually performed.

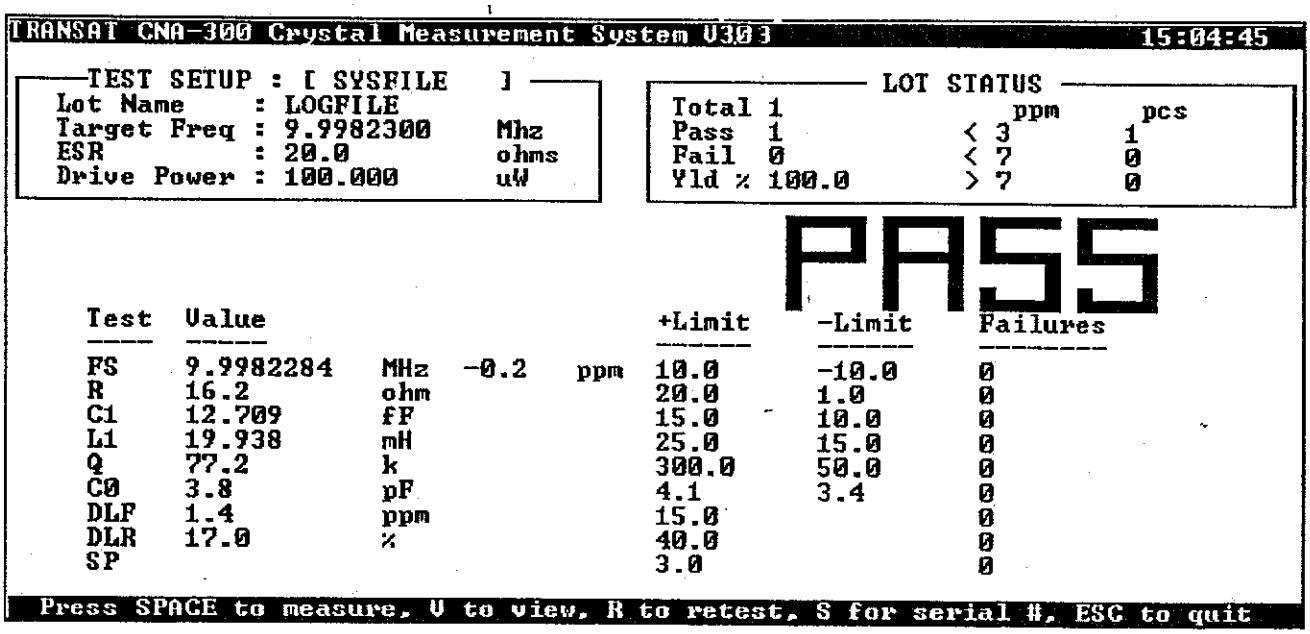


Figure 5.16 Test Screen Containing Test Results

This screen contains the information you entered in the Test windows, and the information described in the following table.

Parameter	Description
Total	The number of crystals that have been tested.
Pass	The number of crystals that have passed the tests.
Fail	The number of crystals that have failed the tests.
YLD%	The number of crystals that passed divided by the total number of crystals tested.
ppm	The limits for reporting test result distribution of Fs or FL1 for all parts which PASS. Three distribution limits are set and shown in the LOT STATUS box of the Test Screen. Distribution limits are set using the "Frequency Distribution Factor" (See Section 8.4.1, "System Parameters Screen"). Example, if Freq Dist Factor is set to 0.33 and the test spec for Fs is +/-10 ppm, the first distribution limit is calculated 0.33 x +/-10ppm = +/-3ppm. The second distribution limit is calculated 0.66 x +/-10ppm = +/-7ppm.
pcs	The number of crystals that test within the limits defined in ppm described above.

To measure a crystal

1. Place the next crystal in the Pi Network.
2. If the CNA is in Manual mode, press <SPACE>.

   If the CNA is in Automatic mode, do NOT press anything.

   (See Section 8.4.1 for information about Manual and Automatic modes.)

Continue repeating the above steps until all crystals have been tested. The information displayed after each test is described in the following table.

Parameter	Description
PASS/FAIL	Either PASS or FAIL displays after a test is run, indicating whether the crystal just tested was within the limits specified.
Test	The name of each test you selected in the Current Test screen.
Value	The value that was measured for the current crystal.
+ Limit	The upper limit that you specified for each test.
- Limit	The lower limit that you specified for each test.
Failures	The number of crystals that have been tested in this lot that have failed tests.

To view the results of previous tests

- Press the <V> key.

NOTE Only the test results from the current lot is displayed.

To re-test the same crystal

- Press the <R> key.

This function is useful when a crystal fails due to improper insertion into the PI Network. This causes the last results recorded in the Log file to be overwritten with the results of the re-test, if logging is enabled.

To display or modify the serial number

- Press the <S> key. To modify the serial number, simply type in the new value and press ENTER.

This function is useful when non-sequential serial numbers are needed.

To stop testing

- Press the <ESC> key. A dialog box will appear warning you that the operation is about to be aborted. Press <ESC> again to return to the Main menu.

6 SETUP TEST

Setup Tests define the method of testing for specific types of crystals. Each Setup Test contains everything the system needs to know to measure a group of crystals. To run a test, all you need to do is load the appropriate Setup Test and provide Lot information.

A Setup Test contains:

- The list of tests you want performed on a type of crystal and each test's parameters.
- The measurement parameters that describe how to measure this type of crystal.
- The types of reports you want generated from the test results.

This chapter describes how to create and modify Setup Tests. The first screen you will see after you select Setup Test from the Main menu is the Setup Test screen described in the following section.

6.1 Creating and Modifying Setup Tests

The Setup Test screen allows you to create, modify, and delete Setup Tests and the information contained in them.

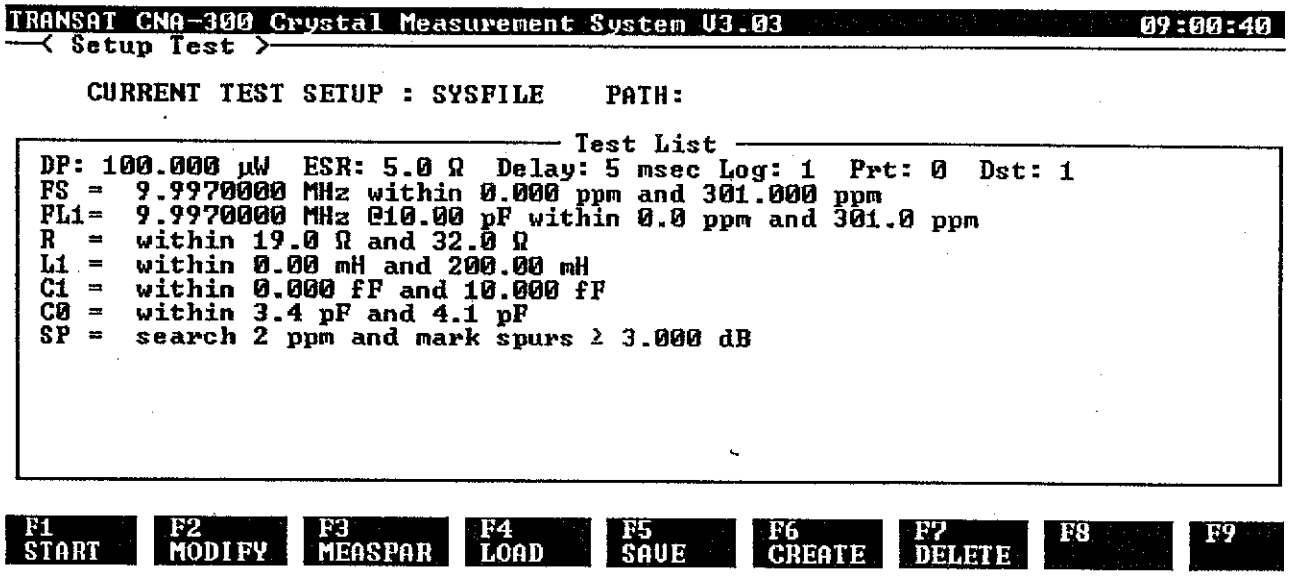


Figure 6.1 Setup Test Screen

In this screen you can make a Test List as explained in Section 5.1, "Specify a Test Setup". You can also specify how to make crystal measurements (see Section 6.7, "Modifying Measurement Parameters"). The following table describes the options available from this screen.

Option	Description
<F1> Start	Choosing this parameter causes the Test screen to display. Tests and measurements are performed from the Test screen. The Test screen is described in Section 5.4.

Option	Description
<F2> Modify	This option allows: ■ Starting a Test ■ Editing a Test in the Test List ■ Adding a test to the Test List ■ Deleting a test from the Test List ■ Deleting all Test When selected, another menu appears at the bottom of the screen. These menu selections are described in section 5.3.
<F3> MeasPar	Choosing this option causes the Measurement Parameter screen for the selected measurement type to display. The different measurement parameter screens are described in Appendix A, "MEASUREMENT TYPES".
<F4> Load	Choosing this option allows another setup to be loaded. This screen is described in section 6.2.
<F5> Save	Choosing this option causes all changes you made to the current test Setup file to be saved. **NOTE** If you exit the Setup Test screen without selecting this option, all changes you made are lost.
<F6> Create	Choosing this option allows a setup to be created. This screen is described in section 6.4.
<F7> Delete	Choosing this option allows a setup to be deleted. This screen is described in section 6.5.

6.2 Load Setup Test

From the Setup Test menu, you can load Setup Tests by pressing <F4>.

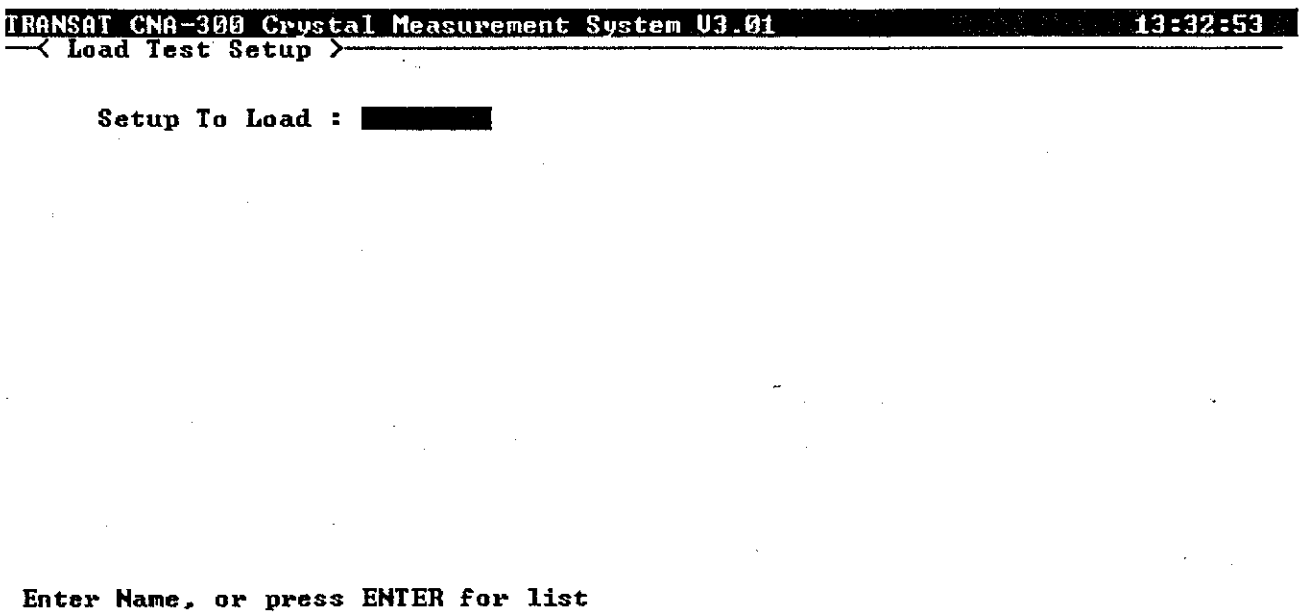


Figure 6.2 Load Setup Screen

To load a Setup Test

1. Press <F4>
2. Type in the name of the Setup Test.

   To load a predefined (or saved) Setup Test, press <ENTER>. A list of all saved Setup Tests is displayed. Use the Up- and Down-Arrow Keys to select from the list of Setup Tests.

3. Press <ENTER>.

6.3 Save Setup Test

From the Test Setup screen, you can save Setup Tests.

To save the current Setup Test

- Press <F5>.

  All changes are saved to the current Setup Tests.

6.4 Create Setup Test

From the Test Setup screen, you can create Setup Test.

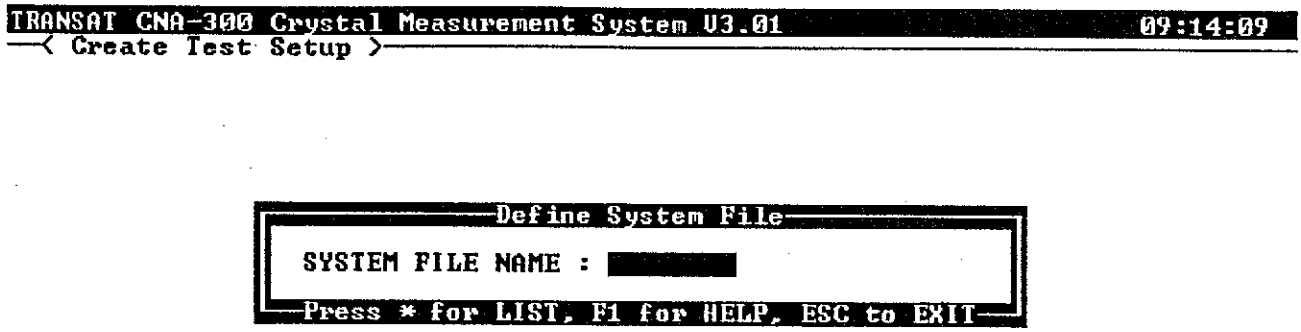


Figure 6.3 Create a Setup Test.

To create a Setup Test

1. Press <F6>.
2. Type in the name of the Setup Test to create.

NOTE The name of the Setup Test must be unique. Otherwise, the system will ask if you want to load it or save (overwrite) it. If you choose to load it, any changes you made are lost!

To see a list of Setup Tests currently defined, press * (asterisk) and then <ENTER>.

3. Press <ENTER>.

6.5 Delete Setup Test

From the Test Setup screen, you can delete Setup Tests.

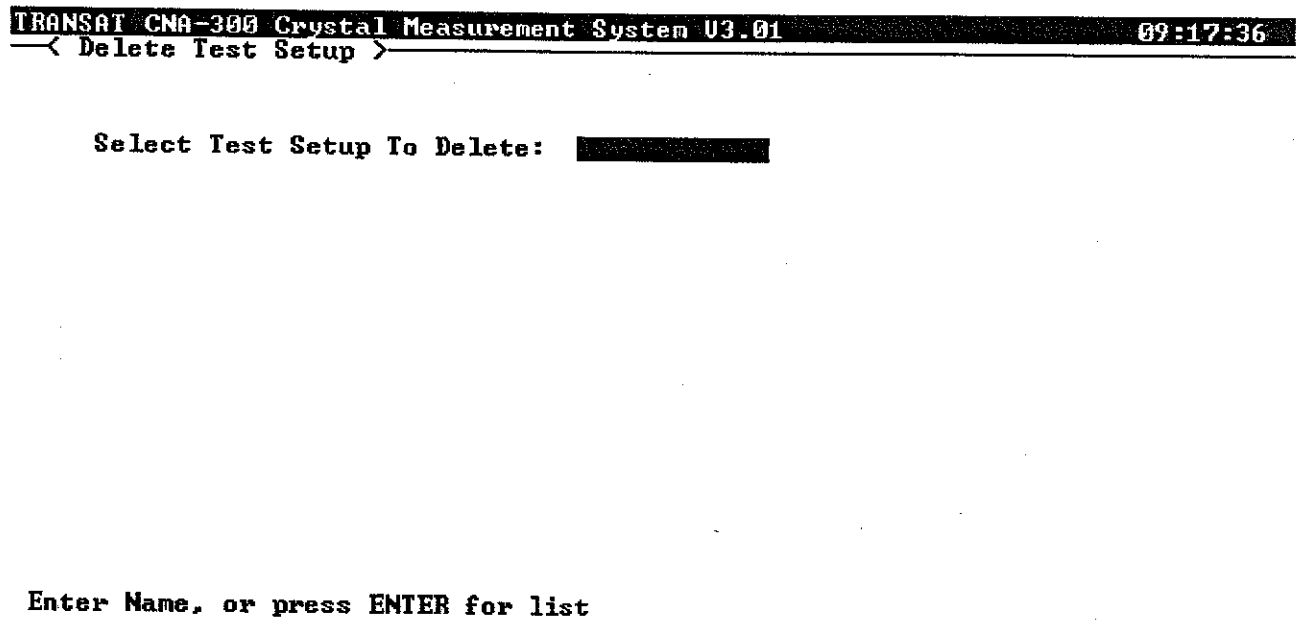


Figure 6.4 Delete Setup Test

To delete a Setup Test

1. Press <F7>.

2. Type in the name of the Setup Test.

   To delete a predifined (or saved) Setup Test, press <ENTER>. A list of all saved Setup Tests is displayed. Use the Up- and-Down-Arrow Keys to select from the list of Setup Tests.

3. If you are sure that you selected the Setup Test to delete, press <ENTER>. Otherwise, press <ESCAPE> to abort the delete command.

WARNING Once the Setup Test is deleted, there is no way to recover it!

6.6 Modifying Measurement Parameters

The system can measure crystals using different methods. Each Setup Test specifies the type (method) of measurement to use for testing. The type of measurement selected is typically based on the user's test requirements and the characteristics of the device to be tested. The following section describes how to select a measurement type and modify its associated parameters. Appendix A, "MEASUREMENT TYPES" explains the different measurement types in more detail.

NOTE Depending on the measurement type selected, you will have different parameters displayed. The following procedure is based on selecting the Standard Parameter measurement.

To select the measurement type and modify its parameters

1. Press <F3>.

2. Press <SPACE> to display a list of measurement types.

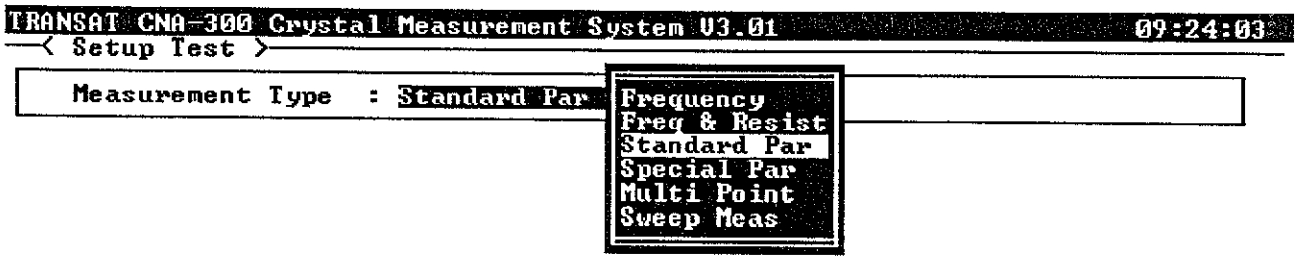


Figure 6.5 List of Measurement Types(CNA 300)

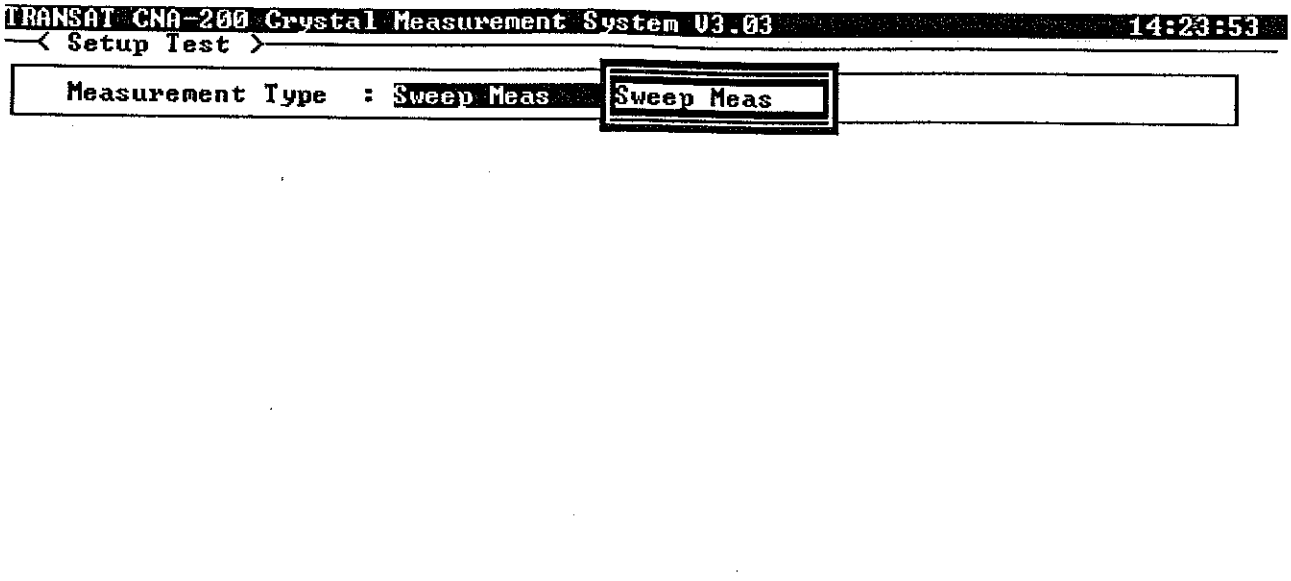


Figure 6.6 List of Measurement Types (CNA 200)

3. Select the desired measurement type by using the Up- and Down-Arrow Keys. For example, highlight Standard Par, and then press <ENTER>.

   The parameter screen for Standard Parameter displays.

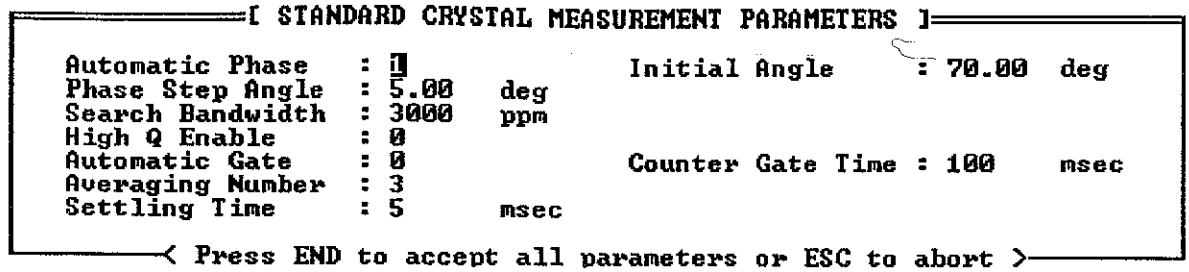


Figure 6.7 Standard Crystal Parameters Screen (CNA 300)

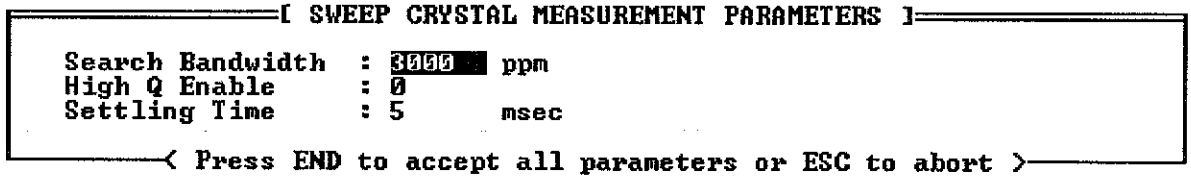


Figure 6.8 Sweep Crystal Parameters Screen (CNA 200)

4. Use the arrow keys to move between parameters and modify the parameters as desired.

5. When you are done, press <END> to accept the parameters as shown. Otherwise, press <ESC> to abort any changes.

If you selected one of the following measurment types Standard Par, Special Par, Multi Point, or Sweep Meas, the Load Capacitance Measurement Parameters window will appear. If you are testing for loaded frequency (FL1, FL2, or FL3) modify parameters as described per Section 6.4, "Modifying Load Capacitance Measurement Parameters". If no loaded frequency tests are selected, press <END> to accept the changes and return to the Setup Test screen.

6.7 Modifying Load Capacitance Measurement Parameters

The system is capable of performing measurements of the crystal in series with a capacitive load when Standard Parameter, Special Parameter, Multi Point, or Sweep Measurement is selected. Please refer to Appendix B, "LOAD CAPACITANCE MEASUREMENTS" for a detailed description of the different methods of calculating load frequency.

To modify the load capacitance parameters

1. From the Setup Test screen, press <F3> to choose MEASUREMENT PARAMETERS.After modifying the measurement parameters, the Load Capacitance Measurement Parameters screen displays.
2. Modify the Measurement Parameters as described in Section 6.7. Press <END> when done.

   The Load Capacitance Measurement Parameters screen appears.

Figure 6.9 Load Capacitance Measurement Parameters Screen

3. Use the arrow keys to highlight Load CL Mode and press <SPACE>.

   A list of the available CL modes are listed. The following table briefly describes the different methods of making load capacitance measurements. See Appendix B, "LOAD CAPACITANCE MEASUREMENTS".

CL Mode	Method
Physical	Uses a physical load capacitor to make measurements.
Numerical	Mathematically calculates Load frequency without the use of a Load capacitor.
EQREACT (Equivalent Reactance)	Uses reactance slope to calculate the Load frequency without the use of a Load capacitor.

NOTE To use any of these methods, the FL1, FL2, or FL3 test must be selected.

4. Use the arrow keys to highlight the desired Load CL Mode and press <ENTER> to select it.

   If Load CL Mode is set to Physical, then enter the value of the insert capacitor placed in the PI Network in the Insert Cap field. For Numerical or EQREACT modes, set Insert Cap to 0.

5. When you are finished, press <ENTER> to accept the Load Capacitance Parameters.

7 WORKING WITH DATA FROM PREVIOUS TESTS

Data from previous test runs can be viewed, printed, or exported to a dBASE compatible file at a later time from the View Data menu. The system also has the ability to regenerate a test report based on a different set of test specifications. The following sections describe how to do the following:

- Review test data from previous test runs.
- Review distribution data.
- Regenerate test reports based on specifications other than those defined when the test was run.
- Export data to dBASE compatible formatted files.
- Delete old test data.

To access the View Data Menu

- From the Main Menu, press <3> to choose VIEW DATA.

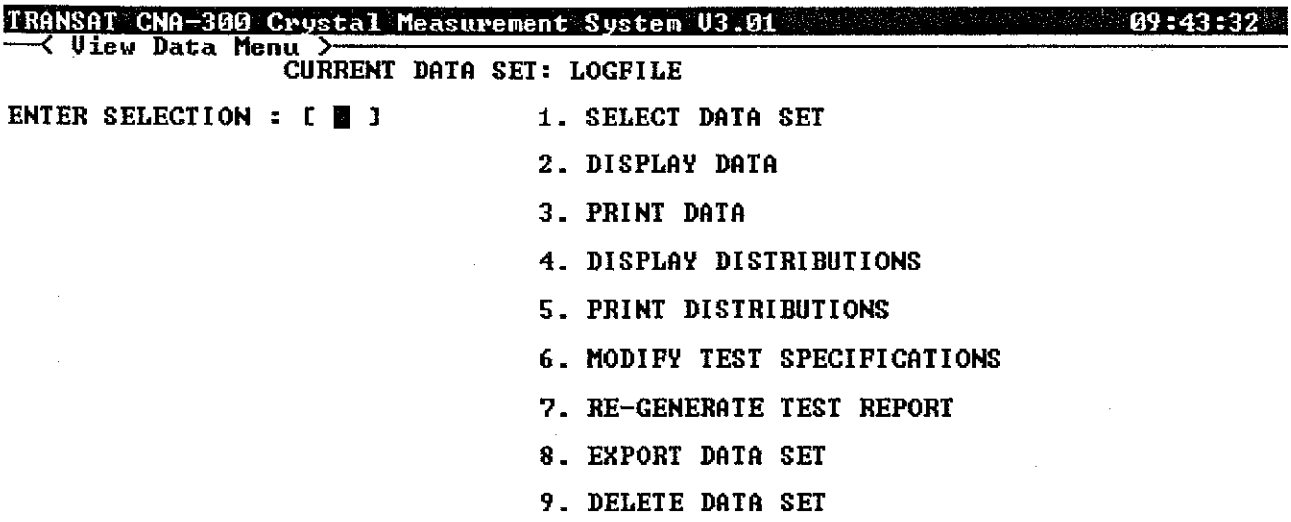


Figure 7.1 View Data Menu

7.1 Review Test Data from Previous Test Runs

Test data is collected and saved in Log Files referenced by the Lot Name assigned when the test was run. (See Section 5.2).

To select data from a previous test run

1. Press <1> to choose SELECT DATA SET.
2. Type in the name of the data set to view.

   To view a list of all saved Log Files, press <ENTER>. Use the Up- and Down-Arrow Keys to select the Log File from the list.
3. Press <ENTER>.

Results from the selected Log File can now be displayed, printed, exported, etc... using functions in the View Data Menu.

To display the test data

- Press <2> to choose DISPLAY DATA.

  You can use the arrow keys, <PgUp>, <PgDn>, <Home>, and <End> keys to view the data. Press <ESC> when you are finished.

To print the test data

- Press <3> to choose PRINT DATA.

  The test data printed to the printer is in the same format as displayed on the screen.

7.2 Review Distribution Data

To display distribution charts

- Press <4> to choose DISPLAY DISTRIBUTIONS.

  A distribution chart for each test selected is displayed one at a time. Press <ESC> to display the next distribution chart.

NOTE Distributions will only be displayed if the *Distribs* parameter is set to 1 in Basic Test when the test report is generated! You can regenerate a test report later with the *Distribs* parameter set to 1 to cause the system to generate distribution charts. (See Section 7.3)

To print distribution charts

- Press <5>.

  The distribution charts for each of the selected tests is printed.

7.3 Regenerate Test Reports

To regenerate a test report based on modified test specifications

1. Press <6> to choose MODIFY TEST SPECIFICATIONS.

   See Section 5.3, "Modifying the Current Test Setup" for information on how to add, modify, and delete tests.

2. Press <7> to regenerate the test report based on the modified test specifications.

   You will be prompted to enter a new Log File name for storing the modified test results. A new Log File name must be given in order to regenerate the test report.

7.4 Export Data

To export test data to dBASE format

- From the View Data menu, press <8> to choose EXPORT TEST DATA.

The system will create a lot information file (.DBL) and an individual measurement file (.DBF) based on the currently selected test data. An index file (.CDX) is also created for the individual measurement file. All three files have the same name as the selected test data and are stored in the directory specified by the External Report File Path parameter described in Section 8.4.6.

If the files already exist, you are asked if you want to overwrite them. Press <1> to overwrite, or any other key to abort the process.

7.5 Delete Old Test Data

To delete test data

1. From the View Data menu, press <9> to choose DELETE LOG FILE.

2. Type in the name of the data set to delete.

   To view a list of the test data to delete, press <ENTER>. Use the Up- and Down-Arrow Keys to select the Log File from the list. Press <ENTER> to select it.

3. Press <ENTER> to confirm, or press <ESC> to abort the procedure. This last step avoids accidentally deleting test data.

WARNING Once the test data is deleted, it can not be recovered!

---

8 CONFIGURING THE SYSTEM

This chapter describes how to do the following:

- Calibrate the instrument to correct for variations in phase and amplitude over its operating range.
- Setup how reports are printed and/or saved in log files.
- Perform quick measurements for fast analysis of crystal characteristics.
- Setup system specific parameters (other than crystal parameters).

To configure the system

- From the Main Menu, press <4> to choose CONFIGURE SYSTEM. The Configure System menu is displayed.

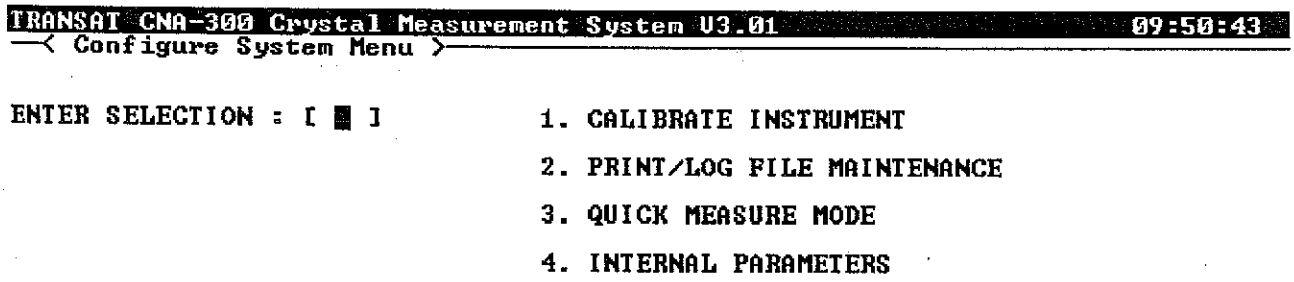


Figure 8.1 Configure System Menu

8.1 Calibrating the Instrument

The system must be calibrated to correct for variations in phase and amplitude over the operating frequency range of the instrument. The calibration data is stored and used for all measurement calculations. The calibration need only be performed periodically as part of a regular maintenance cycle or when changes or modifications are made to the tooling used with the instrument (cables, PI Network, etc.).

You will need the following to perform the calibration:

- A Reference Short.
- A Reference Resistor (approx. 50 ohms).

The system prompts when to place them in the PI Network at the appropriate time.

NOTE If you have a PI Network that has a Load Capacitance socket (i.e. TFP-6L), insert a short (supplied with the system) in the Load Capacitance socket before beginning the calibration.

To perform a calibration

1. From the Configure System menu, press <1>.
   The Short Circuit Calibration window is displayed.

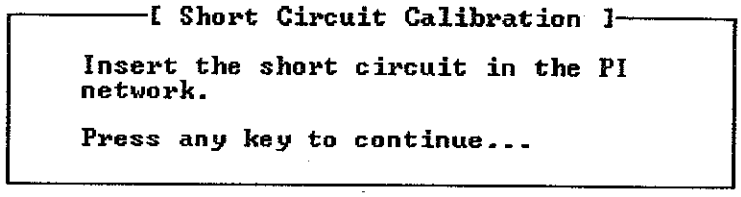


Figure 8.2 Short Circuit Calibration Window

2. Place the Reference Short into the PI Network and press <ENTER>.

NOTE Pressing <ESC> at any time during calibration will abort the process and the system will revert to the last successful calibration.

This window displays:

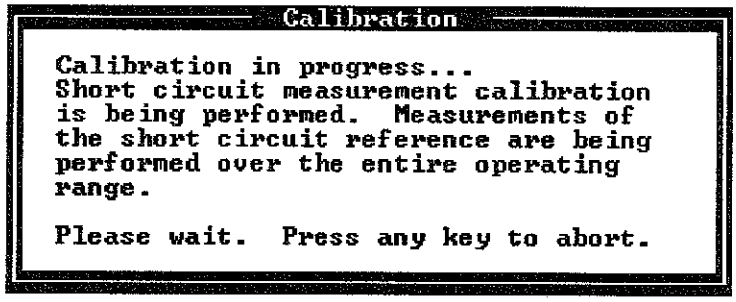


Figure 8.3 Calibration - Step 1

After the Short Circuit calibration completes, the Resistor calibration begins. The following window displays:

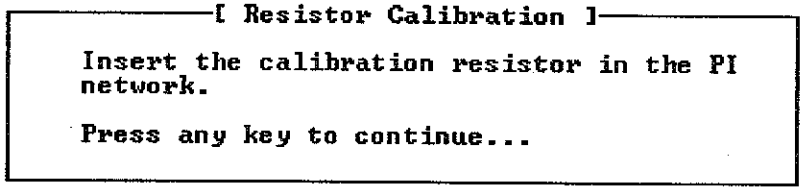


Figure 8.4 Resistor Calibration Window

3. Place the Calibration Resistor in the PI Network. Press any key (other than <ESC>) to continue the calibration.
   This screen displays:

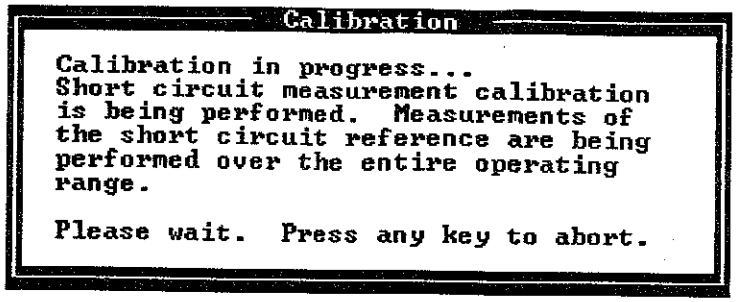


Figure 8.5 Calibration - Step 2

After the Resistor calibration completes successfully, the Calibration Complete window is displayed.

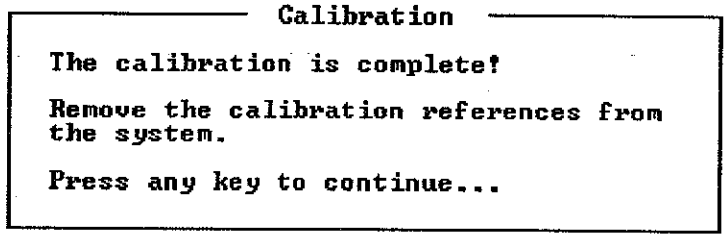


Figure 8.6 Calibration Complete

If the calibration is aborted, the system will display the Calibration Failed screen and revert to the last successful calibration.

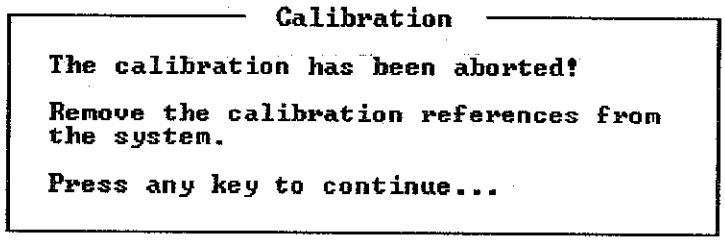


Figure 8.7 Calibration Aborted

4. Press any key to return to the Configure System menu.

8.2 Setting Up How Reports are Printed and/or Saved in Log Files

The measurement system has very flexible reporting capabilities. The following list briefly describes the capabilities available:

- System reports can be sent to a printer and/or saved to a log file.
- Automatically name the log file (based on today's date).
- Automatically delete log files that are older than a specified number of days.
- Choose from three standard report types (COMPLETE, PASS ONLY, or FAIL ONLY).
- Use a Custom Report Script for flexibility in making your own report.
- Use an external program to generate a report (maximum flexibility).

To go to the Print/Log Setup Menu

1. From the Main Menu, press <4> to choose CONFIGURE SYSTEM.

2. Press <2> to choose PRINT/LOG FILE MAINTENANCE.

The Print/Log File Maintenance Menu is displayed.

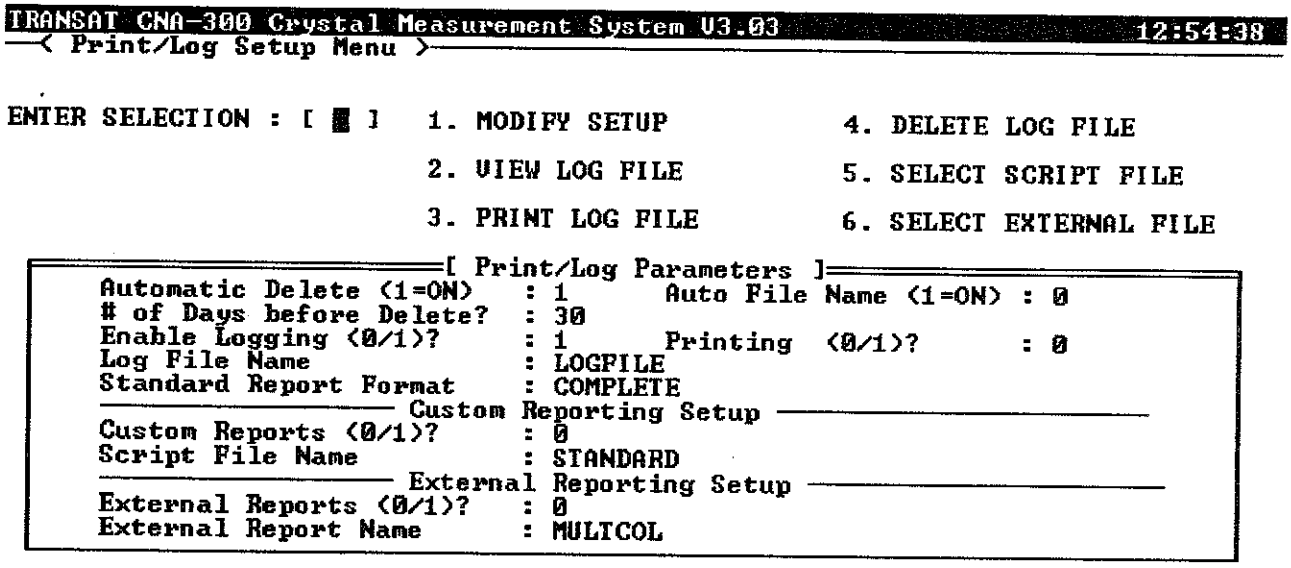


Figure 8.8 Print/Log Setup Menu

8.2.1 Modifying the Print/Log Setup

You can enable and/or modify any of the report(s) and/or functions listed in the Print/Log Parameters screen by selecting the Modify Setup option.

To modify the setup

1. From the Print/Log Setup menu, press <1>.

2. Use the arrow keys to highlight the parameter to modify. When you are done modifying parameters, press <ESC> to return to the Print/Log Setup menu.

The following table describes the parameters that can be modified.

Parameter	Description
Automatic Delete	When enabled, this option deletes all Log files older than the value entered in the # of Days before Delete parameter. 1 enables this option, 0 disables this option.
# of Days before Delete	The number of days from the current date to delete Log files if the Automatic Delete parameter is enabled.
Enable Logging	Set this to 1 to enable logging of measurement results, 0 to disable it. The Log File Name parameter specifies the name of the file the measurement results are saved in.
Log File Name	This, combined with the Log File Path parameter (See section 8.4.6, "Parameter File Paths Screen"), specifies the file name of the Log file used to save measurement results. The file name can be up to 8 characters.

Parameter	Description
Standard Report Format	The report format used when logging and printing results. **COMPLETE:** Prints, and/or logs, all results. **FAILURE ONLY:** Prints, and/or logs, only the results of crystals that fail any selected measurement parameters. **PASS ONLY:** Prints, and/or logs, only the results of crystals that pass all selected measurement parameters.
Custom Reports	Enabling this option allows you to customize your reports using a template. See Appendix E, "CREATING CUSTOM REPORTS USING SCRIPT FILES". Set this to 1 to enable custom reports, 0 to disable it.
Script File Name	The name of the Custom Report Script File you created to perform custom reports. This can be a maximum of 8 characters long.
External Report	Set this to 1 to enable external reports, 0 to disable it.
External Report Name	The name of the batch file (external report) you created. The name can be a maximum of 8 characters long.

8.2.2 Viewing Log Files

You can view the current log file or choose from a list of log files available.

To view the current log file

1. From the Print/Log Setup menu, press <2>.
2. Use the Up- and Down-Arrow Keys to highlight `Current File` and press <ENTER>.

   You can use the Up- and Down-Arrow Keys, <PgUp>, <PgDn>, <Home>, and <End> keys to view the data. Press <ESC> when you are finished.

To view a log file other than the current

1. From the Print/Log Setup menu, press <2>.
2. Use the Up- and Down-Arrow Keys to highlight `List Files ...` and press <ENTER>.
3. Use the Up- and Down-Arrow Keys to highlight the log file to view and press <ENTER>.

   You can use the arrow keys, <PgUp>, <PgDn>, <Home>, and <End> keys to view the data. Press <ESC> when you are finished.

8.2.3 Printing Log Files

You can print the current log file or choose from a list of log files available. The log file is printed to the printer attached to LPT1.

To print the current log file

1. From the Print/Log Setup menu, press <3>.

2. Use the arrow keys to highlight `Current File` and press <ENTER>.

To print a log file other than the current

1. From the Print/Log Setup menu, press <3>.

2. Use the Up- and Down-Arrow Keys to highlight `List Files ...` and press <ENTER>.

3. Use the Up- and Down-Arrow Keys to highlight the log file to print and press <ENTER>.

8.2.4 Deleting Log Files

You can delete the current log file or choose from a list of log files available.

To delete the current log file

1. From the Print/Log Setup menu, press <4>.

2. Use the Up- and Down-Arrow keys to highlight `Current File` and press <ENTER>.

3. Press <ENTER> to confirm, or press <ESC> to abort the procedure. This last step avoids accidentally deleting the log file.

WARNING Once the log file is deleted, it can not be recovered!

To delete a log file other than the current

1. From the Print/Log Setup menu, press <4>.

2. Use the Up- and Down-Arrow Keys to highlight `List Files ...` and press <ENTER>.

3. Use the Up- and Down-Arrow Keys to highlight the log file to delete and press <ENTER>.

4. Press <ENTER> to confirm, or press <ESC> to abort the procedure. This last step avoids accidentally deleting the log file.

WARNING Once the log file is deleted, it can not be recovered!

8.2.5 Selecting a Custom Report Script File

Using your own Custom Report Script allows you to tailor the report to include only the information that you need.

A Custom Report Script File called STANDARD is provided with the measurement system. This is an example of what can be done using the custom reporting capability of the system. The format for each data item is defined using a "C" language printf style. For more information on creating a Custom Report Script, see Appendix E, "CREATING CUSTOM REPORTS USING SCRIPT FILES".

To select a custom report script file

1. From the Print/Log Setup menu, press <5>.

2. Enter the name of the script file to use and press <ENTER>.

   To choose from a list of available script files, press * (asterisk) and <ENTER>. Use the Up- and Down-Arrow Keys to highlight the script file and press <ENTER>.

NOTE You must enable custom reports by setting the *Custom Reports* parameter to 1. (See Section 8.2.1, "Modifying the Print/Log Setup".)

8.2.6 Selecting an External Report

We provide a facility to save all measurement data in dBASE format and run an external program to generate a report. This allows you to use one of many commercially available products (i.e. Microsoft FoxPro, R&R XBase Edition for DOS from Concentric Data Systems, etc...) that can read dBASE files to generate a report. Using an external program to generate a report is the most flexible method, but requires you to purchase a separate program to generate the report.

External reports are batch files that you create that are automatically run after a production test ends. The batch file is a single line MS-DOS batch file with a ".EXT" file extension. An example method using the R&R Report Writer® is described in Appendix D, "USING R&R REPORT WRITER® TO CUSTOMIZE REPORTS".

To select an external report

1. From the Print/Log Setup menu, press <6>.

2. Enter the name of the external report to use and press <ENTER>.

   To choose from a list of available external reports, press * (asterisk) and <ENTER>. Use the Up- and Down-Arrow Keys to highlight the report and press <ENTER>.

NOTE You must enable external reports by setting the *External Reports* parameter to 1. (See Section 8.2.1, "Modifying the Print/Log Setup".)

8.3 Quick Measurement Screen

The Quick Measurement screen is intended to be used as an engineering tool for quick evaluation of device characteristics.

To access the Quick Measurement Screen

1. From the Main Menu, press <4> to choose CONFIGURE SYSTEM.

2. Press <3> to choose QUICK MEASURE MODE.

   The Quick Measurement Screen is displayed.

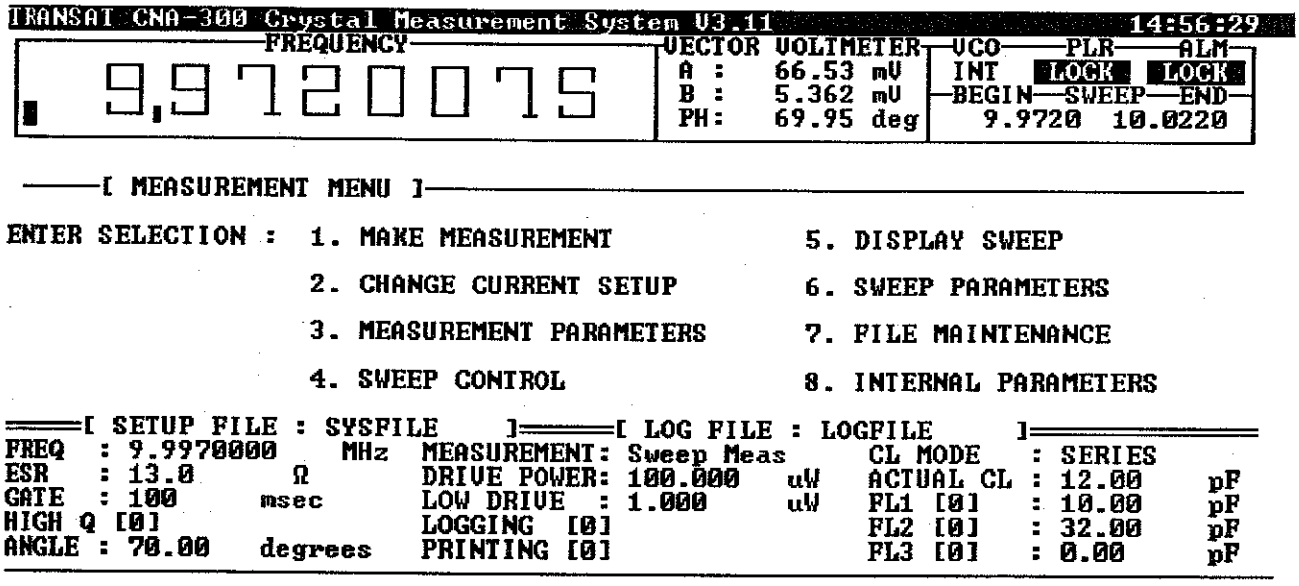


Figure 8.9 Quick Measurement Screen (CNA 300)

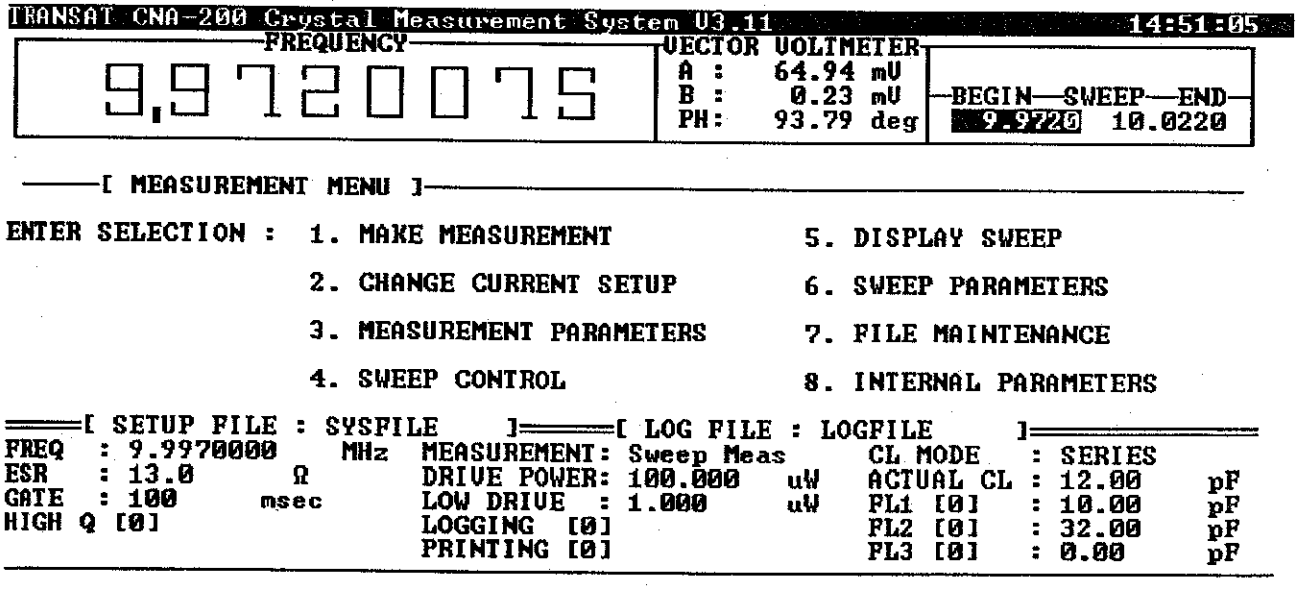


Figure 8.10 Quick Measurement Screen (CNA 200)

The Quick Measurement screen is divided into three major sections:

- A Status line at the top of the screen that shows the status of the CNA.
- A menu section in the middle of the screen.
- Current setup parameters at the bottom of the screen.

8.3.1 Status Line

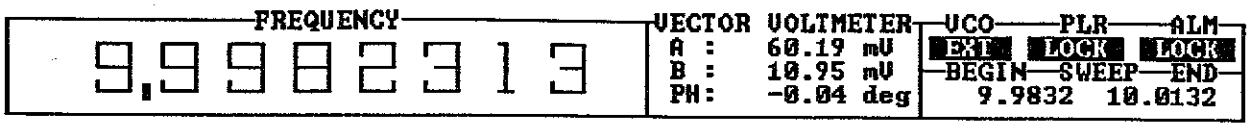


Figure 8.11 Status Line of the Quick Measure Screen (CNA 300)

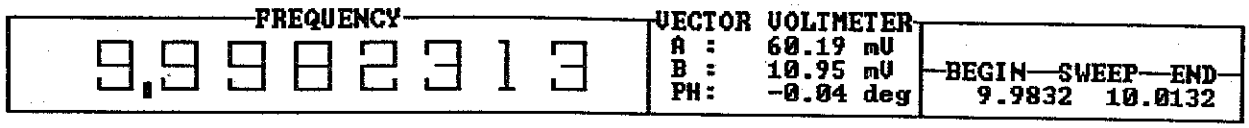


Figure 8.12 Status Line of the Quick Measure Screen (CNA 200)

The Status line in the Quick Measurement screen displays the following information about the status of the CNA measurement system:

- Current device or instrument frequency measured (in MHz).
- Displays the A and B channel voltages in millivolts and the raw phase meter measurement in degrees.
- Shows the sweep begin and end frequencies (in MHz).
- Indicates that the Phase Locked Receiver is operating properly when PLR displays 'LOCK' (CNA 300).
- ALM indicates 'LOCK' when the system is phase locked to a crystal, or when the phase offset between A and B channels is close to the targeted phase angle (CNA 300).

8.3.2 Measurement Menu

The menu section, located in the middle of the Quick Measurement screen, is illustrated in the following figure.

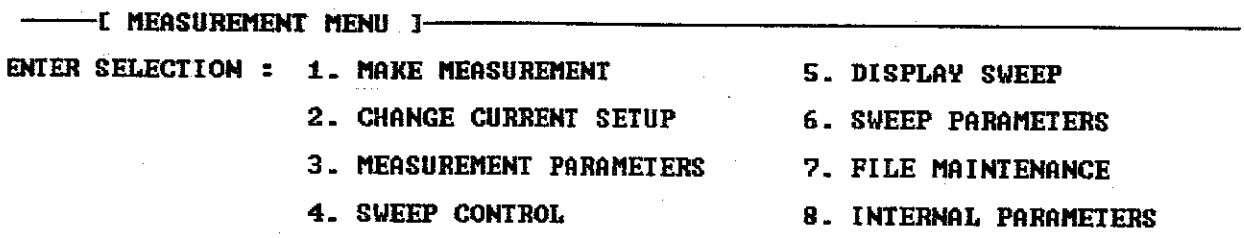


Figure 8.13 Menu Section of Quick Measurement Screen

The following table briefly describes the menu choices in the Quick Measurement menu.

Option	Description
Make Measurement	Triggers the actual measurement. See Appendix A, "MEASUREMENT TYPES" for more detailed information on each measurement type.

Option	Description
Change Current Setup	Allows the operator to modify the Current Setup parameters at the bottom of the Quick Measurement Screen. When selected, the cursor is moved to the *Frequency* parameter in the Current Setup parameters section.
Measurement Parameters	Displays the Measurement Parameters Screen associated with the currently selected measurement type. See Appendix A, "MEASUREMENT TYPES" for more detailed information on each measurement type.
Sweep Control	Displays the Phase Lock Control menu for the CNA 300. For the CNA 200, activation displays a menu to set the sweep begin and end.
Display Sweep	Performs the Sweep measurement. After the sweep has completed, the selected plots display.
Sweep Parameters	Allows the operator to modify the sweep parameters. See Section 8.3.4, "Modifying How a Sweep Measurement is Made" for information.
File Maintenance	Causes the Quick Measure File Maintenance menu to display.
Internal Parameters	Displays the Internal Parameters menu. See Section 8.4, "Modifying Internal Parameters" for more information.

8.3.2.1 Using the Sweep Control Menu

While in the phase lock mode, you can manually control the sweep begin and sweep end frequencies.

To set a new sweep begin frequency

1. From the Quick Measurement menu, press <4>.
2. Press <1>.
3. Enter a new sweep begin frequency (in MHz) and press <ENTER>.

   The new sweep begin frequency is displayed in the Quick Measurement Status Line.

NOTE The sweep limits are limited to the frequency ranges of the measurement instrument. For example, if the SWEEP BEGIN is changed to 18.0000 MHz, the SWEEP END is automatically adjusted to 31.9990 MHz.

The frequency ranges are (in MHz):

- 128 - 256 (128 - 200 for the CNA 200)
- 64 - 128
- 32 - 64
- 16 - 32
- 8 - 16
- 4 - 8
- 2 - 4
- 1 - 2

To set a new sweep end frequency

1. From the Quick Measurement menu, press <4>.
2. Press <2>.
3. Enter a new sweep end frequency (in MHz) and press <ENTER>.

The new sweep end frequency is displayed in the Quick Measurement Status Line.

NOTE The sweep limits are limited to the frequency ranges of the measurement instrument. For example, if the SWEEP END is changed to 18.0000 MHz, the SWEEP BEGIN is automatically adjusted to 15.6800 MHz.

To go to sweep begin (CNA 300 only)

1. From the Quick Measurement menu, press <4>.
2. Press <3>.

The measurement instrument will go to the sweep begin frequency displayed in the status line of the screen.

To go to sweep end (CNA 300 only)

1. From the Quick Measurement menu, press <4>.
2. Press <4>.

The measurement instrument will go to the sweep end frequency displayed in the status line of the screen.

8.3.2.2 Modifying the Current Setup

The Current Setup Parameters section, located on the bottom of the Quick Measure screen, is illustrated in the following figure.

```
=====[ SETUP FILE : SYSFILE     ]=====[ LOG FILE : LOGFILE      ]==========
FREQ   : 9.9970000     MHz   MEASUREMENT: Sweep Meas      CL MODE    : SERIES
ESR    : 13.0          Ω     DRIVE POWER: 100.000    uW   ACTUAL CL  : 12.00    pF
GATE   : 100         msec    LOW DRIVE  : 1.000      uW   FL1 [0]    : 10.00    pF
HIGH Q [0]                   LOGGING  [0]                 FL2 [0]    : 32.00    pF
ANGLE  : 70.00     degrees   PRINTING [0]                 FL3 [0]    : 0.00     pF
```

Figure 8.14 Current Setup Parameters (CNA 300)

```
=====[ SETUP FILE : SYSFILE     ]=====[ LOG FILE : LOGFILE      ]==========
FREQ   : 9.9970000     MHz   MEASUREMENT: Sweep Meas      CL MODE    : SERIES
ESR    : 13.0          Ω     DRIVE POWER: 100.000    uW   ACTUAL CL  : 12.00    pF
GATE   : 100         msec    LOW DRIVE  : 1.000      uW   FL1 [0]    : 10.00    pF
HIGH Q [0]                   LOGGING  [0]                 FL2 [0]    : 32.00    pF
                             PRINTING [0]                 FL3 [0]    : 0.00     pF
```

Figure 8.15 Current Setup Parameters (CNA 200)

The following table describes the parameters that can be modified.

Parameter	Description
Freq (MHz)	The Target Frequency of the crystal. The frequency can be set anywhere in the operating range of the instrument: ■ CNA 300: 1.0 to 256 MHz ■ CNA 200: 1.0 to 200 MHz
ESR (Ohm)	Expected series resistance.
Gate (mSec)	Sets the frequency counter gate time. The gate affects the accuracy of the selected measurement. For maximum accuracy in measurements, the gate time should be set to 1000 mSec (1 sec). The resolution of the frequency measurements made with each gate setting is (approximately): ■ 1000 mSec - 0.0025 ppm ■ 100 mSec - 0.025 ppm ■ 10 mSec - 0.25 ppm ■ 1 mSec - 2.5 ppm
High Q	Set to 1 to enable slow sweep. Used for measuring higher Q (>500K) crystals.
Angle (deg)	Sets the phase lock angle for the system. Valid values are from 0 to 90 degrees.
Measurement	Selects the measurement type to use. The options are: ■ Frequency ■ Freq & Resist ■ Standard Par ■ Special Par ■ Multi Point ■ Sweep Meas ■ Ph Locked Im ■ Freq Locked Im ■ Insert Cap ■ Spur Search ■ DLD Sweep ■ Calculate CL See Appendix A, "MEASUREMENT TYPES" for more information.
Drive Power (uW)	Sets the drive power applied to the device, based on ESR.
Low Drive (uW)	The low-drive level for the Drive Level test (if Drive Level test is enabled).
Printing	Enable/disable printing the test results to a printer. Enter 0 to disable, 1 to enable.
Logging	Enable/disable logging the test results to a file. Enter 0 to disable, 1 to enable.
CL Mode	Selects Series or Load Capacitance measurement. The various Load Capacitance Measurements are described in Appendix B, "LOAD CAPACITANCE MEASUREMENTS".
Actual CL (pF)	The physical insert capacitance inserted in the Pi Network during measurements.
FL1, FL2, FL3 (pF)	Multiple target load capacitance values.

8.3.3 Performing a Sweep Measurement

- From the Quick Measurement menu, press <5>.

  A status line at the bottom of the screen is updated as the sweep is made. After completing the sweep, the results are graphically displayed. You can plot the graph(s) to a printer by pressing <P>. Press <ESC> when you are finished viewing the sweep results.

8.3.4 Modifying How a Sweep Measurement is Made

To modify a sweep measurement

- From the Quick Measurement menu, press <6>.

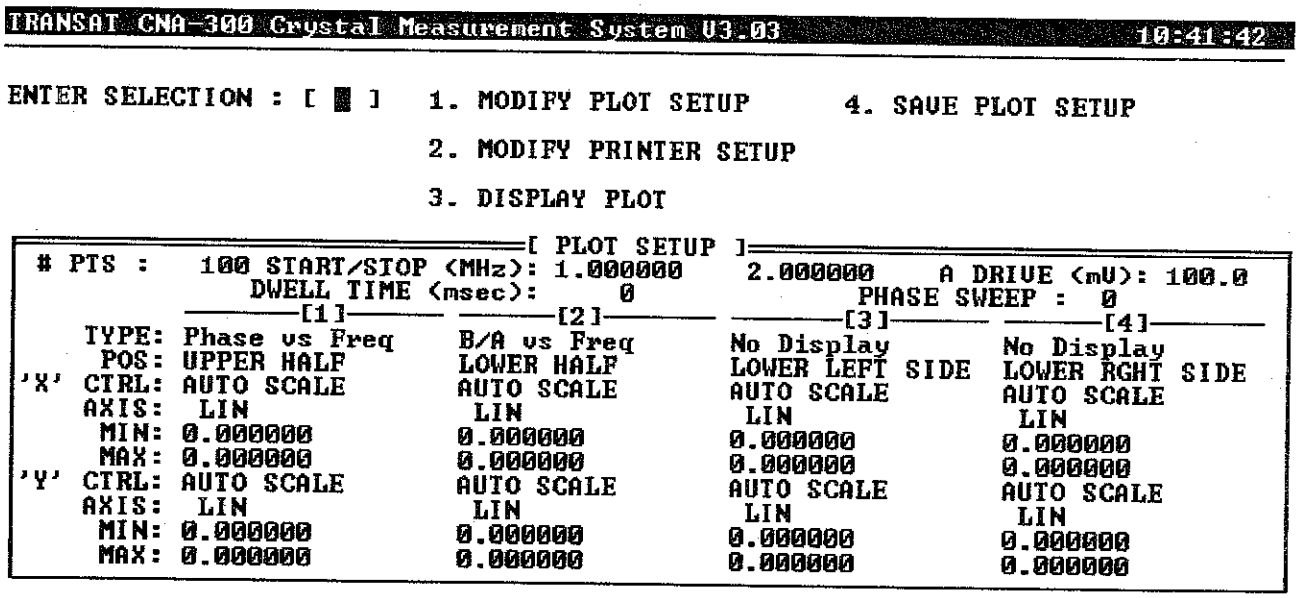


Figure 8.16 Sweep Measurement Menu

The following table briefly describes each menu choice.

Option	Description
1. Modify Plot Setup	Change the setup parameters for performing a sweep measurement.
2. Modify Printer Setup	Allows the operator to modify the type of printer and certain parameters associated with the printer. Remember these printer definitions are only used for printing the graphic images from the sweep measurement mode.
3. Display Plot	Start the sweep measurement function. After the sweep is complete, the selected plot(s) will display.
4. Save Plot Setup	Save all current values displayed in the Plot Setup box except Start/Stop Frequencies and A Drive.

To make a frequency sweep measurement, you must specify the start and stop frequencies. The default values are taken from the sweep begin and sweep end frequencies displayed on the Status Line of the Quick Measurement screen. You can also specify a dwell time per point to help stabilize the measurements. The system also can make a phase sweep measurement where the frequency is held constant while the phase is swept.

To modify the sweep measurement parameters

1. From the Quick Measurement menu, press <6> to choose SWEEP PARAMETERS.
2. Press <1> to modify the plot setup. Use the arrow keys to highlight the parameter to change. The following table describes the parameters available. Press <ESC> when you are finished making changes.

Parameter	Description
# Points	The number of points measured to generate the desired plot.
Start/Stop (MHz)	The frequency sweep range for the sweep measurement.
A Drive (mV)	The drive level setting in mV for the sweep measurement.
Delay (mSec)	Amount of time to delay before each measurement in the sweep.
Phase Sweep	Starts a special mode of sweep operation that continuously samples the frequency while the CNA is performing a phase lock sweep.
Type	The type of plot to be displayed (phase vs. freq, B vs. freq, etc.).
POS	The area of the screen to display the plot. Up to four different plots may be displayed at the same time.
'X' Control ('Y' Control)	The type of scaling to be applied to the 'X' ('Y') axis. **MANUAL SCALE:** In this mode the user may enter the X and Y values to be used as the maximum and minimum values for the plot. The plot is scaled according to these values. **AUTO SCALE:** In this mode, the plot data will be used to determine the maximum and minimum values for each axis, and then the graph is scaled accordingly.
Axis	The measurement display type: LIN (linear) or LOG (logarithmic).
Min	Minimum value for the 'X' or 'Y' axis. It is not necessary to enter a value here if the corresponding Scale Control is set to AUTO.
Max	Maximum value for the 'X' or 'Y' axis. It is not necessary to enter a value here if the corresponding Scale Control is set to AUTO.

To display a plot

- In the Sweep Measurement menu, press <3>.

The sweep measurement is performed and the results are plotted and/or printed. See Section 8.3.3, "Performing a Sweep Measurement" for more information.

To save the plot setup as the system default

- In the Sweep Measurement menu, press <4>.
  The plot setup parameters, except Start/Stop Frequencies and Drive Level, are saved as the system defaults.

8.3.5 Performing File Maintenance

From the Quick Measure menu, you can perform simple file maintenance on the current log file and current setup file. These functions are available elsewhere in the system, but are provided here as a convenience.

To view the current log file

1. In the Quick Measurement menu, press <7> to choose FILE MAINTENANCE.
2. Press <1> to choose VIEW LOG FILE. When you are finished, press <ESC>.

To print the current log file

- In the Quick Measure File Maintenance menu, press <2>.

To create a log file or change the name

1. In the Quick Measure File Maintenance menu, press <3>.
2. Enter the name of the log file to create or press * (asterisk) to pick from a list of log files.

To delete a log file

1. In the Quick Measure File Maintenance menu, press <4>.
2. Use the arrow keys to choose the log file to delete.
3. Press <ENTER> to confirm, or press <ESC> to abort the procedure. This last step avoids accidentally deleting the log file.

WARNING Once the log file is deleted, it can not be recovered!

To load a setup

1. In the Quick Measure File Maintenance menu, press <5>.
2. Type in the name of the Test Setup.

   To load a Test Setup from a list, press * (asterisk) and then <ENTER>. Use the Up- and Down-Arrow Keys to select from the list.
3. Press <ENTER>.

WARNING Trying to load a CNA300 Setup for a CNA 200 may present problems.

To save a setup

- In the Quick Measure File Maintenance menu, press <6>.

  All changes are saved to the current Test Setup.

To create a setup

1. In the Quick Measure File Maintenance menu, press <7>.
2. Type in the name of the Test Setup to create.

   To see a list of Test Setups currently defined, press * (asterisk) and then <ENTER>.

NOTE The name must be unique. Otherwise, the system will ask if you want to load it or save (overwrite) it. If you choose to load it, any changes you made are lost!

3. Press <ENTER>.

To delete a setup

1. In the Quick Measure File Maintenance menu, press <8>.
2. Use the Up- and Down-Arrow Keys to highlight the Test Setup to delete and press <ENTER>.
3. If you are sure that you selected the Test Setup to delete, press <ENTER>. Otherwise, press <ESCAPE> to abort the delete command.

WARNING Once the Test Setup is deleted, there is no way to recover it!

8.3.6 Internal Parameters

From the Quick Measure menu, you can access the Internal Parameters menu. This Internal Parameters menu is almost the same as the one described in Section 8.4, "Modifying Internal Parameters," except that option 7 is Calibrate Instrument (instead of Plating Rate Control Parameters).

8.4 Modifying Internal Parameters

This screen allows you to access all CNA 200 and 300 system parameters.

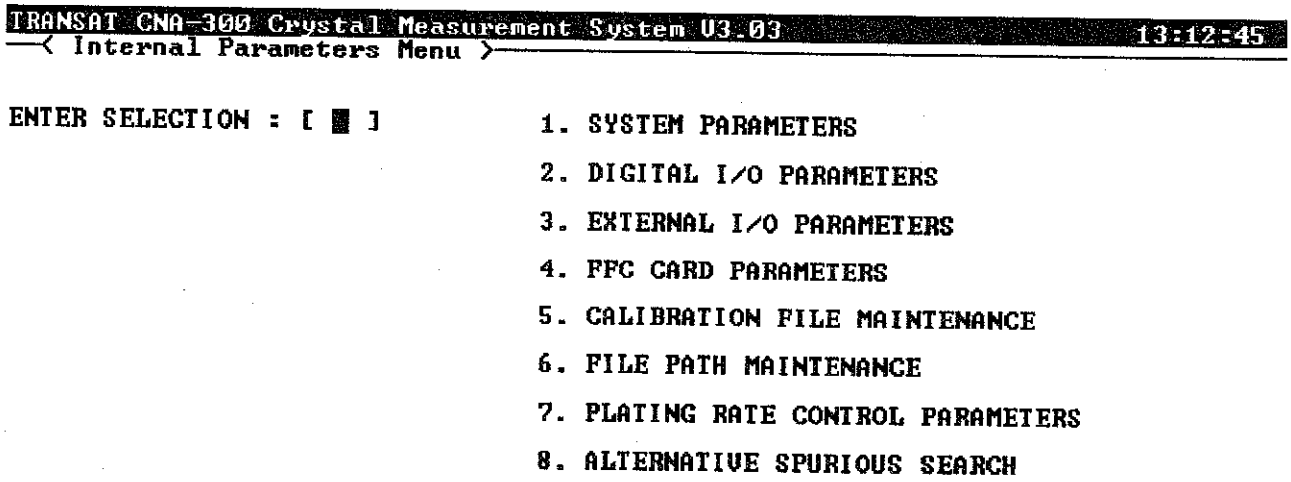


Figure 8.17 Internal Parameters Menu (CNA 300)

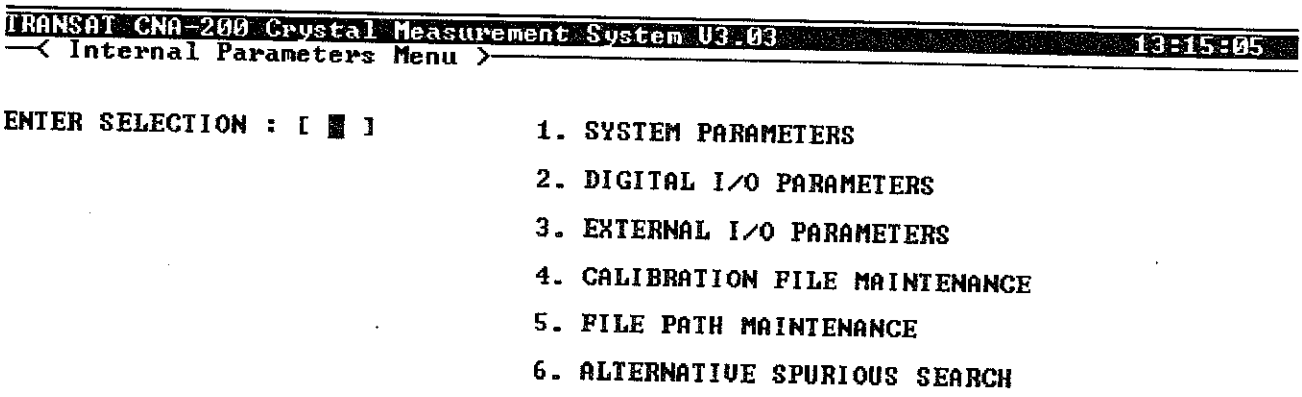


Figure 8.18 Internal Parameters Menu (CNA 200)

WARNING Do NOT modify these parameters without consulting the factory. Modifying these incorrectly causes the system to no longer function! The following information has been provided for completeness.

The Internal Parameters menu illustrated is briefly described in the following table.

Option	Description
System Parameters	System, Calibration, and Password parameters.
Digital I/O Parameters	DOS, View, and Export command strings, and I/O addresses.
External I/O Parameters	Parameters that interface to external devices.
FFC Card Parameters	Parameters that directly affect the FFC card (CNA 300 only).
Calibration File Maintenance	Parameters that allow you to store Calibration files for different fixtures in different directories.
File Path Maintenance	Directories that the system uses to create files.
Plating Rate Control Parameters	Parameters that interface with an external plating machine (CNA 300 only).
Alternative Spurious Search	Parameters that directly affect both the Spurious Search and the Secondary Spurious Search.

8.4.1 System Parameters Screen

This screen allows you to change System, Calibration, and Password parameters.

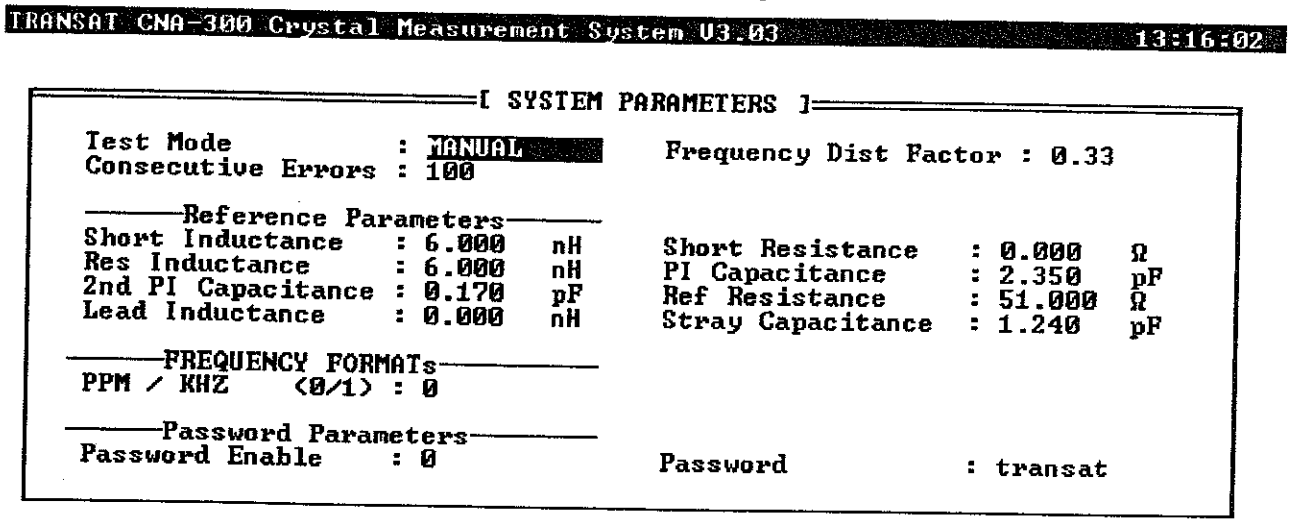


Figure 8.19 System Parameters Screen

The System Parameters are described in the following table.

Parameter	Description
Test Mode	The mode the system will operate in. **MANUAL:** The operator must load the crystal into the PI Network and then press <SPACEBAR> to cause a measurement to be performed. **AUTOMATIC:** Automatically detects when a part is installed in the PI Network. If a part is not properly inserted in the PI Network, a bad measurement may occur. Drive level testing should not be enabled in this mode. **EXTERNAL:** Allows the measurement to be triggered externally from other equipment (see the CNA Application Notes). **CONTINUOUS:** Performs a continuous measurement. If a part is not properly inserted in the PI Network, a bad measurement may occur. Neverthless, the measurement still occurs until the user presses ESC. **TEST WHEEL:** Not currently supported.
Frequency Dist Factor	This determines how the pcs will be divided in the Test screen (See Section 5.4). For example if the Frequency Dist Factor parameter is 0.33, then the "pcs" heading in the Test Screen will display the number of parts that passed that are within 1/3 of the nominal, between 1/3 and 2/3 of the nominal, and beyond 2/3 of the nominal (but still passing). Where nominal is the midpoint of the range (from Min to Max) that was specified in the Fs or FL1 test.
Consecutive Errors	If N consecutive tests fail, the system will leave Measurement mode. N is the value you entered in the Consecutive Errors parameter.

Parameter	Description
Short Inductance	The inductance of the reference short used for calibration. Valid values are between 0 and 999 nH.
Short Resistance	The reference resistance used for the calibration. For a short, this value should be 0. Valid values are between 0 and 999 ohms.
Res Inductance	The inductance of the reference resistance used for calibration. Valid values are between 0 and 999 nH.
PI Capacitance	The characteristic capacitance value of the PI Network. This value is usually defined by design and will not vary significantly from PI network to PI network of the same model type. This value has been placed on the bottom of the PI Network as CP1. Valid values are between 0 and 9.8 pF.
2nd PI Capacitance	The secondary PI capacitance that describes the PI network. This value has been placed on the bottom of the PI Network as CP2. Valid values are between 0 and 9.8 pF.
Ref Resistance	The resistance for the reference resistor used for the calibration. Valid values are between 0 and 999 ohms.
Lead Inductance	Allows the system to compensate for the inductance of the crystal leads. Currently not used. Should be set to 0.
Stray Capacitance	The capacitance of the CL insert socket. This value has been placed on the bottom of the PI Network as CS. Valid values are between 0 and 9.8 pF.
PPM / KHz (0/1)	Frequency specification limits can be in either ppm or KHz of the Target frequency. 0 indicates ppm, and 1 indicates KHz. This affects the specifications in the Fs and FL tests.
Password Enable	Enable/disable password protection on the Setup Model and Configure System options of the Main menu. Enter 0 to disable, 1 to enable.
Password	The system password when the Password Enable parameter is set to 1. The password can be up to 8 ASCII characters. You will be prompted for a password when you select Setup Model or Configure System from the Main menu.

8.4.2 Digital I/O Parameters Screen

The Digital I/O Parameters screen allows you to change DOS, View, and Export command string, and I/O addresses.

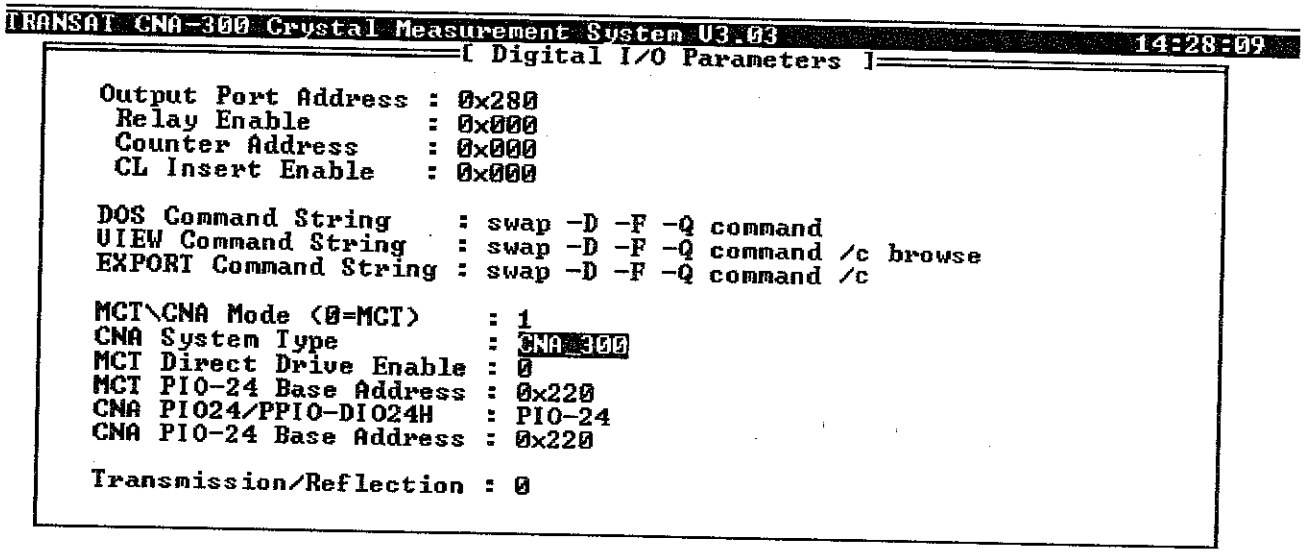


Figure 8.20 Digital I/O Parameters Screen

The Digital I/O Parameters screen illustrated is described in the following table.

Parameter	Description
Output Port Address	The I/O address of the output port used for communicating with an external relay rack.
Relay Enable	The byte value used to toggle the Relay Enable Signal.
Counter Address	The I/O address of the counter chip.
CL Insert Enable	The byte value used to toggle the CL Insert Enable Signal.
DOS Command String	The character string to invoke the DOS Command Prompt.
VIEW Command String	The character string to invoke the data viewer.
EXPORT Command String	The character string to export data to dBASE format.
MCT\CNA Mode	Set to 0 for Transat MCT or 1 for Transat CNA.
CNA System Type	Set to a CNA 200 or a CNA 300.
MCT Direct Drive Enable	Set to 1 to enable, or 0 to disable.
MCT PIO-24 Base Address	The base address of the PIO-24 card used for Transat MCT.
CNA PIO24/PPIO-DIO24H	Sets the interface type used to communicate with the CNA. Currently there are three types: PIO-24, PPIO-24, and DIRECT.
CNA PIO-24 Base Address	The base address of the interface card used for the Transat CNA.
Transmission/Reflection	Set to 0 for transmission method, or 1 for reflection method.

8.4.3 External I/O Parameters Screen

The External I/O Parameters screen allows you to change parameters that interface to an external device.

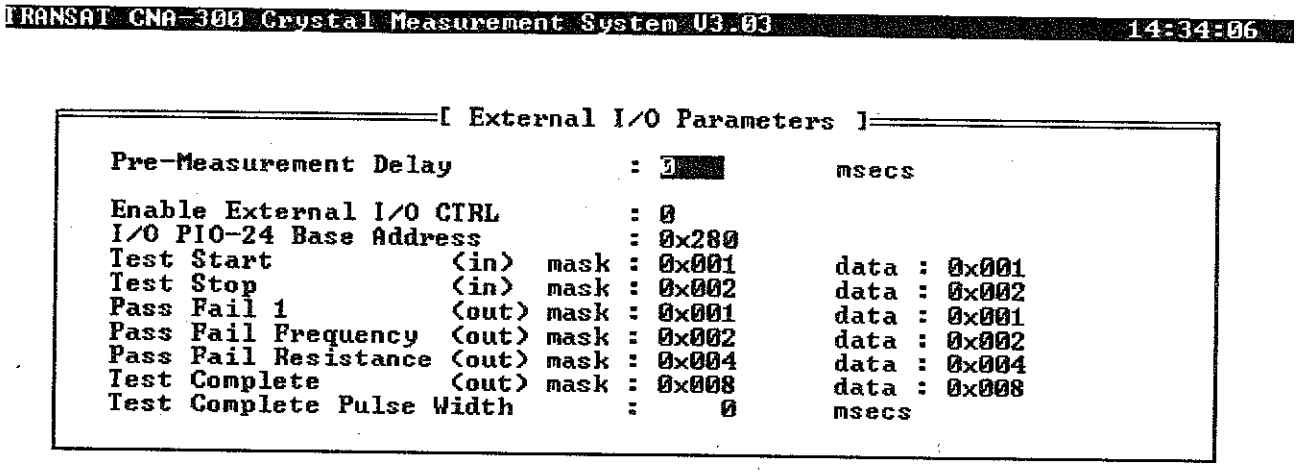


Figure 8.21 External I/O Parameters Screen

The External I/O Parameters screen illustrated is described in the following table.

Parameter	Description
Pre-Measurement Delay	The amount of time to delay after getting Test Start signal before making a measurement. Specified in milliseconds.
Enable External I/O CTRL	Set to 1 to enable external I/O control.
I/O PIO-24 Base Address	The base address for the PIO-24 card used for external I/O.
Test Start (in)	This signal starts the measurement for the current crystal. Address mask and data for monitoring the Test Start I/O line. Both are displayed in hexadecimal format. The defaults for the mask and the data are (0x001).
Test Stop (in)	This aborts the current test. Address mask and data for monitoring the Test Stop I/O line. Both are displayed in hexadecimal format. The defaults for the mask and the data are (0x002) and (0x000), respectively.
Pass Fail 1 (out)	This Address mask and data for outputting the Pass Fail 1 I/O line. Both are displayed in hexadecimal format. The defaults for the mask and the data are (0x001) and (0x000), respectively. Outputs the value in the data parameter when the current part passes it's specification, otherwise the data value is inverted. This is set before the Test Complete pulse.
Pass Fail Frequency (out)	Address mask and data for outputting a successful Frequency or all three Load Frequency tests. Both are displayed in hexadecimal format. The defaults for the mask and the data are both (0x002). The Pass Fail Frequency pulse is performed after the part is measured and the either the Frequency fails or any of the Load Frequencies fail.
Pass Fail Resistance (out)	Address mask and data for a successful Resistance. Both are displayed in hexadecimal format. The defaults for the mask and the data are both (0x004). The Pass Fail Resistance pulse is performed after the part is measured and the Resistance fails.

Parameter	Description
Test Complete	Address mask and data for outputting Test Complete. Both are displayed in hexadecimal format (0x???). The Test Complete pulse is performed after the part is measured and the Pass Fail 1 signal is set.
Test Complete Pulse Width	The pulse width for the Test Complete I/O line specified in milliseconds.

8.4.4 FFC Card Parameters Screen (CNA 300 Only)

The FFC Card Parameters screen allows you to change parameters that directly affect the Transat FFC card.

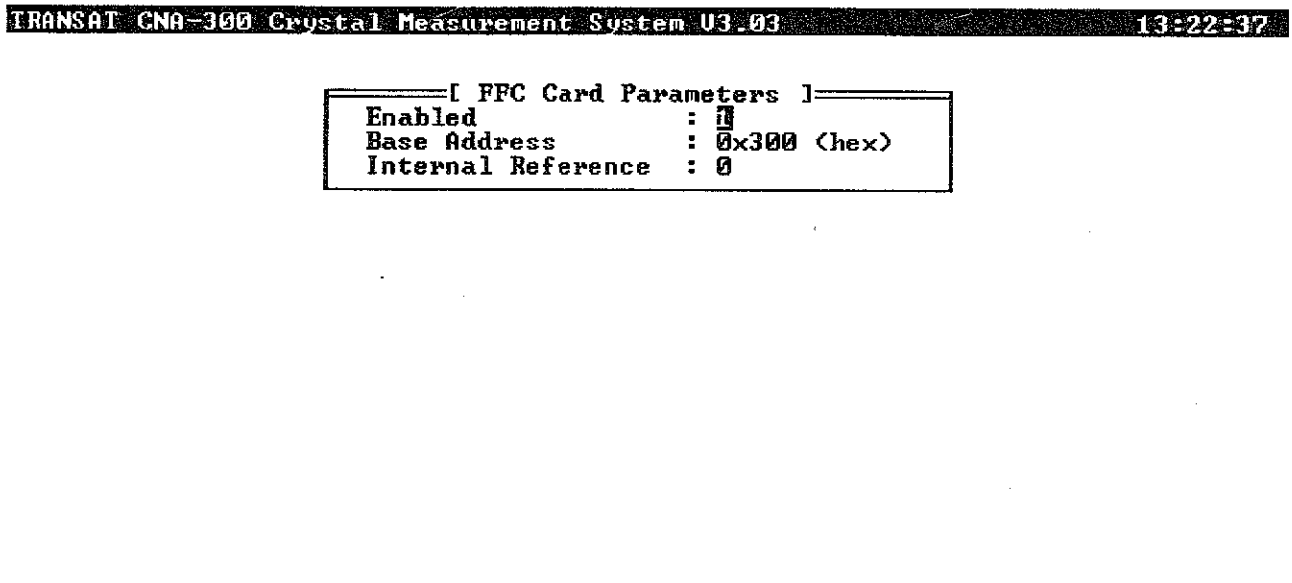


Figure 8.22 FFC Card Parameters Screen (CNA 300)

The FFC Card Parameters screen illustrated is described in the following table.

Parameter	Description
Enabled	Set to 1 if a TRANSAT Fast Frequency Card is used for frequency measurement.
Base Address	The I/O address of the FFC.
Internal Reference	Either enabled (1) or disabled (0)

8.4.5 Calibration File Maintenance Screen

The Calibration File Maintenance screen allows you to use multiple fixtures (i.e. Pi Networks) easily by allowing you to place calibration files for the different fixtures in different directories.

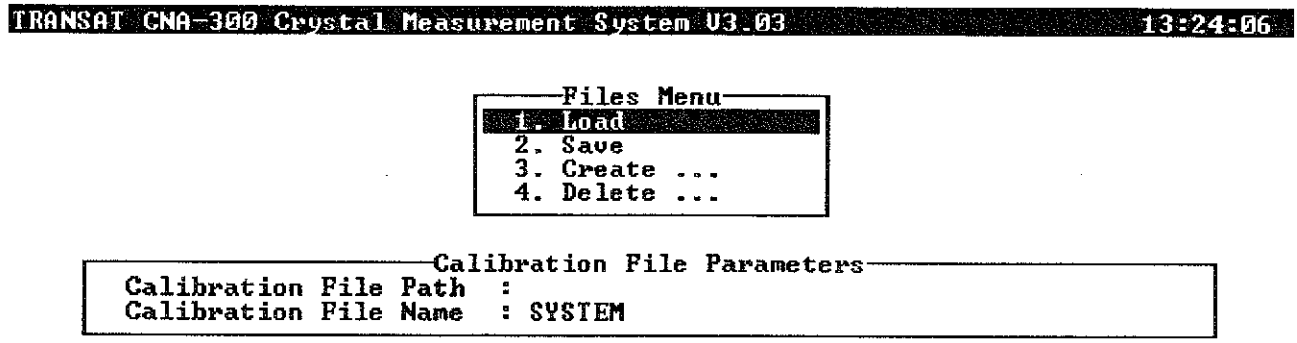


Figure 8.23 Calibration File Maintenance Screen

The Calibration File Maintenance screen illustrated is described in the following table.

Option	Description
1. Load	Loads the selected Calibration file.
2. Save	Saves any changes made to the currently selected Calibration file.
3. Create ...	Creates a calibration file. A newly created Calibration file will contain the contents of currently loaded Calibration file. The newly created Calibration file will become the default Calibration file.
4. Delete ...	Deletes the calibration file.

8.4.6 Parameter File Paths Screen

This screen allows you to specify the directories that will contain the files the system creates.

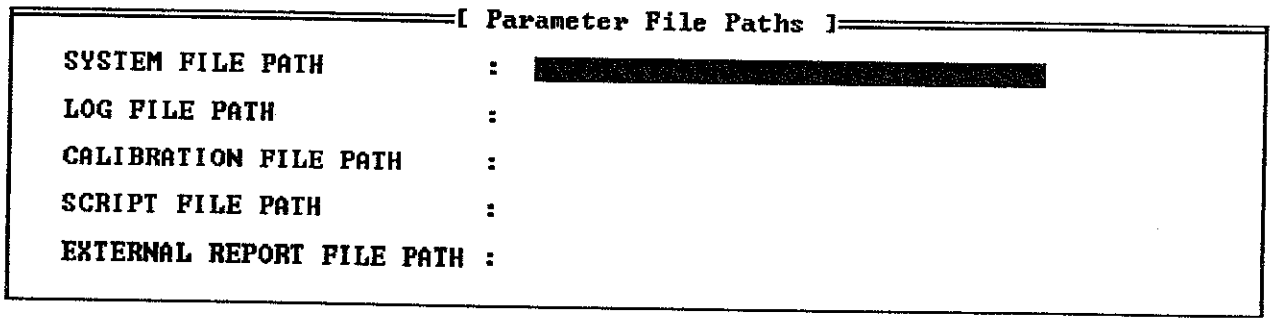


Figure 8.24 Parameter File Paths Screen

The Parameter File Paths screen illustrated is described in the following table.

Parameter	Description
System File Path	Directory that contains the measurement system programs.
Log File Path	Directory that the Log files are stored in.
Calibration File Path	Directory the Calibration file is stored in. This parameter and the Calibration File Path parameter (in the Calibration File Maintenance screen) contain the same information.
Script File Path	Directory where your customized reports are stored.
External Report File Path	Directory where the DBF files you generated from your batch files are stored.

If the path is blank (empty), then the files are stored in the current directory. Normally, this is at C:\TESTMEAS.

8.4.7 Plating Rate Control Setup Parameters Screen (CNA 300 Only)

This screen allows you to change parameters that interface with an external plating machine.

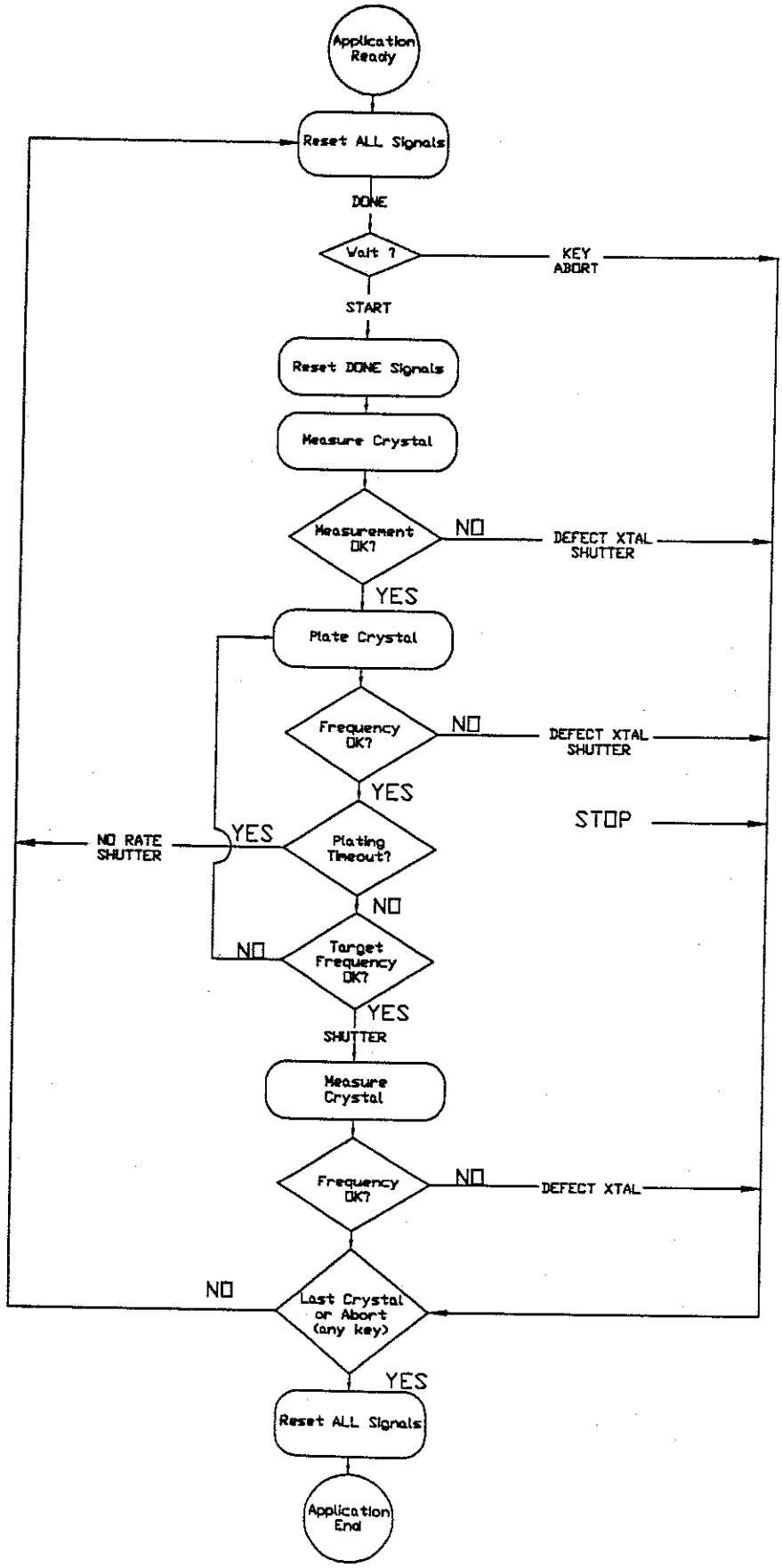
```
[ Plating Rate Control Setup Parameters ]

Plating Rate Control Enable :  1

I/O Card Address     : 0x0240 (hex)

                       BIT MASK   VALUE   DELAY (Sec)
External Enable      : 0x01       0x00      0.0
External Start       : 0x02       0x00
External Stop        : 0x04       0x00
Done Flag (OUTPUT)   : 0x80                  0.5
FILAMENT CTRL (ALL)  : 0x01
SHUTTER (OUTPUT)     : 0x08       0x00

                       BIT MASK   PLATING TIME (Sec)
Plating Time Out     : 0x04       20.00
Defective Crystal    : 0x02
Control Pulse Width :  100  msecs      (for Defective Xtal or Time Out)
```

Figure 8.25 Plating Rate Control Parameters Screen (CNA 300)

NOTE When the *Plating Rate Control Enable* parameter is enabled (set to 1), the Main menu will contain two more options, Plate and Plate Setup.

The Plating Rate Control Setup Parameters screen illustrated is described in the following table.

Parameter	Description
Plating Rate Control Enable	Set to 1 to enable plating control, 0 to disable.
I/O Card Address	The base address of the I/O card used to communicate with the plating system.
External Enable (in)	The Bit Mask, Value, and Delay (in ms) used to enable plating from an external signal. The Bit Mask and Value are displayed in hexadecimal format (0x??).
External Start (in)	This signal allows remote operation of plating from an external source. The Bit Mask and Value used to start plating from an external signal. The Bit Mask and Value are displayed in hexadecimal format (0x??).
External Stop (in)	The Bit Mask and Value used to stop plating from an external signal. The Bit Mask and Value are displayed in hexadecimal format (0x??).
Done Flag (OUTPUT)	The Bit Mask used to signal that plating is done (TRUE). The Delay specifies how long the Done Flag is present (in milliseconds). This forms a logic low-high-low pulse.
FILAMENT CTRL (ALL)	The Bit Mask used to define the I/O line used for controlling a filament SSR during plating.
SHUTTER (OUTPUT)	The Bit Mask and Value used to close the shutter. The Bit Mask and Value are displayed in hexadecimal format (0x??).
Plating Time Out	The amount of time (in seconds) allowed for a crystal to plated to the desired frequency. The Bit Mask is displayed in hexadecimal format (0x??).
Defective Crystal	The Bit Mask used to indicate the system is unable to lock to the crystal.
Control Pulse Width	The amount of time (in msec) the pulse will be held for the defective crystal or plating time out signal.


Application Ready
Reset ALL Signals
DONE
Wait 1
KEY ABORT
START
Reset DONE Signals
Measure Crystal
Measurement OK?
NO
DEFECT XTAL SHUTTER
YES
Plate Crystal
Frequency OK?
NO
DEFECT XTAL SHUTTER
YES
STOP
NO RATE SHUTTER
YES
Plating Timeout?
NO
NO
Target Frequency OK?
YES
SHUTTER
Measure Crystal
Frequency OK?
NO
DEFECT XTAL
NO
Last Crystal or Abort (any key)
YES
Reset ALL Signals
Application End

8.4.8 Alternative Spurious Search

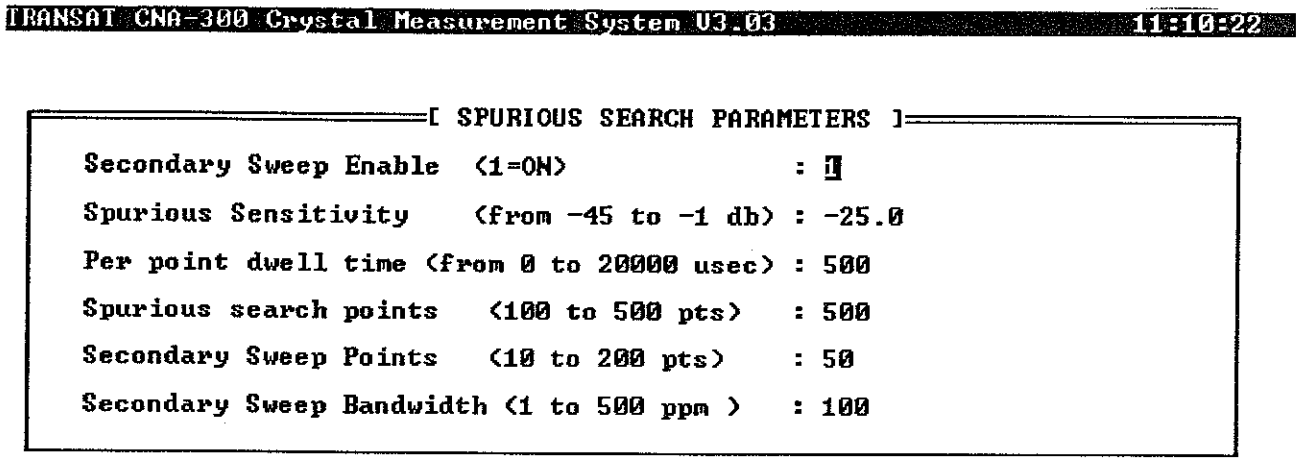


Figure 8.26 Alternative Spurious Search

This screen allows you to change the parameters described in the following table.

Parameter	Description
Secondary Sweep Enable	When set to 1, this enables a secondary sweep of every spurious response to better identify it's resistance.
Spurious Sensitivity	The sensitivity of the system for detecting spurious responses. Valid values are between -45 and -1 dB.
Per point dwell time	The amount of time to dwell per point before measuring it's impedance during a Spurious Test. This is specified in microseconds. Valid values are between 0 and 20000 uS.
Spurious search points	The number of points to measure over the spurious search region. The higher the number, the finer the resolution of spurious modes. Valid values are between 100 and 500 points.
Secondary Sweep Points	The number of points to sweep for each secondary sweep. Valid values are between 10 and 200 points.
Secondary Sweep Bandwidth	The bandwidth of each secondary sweep. Valid values are between 1 and 500 khz or ppm.

APPENDIX A MEASUREMENT TYPES

The CNA 300 is a unique instrument in that it offers the ability to perform PHASE LOCKED measurements and FREQUENCY LOCKED impedance and admittance measurements. This capability allows the instrument much flexibility in making measurements.

A PHASE LOCKED measurement is made when the CNA 300 uses an analog phase lock circuit to 'lock on' to the crystal resonance. The advantage to this method is very fast acquisition of the crystal frequency. The disadvantage of this method is that phase locking might be impractical under certain conditions. For example, the crystal response may be weak due to low drive level, or the device has a high Q response.

To overcome the problem of low drive level measurement, a CNA FREQUENCY LOCKED measurement can effectively extend the range of the instrument to less than 10 nW for most devices. Note that the FREQUENCY LOCKED measurement is also valid at higher drive levels, but tends to be slower than the PHASE LOCKED methods.

To overcome the problem with high Q devices in a PHASE LOCKED measurement, the CNA incorporates a special 'HIGH Q' mode that slows the basic analog frequency sweep rate to allow the instrument to phase lock to higher Q devices (devices with Q > 500000).

There are a number of measurements available with the CNA test system. Some of the measurements are available for crystal measurements while others are only available from the QUICK MEASUREMENT screen for engineering analysis. The following are descriptions of the different measurements available:

A.1 Frequency (CNA 300 Only)

Frequency measurements of the crystals will be performed at the phase angle set in the Measurement Angle parameter (in the Direct Lock Measurement Parameters screen).

A.2 Freq & Resist (CNA 300 Only)

Frequency, resistance, and drive power measurements of the crystals will be performed at the phase angle set in the Measurement Angle parameter (in the Direct-Lock Measurement Parameters screen).

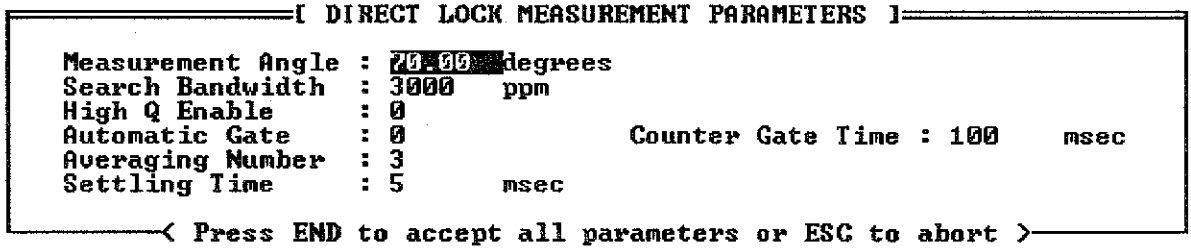


Figure A.1 Direct Lock Measurement Parameters Screen

The following table describes the parameters found in the Direct Lock Measurement Parameters screen.

Parameter	Description
Measurement Angle (deg)	The angle that the measurements will be performed at.
Search Bandwidth (ppm)	The distance to search centered around the main resonance (Target frequency). This is specified in ppm of the main resonance.
High Q Enable	Used for measuring high Q crystals (Q greater than 500K). A value of 1 enables slow sweep, 0 disables it.

Parameter	Description
Automatic Gate	If set to 1, the system determines the appropriate gate time based on the value entered for Settling Time. Automatic Gate should normally be set to 1 to ensure accurate measurements in the least amount of time. If set to 0, the Counter Gate Time parameter is used.
Averaging Number	The number of frequency measurements that will be made at each point. Valid values are between 0 and 30.
Delay (msec)	The amount of time needed for the crystal to begin oscillating. A typical value to use is 10 ms.
Counter Gate Time (msec)	The amount of time the system uses to count the number of oscillations of the crystal. The number of oscillations is used to determine the frequency of the crystal. For maximum accuracy, set the gate time to 1000 msec (1 sec).

This measurement is sometimes called a Direct Lock measurement because the frequency and resistance reported are the direct result of locking at the specified phase angle.

A.3 Standard Par (CNA 300 Only)

This method makes a 3-point calculation of the crystal's parameters based on an initial Co measurement and two additional measurements. The measurement is basically performed as follows:

- A Co measurement is made off-resonance.
- A phase-lock measurement is made at the phase angle specified in the Initial Angle parameter (in the Standard Crystal Measurement Parameters screen).
- The admittance and impedance of the crystal at that angle is calculated.
- Using the Co measurement and the first phase locked measurement, calculate the series resonant phase angle and phase lock to the crystal at this angle.
- Measure the admittance and impedance of the crystal at the angle calculated from the previous step.
- Using all three measurements, calculate the crystal motional parameters.

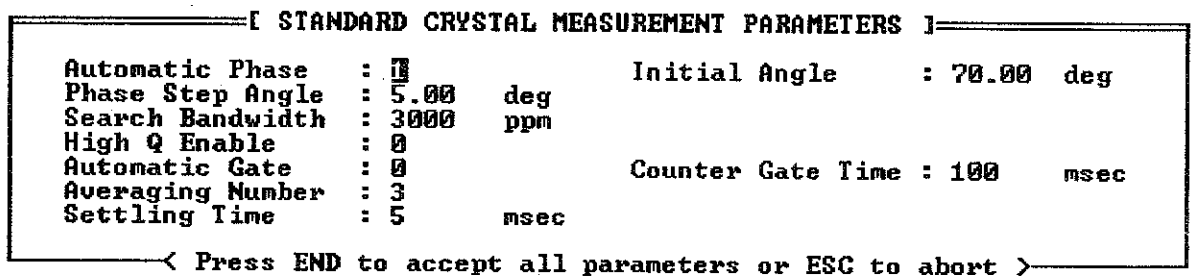


Figure A.2 Standard Crystal Measurement Parameters Screen

The following table describes the parameters found in the Standard Crystal Measurement Parameters screen.

Parameter	Description
Automatic Phase	If set to 1, the initial phase angle is automatically reduced based on the frequency of the device. If the frequency is less than 20 MHz, the phase angle is set to 20 degrees. If the frequency is between 20 and 70 MHz, the phase angle is set to 45 degrees. If the frequency is greater than 70 MHz, the value specified in Initial Angle is used. If set to 0, the value specified in Initial Angle is used for all frequencies.
Phase Step Angle (deg)	The amount of angle to incrementally increase the Initial Angle, should the system be unable to achieve phase lock with the current angle.
Search Bandwidth (ppm)	The distance to search centered around the main resonance (Target frequency). This is specified in ppm of the main resonance.
High Q Enable	Used for measuring high Q crystals (Q greater than 500K). Setting to 1 enables slow sweep, 0 disables it.
Automatic Gate	If set to 1, the system determines the appropriate gate time based on the value entered for Settling Time. Automatic Gate should normally be set to 1 to ensure accurate measurements in the least amount of time. If set to 0, the Counter Gate Time parameter is used.
Averaging Number	The number of frequency measurements that will be made at each point. Valid values are between 0 and 30.
Delay	Specifies the amount of time the system waits at each point while sweeping the part. A typical value is 10 ms.
Initial Angle (deg)	The first phase angle the system will try when attempting to phase lock to the crystal.
Counter Gate Time	The amount of time the system uses to count the number of oscillations of the crystal. For maximum accuracy, set the gate time to 1000 msec (1 sec).

A.4 Special Par (CNA 300 Only)

Measures the crystal motional parameters using a multiple point addmittance circle fit. Full motional parameters are derived as well as off resonance Co. Again the measurement points are derived using phase locked measurements. Additionally, the phase angles for measurements within the 3 dB bandwidth of the device are used. This generally allows more stable and repeatable measurements. The measurement sequence is:

- A Co measurement is made off-resonance
- A phase-lock measurement is made at the phase angle specified in the Initial Angle parameter .
- The admittance and impedance of the crystal at that angle is calculated.
- Using the Co measurement and the first phase locked measurement, calculate the series resonant phase angle.
- A series of phase-locked measurements are made within ±3 dB (decibels) from the calculated series resonant phase angle of the crystal. The Points on Circle parameter specifies how many of these measurements will be made. Again, the admittance and impedance of the crystal are measured at these angles.
- Using these measurements, calculate the motional parameters of the crystal by fitting this measurement data to a circle.

NOTE The 3 dB phase angles are used to insure that the measurement points appear on the 'right hand side' of the admittance circle of the device.

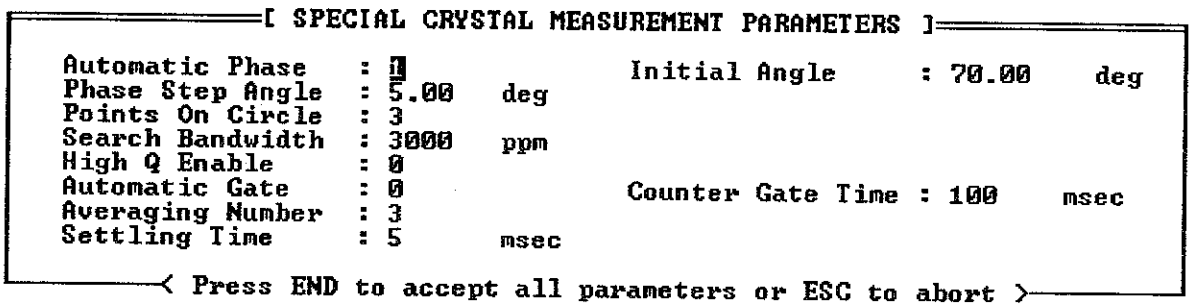


Figure A.3 Special Crystal Measurement Parameters Screen

The following table describes the parameters found in the Special Crystal Measurement Parameters screen.

Parameter	Description
Automatic Phase	If set to 1, the initial phase angle is automatically reduced based on the frequency of the device. If the frequency is less than 20 MHz, the phase angle is set to 20 degrees. If the frequency is between 20 and 70 MHz, the phase angle is set to 45 degrees. If the frequency is greater than 70 MHz, the value specified in Initial Angle is used. If set to 0, the value specified in Initial Angle is used.
Phase Step Angle (deg)	The amount of angle to incrementally increase the Initial Angle, should the system be unable to achieve phase lock with the current angle.
Points On Circle	The number of points to measure on the admittance circle. Valid values are between 3 and 20.
Search Bandwidth (ppm)	The distance to search centered around the main resonance (Target frequency). This is specified in ppm of the main resonance.
High Q Enable	Used for measuring high Q crystals (Q greater than 500K). Setting to 1 enables slow sweep, 0 disables it.
Automatic Gate	If set to 1, the system determines the appropriate gate time based on the value entered for Settling Time. Automatic Gate should normally be set to 1 to ensure accurate measurements in the least amount of time. If set to 0, the Counter Gate Time parameter is used.
Averaging Number	The number of frequency measurements that will be made at each point. Valid values are between 0 and 30.
Delay	Specifies the amount of time the system waits at each point while sweeping the part. A typical value is 10 ms.
Initial Angle (deg)	The first phase angle the system will try when attempting to phase lock to the crystal.
Counter Gate Time	The amount of time the system uses to count the number of oscillations of the crystal. For maximum accuracy, set the gate time to 1000 msec (1 sec).

A.5 Multi Point (CNA 300 Only)

The multiple-point measurement is similar to the Special Parameter measurement except the phase angles of the measurement points are not derived based on the 3 dB phase angles of the crystal. The key parameters are the Initial Angle, Points On Circle and Phase Sweep Range. The measurement sequence is:

- A Co measurement is made off-resonance
- A phase-lock measurement is made at the phase angle specified in the Initial Angle parameter .

- The admittance and impedance of the crystal at that angle is calculated.
- Make additional phase locked measurements by stepping the phase angle of each measurement based on:

  Phase Step = Phase Sweep Range / (Points On Circle - 1)

  Repeat until the number of measurements specified by the Points On Circle parameter have been made.
- Using these measurements, calculate the motional parameters of the crystal by fitting the measurement data to an admittance circle.

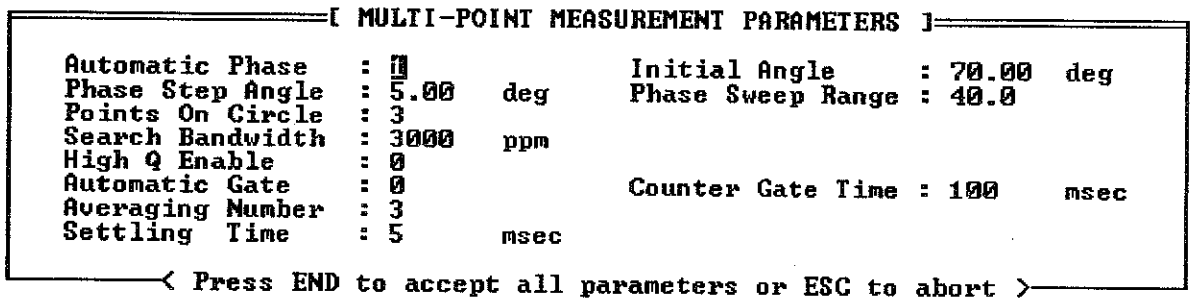


Figure A.4 Multi-Point Measurement Parameters Screen

The following table describes the parameters found in the Multi-Point Measurement Parameters screen.

Parameter	Description
Automatic Phase	If set to 1, the initial phase angle is automatically reduced based on the frequency of the device. If the frequency is less than 20 MHz, the phase angle is set to 20 degrees. If the frequency is between 20 and 70 MHz, the phase angle is set to 45 degrees. If the frequency is greater than 70 MHz, the value specified in Initial Angle is used. If set to 0, the value specified in Initial Angle is used.
Phase Step Angle (deg)	The amount of angle to incrementally increase the Initial Angle, should the system be unable to achieve phase lock with the current angle.
Points On Circle	The number of points to measure on the admittance circle. Valid values are between 3 and 20.
Search Bandwidth (ppm)	The distance to search centered around the main resonance (Target frequency). This is specified in ppm of the main resonance.
High Q Enable	Used for measuring high Q crystals (Q greater than 500K). Setting to 1 enables slow sweep, 0 disables it.
Automatic Gate	If set to 1, the system determines the appropriate gate time based on the value entered for Settling Time. Automatic Gate should normally be set to 1 to ensure accurate measurements in the least amount of time. If set to 0, the Counter Gate Time parameter is used.
Averaging Number	The number of frequency measurements that will be made at each point. Valid values are between 0 and 30.
Delay	Specifies the amount of time the system waits at each point while sweeping the part. A typical value is 10 ms.
Initial Angle (deg)	The first phase angle the system will try when attempting to phase lock to the crystal.
Phase Sweep Range (deg)	The total amount of phase to sweep (see the measurement sequence discussion above). Valid values are between 0.0 and 99.9 degrees. A good choice would be 45.0 degrees.

Parameter	Description
Counter Gate Time	The amount of time the system uses to count the number of oscillations of the crystal. For maximum accuracy, set the gate time to 1000 msec (1 sec).

A.6 Sweep Measurement

The parameters of the crystal are measured by sweeping a span of frequencies around the Target Frequency. The Target Frequency is specified in the Fs or FL1 test. The span is specified by the Sweep Span parameter in the Sweep Crystal Measurement Parameters screen. This measurement has the advantage of not needing to achieve phase lock at any time. The basic measurement sequence is to:

- Rapidly sweep a bandwidth on either side of the target frequency to identify the main resonance.
- Repeatedly decrease the bandwidth of the sweep until the measurement is within the 3 dB bandwidth of the crystal.
- Once sufficient points within the 3 dB bandwidth of the part are measured, calculate the motional parameters of the crystal from the admittance circle fit.

NOTE As the bandwidth of the sweep is reduced, the measurement time is increased to allow for device settling.

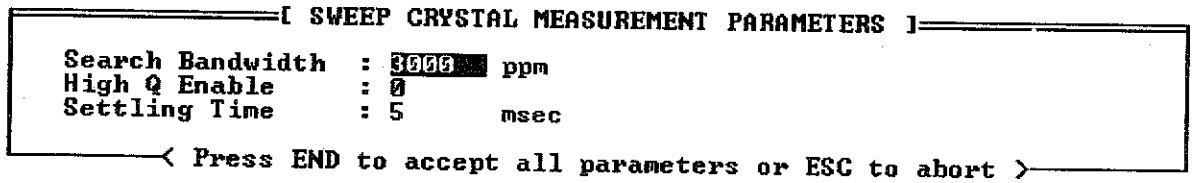


Figure A.5 Sweep Crystal Measurement Parameters Screen

The following table describes the parameters found in the Sweep Crystal Measurement Parameters screen.

Parameter	Description
Search Bandwidth (ppm)	The distance to sweep centered around the main resonance (Target frequency). This is specified in ppm of the main resonance.
High Q Enable	Used for measuring high Q crystals (Q greater than 500K). A value of 1 enables slow sweep, 0 disables it.
Delay (msec)	Settling Time is the amount of time the system waits at each point while sweeping the part. A typical value to use is 10 ms.

A.7 Phase Locked Impedance

Phase Locked Impedance measures the impedance and admittance at the specified phase angle set by the INITIAL ANGLE parameter on the Measurement Parameters Screen. This measurement is only available at the Quick Measurement screen.

A.8 Frequency Set Impedance

Frequency Locked Impedance measures the impedance and admittance at the specified Target Frequency. This measurement is only available at the Quick Measurement screen.

A.9 Insert Capacitance

Measures the capacitance of the physical capacitor inserted in the Pi-network. Please note that this measurement changes the value of the insert capacitance displayed on the Quick Measurement screen test setup.

A.10 Spurious Search

Searches for spurious modes of oscillation. Only the first six responses within the spurious search band are reported. The Spurious Search measurement is used in conjunction with another parameter measurement.

A.11 DL Test or DLD Sweep

Measures the changes in frequency and resistance as the drive is swept from the value specified by *Low Drive* to the value specified by *Drive Level*. The results are displayed on the screen.

The *Low Drive* limit depends on the actual R and Q of the crystal.

When performing a DLD Sweep from the Quick Measure screen, the crystal to be measured should not be placed in the Pi until prompted by a message on the screen. This will ensure the crystal has not been hit with high drive before executing the DL test.

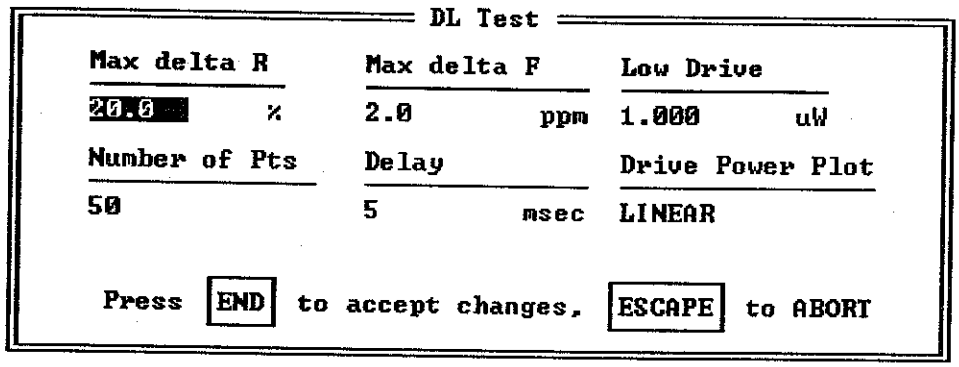


Figure A.6 DLD Sweep Measurement Parameters Screen

The following table describes the parameters found in the DLD Sweep Measurement Parameters screen.

Parameter	Description
Max Delta R (%)	Maximum allowable change in resistance.
Max Delta F (ppm)	Maximum allowable change in frequency.
Low Drive (uW)	The low-drive level.
	NOTE The high-drive level is the Drive Power parameter that was set in the Basic Test screen.
Number of Pts	The number of measurements that will be made (0 to 100 points).
Delay (mSec)	The amount of time the crystal needs to settle before each measurement.

A.12 Calculate CL

Calculates the effective load capacitance in the system based on measuring a reference crystal.

APPENDIX B LOAD CAPACITANCE MEASUREMENTS

The CNA supports three methods of measuring the load capacitance characteristics of a crystal:

- Numerical Calculation of Load Frequency (NUMERICAL).
- Load Frequency Measurement with a Physical Load Capacitance (PHYSICAL).
- Load Frequency Measurement Using Equivalent Reactance (EQREACT).

B.1 Numerical

This method calculates the load capacitance without a CL insert capacitor being placed in the PI Network.

Advantage: This method is adequate for overtone crystals.

Disadvantage: Accuracy problems could occur in fundamental crystals with a load capacitance smaller than 20 pF.

To use the Numerical method

1. Set the Load CL Mode parameter in the Load Capacitance Measurement Parameters window (See Section 6.4) to NUMERICAL.

2. Set the Insert Cap parameter in the Load Capacitance Measurement Parameters window (See Section 6.4) to 0 (zero). This indicates that there is no insert capacitor.

3. Set the Target Cap parameter (in the FL1, FL2, or FL3 Test window) to the desired target load capacitance.

B.2 Physical

This method uses a load capacitance (capacitor placed in the PI Network) close the desired load capacitance. This will cause the crystal to operate close to, or at, the desired load capacitance.

Advantage: Variations from device to device are eliminated by a crystal parameter measurement of each part.

Disadvantage: A limited number of CL inserts are used to cover the entire range of target load capacitance values. This can be a problem for automation applications where the load capacitor cannot be easily changed.

To use the Physical method

1. Set the Load CL Mode parameter (in the Load Capacitance Measurement Parameters window) to PHYSICAL.

2. Set the Insert Cap parameter (in the Load Capacitance Measurement Parameters window) to the value of the capacitor placed in the PI Network.

3. Set the Target Cap parameter (in the FL1, FL2, or FL3 Test window) to the desired target load capacitance.

4. When testing begins, the operator will be prompted to insert a short circuit in the PI Network to allow measurement of the load capacitance. (The short circuit is to be placed in the Pi Network; not the load insert socket!)

5. Press any key (except <ESC>) to measure the load capacitor. After measuring the load capacitance, the user is put into the Test Screen. Remove the short circuit from the Pi Network and begin testing.

B.3 EQREACT

This method measures a target load frequency exactly at the equivalent negative reactance of the desired load capacitance. This measurement is performed without a load capacitor in the PI Network.

Advantage: Easy to setup.

Disadvantage: Accuracy problems could occur with low power measurements.

To use the Eqreact method

1. Set the Load CL Mode parameter (in the Load Capacitance Measurement Parameters window) to EQREACT.

2. Set the Insert Cap parameter (in the Load Capacitance Measurement Parameters window) to 0 (zero). This indicates that there is no insert capacitor.

3. Set the Target Cap parameter (in the FL1, FL2, or FL3 Test window) to the desired target load capacitance.

   A Target Capacitance value which takes into consideration capacitances inherent to the Pi Network can be determined by measuring a reference crystal. This measurement is enabled from the Lot Description screen at the beginning of a test. (See Section B.4)

The accuracy of this method is close to that of the Physical method without the need for an actual load capacitance.

The measurement is accomplished by examining the reactance slope of the crystal at the frequency of interest, and calculating the load frequency that matches the appropriate equivalent reactance.

B.4 Measure Reference Crystal

The system can determine the Target Load Capacitance value based on measuring a reference crystal with a known frequency, at a known load capacitance, at the start of a test. This measurement is available when a FL1, FL2, and/or FL3 test is enabled and EQREACT Load Capacitance Measurement method is selected.

To measure a reference crystal

1. From the Lot Description Screen (See Section 5.2), set the Measure Reference Crystal parameter to 1 and press <END>.

   The Reference Crystal Parameters Window is displayed.

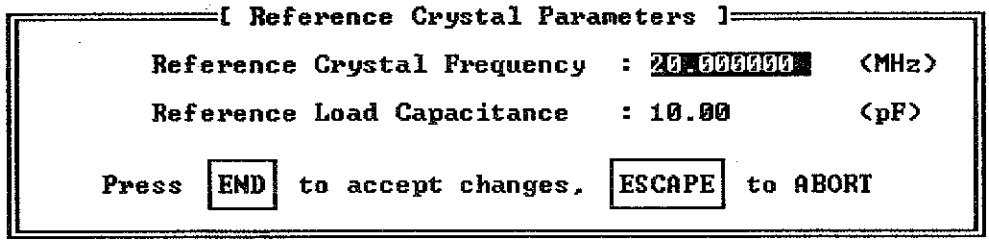


Figure B.1 Reference Crystal Parameters Window

2. Enter the reference crystal frequency and load capacitance and press <ENTER>.

   After measuring the reference crystal, the Target Capacitance value is calculated and the Current Test Setup screen is displayed. (See Section 5.3).

APPENDIX C EXPORTING DATABASE DATA

This appendix describes how to export data to DBF (dBASE) files using either of these two methods:

- Using system menus.
- Using batch files.

The data exported was created by the system while tests were being run. When a test is run, a Lot file and Item file are created. It is the information in these two files that is exported to dBASE compatible files.

C.1 Exporting Data Using System Menus

To export using the CNA menus

1. From the Main menu, press <3>. The View Data menu will display.

2. Press <8>.

   The system will create a lot information file (.DBL) and an individual measurement file (.DBF) based on the currently selected test data. An index file (.CDX) is also created for the individual measurement file. All three files have the same name as the selected test data.

   If the files already exist, you are asked if you want to overwrite them. Press <1> to overwrite, or any other key to abort the process.

C.2 Exporting Data Using Batch Files

An alternative way to move data to .DBF files is by using DOS batch files. Measurement data from multiple test runs can be exported to DBF files by simply typing the name of a batch file.

For example, suppose five test runs with log names of TEST1, TEST2, TEST3, TEST4, and TEST5 are to be exported. You can create a batch file similar to the following (using an ASCII text editor) to export the data.

```
rem This is a batch file to export data to DBF formatted files.
rem Export the lot and item file data to DBF formatted file called
rem TEST1.DBL and TEST1.DBF
dbfcvt -iTEST1 -oTEST1
rem Similarly, export TEST2.
dbfcvt -iTEST2 -oTEST2
rem Similarly, export TEST3.
dbfcvt -iTEST3 -oTEST3
rem Similarly, export TEST4.
dbfcvt -iTEST4 -oTEST4
rem Similarly, export TEST5.
dbfcvt -iTEST5 -oTEST5
```

After running the batch file above, ten new files are created:

TEST1.DBL, TEST1.DBF,
TEST2.DBL, TEST2.DBF,
TEST3.DBL, TEST3.DBF,
TEST4.DBL, TEST4.DBF,
TEST5.DBL, and TEST5.DBF.

C.3 Export Data File Descriptions

This section describes the fields in the Lot and Item files.

The Lot file (DBL) has one record containing setup information for that lot. The format of the file is shown in the following table.

Name	Type	Length	Decimal	Description
LOTNAME	string	9	0	Lot Name
SYSNAME	string	9	0	System File Name
MCTNAME	string	9	0	Calibration File Name
LOGPATH	string	44	0	Log File Path
SYSPATH	string	44	0	System File Path
MCTPATH	string	44	0	Calibration File Path
RPTFMT	number	2	0	Report format
TARFREQ	number	11	7	Target Frequency
LCAPMODE	number	2	0	Load Cap Mode
LOADFRQ1	number	11	7	Load Freq[0]
LOADFRQ2	number	11	7	Load Freq[1]
LOADFRQ3	number	11	7	Load Freq[2]
TARGCAP1	number	11	7	Target Cap[0] (in pF)
TARGCAP2	number	11	7	Target Cap[1] (in pF)
TARGCAP3	number	11	7	Target Cap[2] (in pF)
CL2REF	number	2	0	Reference freq for CL2
CL3REF	number	2	0	Reference freq for CL3
INSRTCAP	number	11	7	Insert Cap (in pF)
DRIVPWER	number	11	7	Drive Power (in W)
ESR	number	11	7	ESR (in ohms)
PLTATMPS	number	5	0	Plating Attempts
TOTPASS	number	5	0	Total Passed
TOTFAIL	number	5	0	Total failed
PPMESERR	number	5	0	Post Plate Measure Errors
PPSPCERR	number	5	0	Post Plate Spec Errors
STARTDTE	string	12	0	Start Plating Date (DD Mmm YYYY)
STARTTME	string	9	0	Start Plating Time (HH:MM:SS)
STOPDTE	string	12	0	Stop Plating Date (DD Mmm YYYY)
STOPTME	string	9	0	Stop Plating Time (HH:MM:SS)
STTIME	number	12	0	Elapsed time since start of application at start of lot.
ENDTIME	number	12	0	Elapsed time since start of application at end of lot.
ELAPTIME	number	11	1	Elapsed time (in seconds)
NOMSEREN	number	1	0	Enable series frequency specification
NOMLOEN1	number	1	0	Enable load frequency[0] specification
NOMLOEN2	number	1	0	Enable load frequency[1] specification
NOMLOEN3	number	1	0	Enable load frequency[2] specification

Name	Type	Length	Decimal	Description
NOMRESEN	number	1	0	Enable resistance specification
NOML1EN	number	1	0	Enable L1 specification
NOMC1EN	number	1	0	Enable C1 specification
NOMC0EN	number	1	0	Enable C0 specification
NOMC0C1EN	number	1	0	Enable C0/C1 specification
NOMQEN	number	1	0	Enable Q specification
DLTENB	number	1	0	Enable Drive Level Test
DLTMAXR	number	11	7	Drive Level Test Max Resistance
DLTMAXF	number	11	7	Drive Level Test Max Frequency
DLTLEVEL	number	11	7	Drive Level Test Low level
DLTANGLE	number	11	7	Drive Level Test Angle
ULIMSFRQ	number	15	7	Upper limit series frequency specification
ULIMLFR1	number	15	7	Upper limit load frequency[0] specification
ULIMLFR2	number	15	7	Upper limit load frequency[1] specification
ULIMLFR3	number	15	7	Upper limit load frequency[2] specification
ULIMRES	number	5	1	Upper limit resistance specification
ULIML1	number	6	2	Upper limit L1 specification
ULIMC1	number	6	3	Upper limit C1 specification
ULIMC0	number	6	1	Upper limit C0 specification
ULIMC0C1	number	6	1	Upper limit C0/C1 ratio specification
ULIMQ	number	6	1	Upper limit Q specification
LLIMSFRQ	number	15	7	Lower limit series frequency specification
LLIMLFR1	number	15	7	Lower limit load frequency[0] specification
LLIMLFR2	number	15	7	Lower limit load frequency[1] specification
LLIMLFR3	number	15	7	Lower limit load frequency[2] specification
LLIMRES	number	5	1	Lower limit resistance specification
LLIML1	number	6	2	Lower limit L1 specification
LLIMC1	number	6	3	Lower limit C1 specification
LLIMC0	number	6	1	Lower limit C0 specification
LLIMC0C1	number	6	1	Lower limit C0/C1 ratio specification
LLIMQ	number	6	1	Lower limit Q specification
AINIFREQ	number	11	7	Average Initial Frequency
AINIRES	number	11	7	Average Initial Resistance
ASERFREQ	number	11	7	Average Series Frequency

Name	Type	Length	Decimal	Description
ALODFRQ1	number	11	7	Average Load Frequency[0]
ALODFRQ2	number	11	7	Average Load Frequency[1]
ALODFRQ3	number	11	7	Average Load Frequency[2]
ATRIMS1	number	11	7	Average Trim Sensitivity[0]
ATRIMS2	number	11	7	Average Trim Sensitivity[1]
ATRIMS3	number	11	7	Average Trim Sensitivity[2]
ARESIST	number	11	7	Average Resistance
AL1	number	11	7	Average L1
AC1	number	11	7	Average C1
AC0	number	11	7	Average C0
AC0C1	number	11	7	Average C0/C1
AQ	number	11	7	Average Q
SINIFREQ	number	11	7	Std Series Initial Frequency
SINITRES	number	11	7	Std Series Initial Resistance
SSERFREQ	number	11	7	Std Series Frequency
SLOFREQ1	number	11	7	Std Load Frequency[0]
SLOFREQ2	number	11	7	Std Load Frequency[1]
SLOFREQ3	number	11	7	Std Load Frequency[2]
STRIMS1	number	11	7	Std Trim Sensitivity[0]
STRIMS2	number	11	7	Std Trim Sensitivity[1]
STRIMS3	number	11	7	Std Trim Sensitivity[2]
SRESIST	number	11	7	Std Resistance
SL1	number	11	7	Std L1
SC1	number	11	7	Std C1
SC0	number	11	7	Std C0
SC0C1	number	11	7	Std C0/C1
SQ	number	11	7	Std Q
TFAILSFR	number	5	0	Total Passed
TFAILLF0	number	5	0	Total Passed
TFAILLF1	number	5	0	Total Passed
TFAILLF2	number	5	0	Total Passed
TFAILRES	number	5	0	Total Passed
TFAILINF	number	5	0	Total Passed
TFAILINR	number	5	0	Total Passed
TFAILL1	number	5	0	Total Passed
TFAILC1	number	5	0	Total Passed
TFAILC0	number	5	0	Total Passed
TFLEC0C1	number	5	0	Total Passed
TFAILQ	number	5	0	Total Passed
TFAILDTF	number	5	0	Total Passed

Name	Type	Length	Decimal	Description
TFAILDTR	number	5	0	Total Passed

The Item file (DBF) has one record for every measurement performed. The format of the file is shown in the following table.

Name	Type	Length	Decimal	Description
LOTNAME	string	15	0	Lot Name
SERNUMBR	string	15	0	Serial Number
TARGFREQ	number	11	7	Target Frequency (in MHz)
INITFREQ	number	11	7	Initial Frequency (in MHz)
INITRES	number	11	7	Initial Resistance (in ohms)
CALCTARG	number	11	7	Calculated Target Freq (in MHz)
MEASTYPE	number	2	0	Measurement Type
FREQ	number	11	7	Measured Frequency (in MHz)
LOADFRQ1	number	11	7	Measured Load Frequency[0] (in MHz)
LOADFRQ2	number	11	7	Measured Load Frequency[1] (in MHz)
LOADFRQ3	number	11	7	Measured Load Frequency[2] (in MHz)
TRIMS1	number	11	7	Trim Sensitivity[0] (in ppm/pF)
TRIMS2	number	11	7	Trim Sensitivity[1] (in ppm/pF)
TRIMS3	number	11	7	Trim Sensitivity[2] (in ppm/pF)
RESIST	number	11	7	Measured Resistance (in ohms)
L1	number	11	7	Inductance of motional branch (in mH)
C1	number	11	7	Capacitance of motional branch (in fF)
C0	number	11	7	Static Capacitance (in pF)
C0/C1	number	11	7	Ratio of C0 to C1 (in pF)
Q	number	11	7	Quality Factor (in 1000s)
LCKANGLE	number	11	7	Measured Lock Angle (in degrees)
DC	number	11	7	Measured Drive Current (in mA)
DP	number	11	7	Measured Drive Power (in mW)
TESTRSLT	string	5	0	Test Result against specifications
EDLTRES	number	11	7	
EDLTFREQ	number	11	7	
ERESPCT	number	11	7	percentage error calculated for these item
EL1PCT	number	11	7	
EC1PCT	number	11	7	
EC0PCT	number	11	7	
EC0C1PCT	number	11	7	
EQPCT	number	11	7	
EINIFREQ	number	11	7	
EINIRES	number	11	7	

Name	Type	Length	Decimal	Description
ESERFREQ	number	11	5	
ELODFRQ1	number	11	5	
ELODFRQ2	number	11	5	
ELODFRQ3	number	11	5	
FAILRES	number	1	0	spec failure flags
FAILL1	number	1	0	
FAILC1	number	1	0	
FAILC0	number	1	0	
FAILC0C1	number	1	0	
FAILQ	number	1	0	
FAILIFRQ	number	1	0	
FAILIRES	number	1	0	
FAILSFRQ	number	1	0	
FAILLFR1	number	1	0	
FAILLFR2	number	1	0	
FAILLFR3	number	1	0	
FAILDLTR	number	1	0	
FAILDLTF	number	1	0	
STARTDTE	string	12	0	Start Plating Date (DD Mmm YYYY)
STARTTME	string	9	0	Start Plating Time (HH:MM:SS)
STOPDTE	string	12	0	Stop Plating Date (DD Mmm YYYY)
STOPTME	string	9	0	Stop Plating Time (HH:MM:SS)
STTIME	number	12	0	Elapsed time since start of application at start of item
ENDTIME	number	12	0	Elapsed time since start of application at end of item
ELAPTIME	number	11	1	Elapsed time (in seconds)
PLTMAGER	number	6	0	Encoded error from Platemgr

APPENDIX D USING R&R REPORT WRITER® TO CUSTOMIZE REPORTS

External reports are batch files that you create that are automatically run after a production test ends. The batch file is a single line MS-DOS batch file with a .EXT file extension. An example method using the R&R Report Writer® is described in this section.

To make a custom report

1. Make a report template and report library (both must have the same name) using R&R REPORT WRITER. See the R&R manual.

2. Create an .EXT file. It should only contain 1 line which will cause a Batch file to run.

   For example:

   ```
   call mulcol
   ```

3. Create the Batch file (the name of the batch file was specified in Step 2). The Batch File name must have an .BAT extension. In the example in Step 2, the Batch file is named MULCOL.BAT.

   Your Batch file should basically be the same as the following example, except place the name of your report in <REPORT_NAME>.

   ```
   @echo off
   dbfcvt -q -i%1 -o%1
   rrcreate -q -r<REPORT_NAME> -l%1
   ..\rr\rruntime rrunin
   ```

   where:
   `@echo off` (turns off the display).

   `dbfcvt -q -i%1 -o%1` (converts the CNA item information to dBASE format).

   `rrcreate -q -r<REPORT_NAME> -l%1` (creates the R&R control file which contains the name (<REPORT_NAME>) of the final report and the report library. The name of the control file is rrunin.).

   `..\rr\rruntime rrunin` (runs the R&R runtime program, which takes the contents of rrunin to create your customized report).

4. From the Main menu, press <4>. The Configure System menu will display.

5. Press <2>. The Print/Log Setup menu will display.

6. Enable (set to 1) External Reports.

7. Enter the name of the .EXT file you created in Step 2.

APPENDIX E CREATING CUSTOM REPORTS USING SCRIPT FILES

This appendix describes how you can create templates to customize reports. Using this method, you can select which measurement data you need in a report, and how it is presented.

The system supports a general purpose report writing facility that allows users to generate fast easy custom reports. You need to create a Script file (with an extension of .SCR) for each type of report you wish to generate.

To use your Script file

1. From the Main menu, press <4>. The Configure System menu will display.

2. Press <2>. The Print/Log Setup menu will display.

3. Enable (set to 1) Script Reports.

4. Enter the name of the Script file (.SCR) you created.

If your directory is not the directory the system software is in, then you will need to specify the filepath of your .EXT file.

1. From the Main menu press <4>. The Configure System menu will display.

2. Press <4>. The Internal Parameters menu will display.

3. Press <6>, and change the External Report File Path.

   Enter the path where the external report is located.

In a Script file you will need to specify these sections:

- HEADER
- ITEM
- SUMMARY
- PAGE HEADER

When a customized report is generated (from the Script file), you will see the following:

- The Header section printed only once, at the beginning of the report.
- The Item section printed for every item, or device, measured during the test run
- The Summary section printed at the end of the report.
- The Page Header section printed at the beginning of every page.

These sections are generated using the ID numbers of the parameters in the Lot and Item files. These files were generated by the system while tests were being performed. The ID numbers are listed in the following table.

ID	Name	Type	Length	Scalar	Description
100	IDI_LOT_NAME	STR_TYPE	"%s"	1	Lot_Name
101	IDI_SERIALNUMBER	STR_TYPE	"%s"	1	SerialNumber
102	IDI_TARGETFREQ	DBL_TYPE	"%10.6lf"	1	TargetFreq
103	IDI_INITIALFREQ	DBL_TYPE	"%10.6lf"	1	InitialFreq

ID	Name	Type	Length	Scalar	Description
104	IDI_INITIALRES	DBL_TYPE	"%6.2lf"	1	InitialRes
105	IDI_CALCTARGET	DBL_TYPE	"%10.6lf"	1	CalcTarget
106	IDI_MEASURETYPE	INT_TYPE	"%d"	1	MeasureType
107	IDI_FREQUENCY	DBL_TYPE	"%10.6lf"	1	Frequency
108	IDI_LOADFREQUENCY1	DBL_TYPE	"%10.6lf"	1	LoadFrequency[0]
109	IDI_LOADFREQUENCY2	DBL_TYPE	"%10.6lf"	1	LoadFrequency[1]
110	IDI_LOADFREQUENCY3	DBL_TYPE	"%10.6lf"	1	LoadFrequency[2]
111	IDI_TRIMSENSITIVITY1	DBL_TYPE	"%6.2lf"	1	TrimSensitivity[0]
112	IDI_TRIMSENSITIVITY2	DBL_TYPE	"%6.2lf"	1	TrimSensitivity[1]
113	IDI_TRIMSENSITIVITY3	DBL_TYPE	"%6.2lf"	1	TrimSensitivity[2]
114	IDI_RESISTANCE	DBL_TYPE	"%6.1lf"	1.0	Resistance
115	IDI_L1	DBL_TYPE	"%8.3lf"	1.0	L1
116	IDI_C1	DBL_TYPE	"%8.4lf"	1.0	C1
117	IDI_C0	DBL_TYPE	"%7.1lf"	1.0	C0
118	IDI_Q	DBL_TYPE	"%7.0lf"	1.0	Q
119	IDI_LOCKANGLE	DBL_TYPE	"%7.1lf"	1.0	LockAngle
120	IDI_DC	DBL_TYPE	"%7.3lf"	1.0	DC
121	IDI_DP	DBL_TYPE	"%7.3lf"	1.0	DP
122	IDI_TESTRESULT	STR_TYPE	"%s"	1.0	TestResult
123	IDI_DLT_RESERR	DBL_TYPE	"%6.1lf"	1.0	DLT_ResErr
124	IDI_DLT_FREQERR	DBL_TYPE	"%6.1lf"	1.0	DLT_FreqErr
125	IDI_ERRRESISTPCT	DBL_TYPE	"%6.2lf"	1.0	ErrResistPct
126	IDI_ERRL1PCT	DBL_TYPE	"%6.2lf"	1.0	ErrL1Pct
127	IDI_ERRC1PCT	DBL_TYPE	"%6.2lf"	1.0	ErrC1Pct
128	IDI_ERRC0PCT	DBL_TYPE	"%6.2lf"	1.0	ErrC0Pct
129	IDI_ERRQPCT	DBL_TYPE	"%6.2lf"	1.0	ErrQPct
130	IDI_ERRINITIALFREQ	DBL_TYPE	"%6.2lf"	1.0	ErrInitialFreq
131	IDI_ERRINITIALRES	DBL_TYPE	"%6.2lf"	1.0	ErrInitialRes
132	IDI_ERRSERFREQ	DBL_TYPE	"%6.2lf"	1.0	ErrSerFreq
133	IDI_ERRLOADFREQ1	DBL_TYPE	"%6.2lf"	1.0	ErrLoadFreq[0]
134	IDI_ERRLOADFREQ2	DBL_TYPE	"%6.2lf"	1.0	ErrLoadFreq[1]
135	IDI_ERRLOADFREQ3	DBL_TYPE	"%6.2lf"	1.0	ErrLoadFreq[2]
136	IDI_FAILRESIST	INT_TYPE	"%d"	1.0	FailResist
137	IDI_FAILL1	INT_TYPE	"%d"	1.0	FailL1
138	IDI_FAILC1	INT_TYPE	"%d"	1	IDI_FAILC1
139	IDI_FAILC0	INT_TYPE	"%d"	1.0	FailC0
140	IDI_FAILQ	INT_TYPE	"%d"	1.0	FailQ
141	IDI_FAILINITIALFREQ	INT_TYPE	"%d"	1.0	FailInitialFreq
142	IDI_FAILINITIALRES	INT_TYPE	"%d"	1.0	FailInitialRes
143	IDI_FAILSERFREQ	INT_TYPE	"%d"	1.0	FailSerFreq

ID	Name	Type	Length	Scalar	Description
144	IDI_FAILLOADFREQ1	INT_TYPE	"%d"	1.0	FailLoadFreq[0]
145	IDI_FAILLOADFREQ2	INT_TYPE	"%d"	1.0	FailLoadFreq[1]
146	IDI_FAILLOADFREQ3	INT_TYPE	"%d"	1.0	FailLoadFreq[2]
147	IDI_FAILDLT_R	INT_TYPE	"%d"	1.0	FailDLT_R
148	IDI_FAILDLT_F	INT_TYPE	"%d"	1.0	FailDLT_F
149	IDI_STARTDATE	STR_TYPE	"%s"	1.0	StartDate
150	IDI_STARTTIME	STR_TYPE	"%s"	1.0	StartTime
151	IDI_STOPDATE	STR_TYPE	"%s"	1.0	StopDate
152	IDI_STOPTIME	STR_TYPE	"%s"	1.0	StopTime
153	IDI_ST_TIME	LNG_TYPE	"%ld"	1.0	st_time
154	IDI_END_TIME	LNG_TYPE	"%ld"	1.0	end_time
155	IDI_ELAPTIME	DBL_TYPE	"%s"	1.0	elaptime
156	IDI_PLTMAGERR	INT_TYPE	"%d"	1.0	pltmagerr
157	IDI_C0C1	DBL_TYPE	"%7.1lf"	1	C0C1
158	IDI_ERRC0C1	DBL_TYPE	"6.2LF"	1	ErrC0C1
159	IDI_FAILC0C1	INT_TYPE	"%d"	1	FailC0C1

Each item in the Lot and Item files have a unique ID # that allows it to be specified. In addition, each item has a default format, in C language printf style, to allow default output formats. Each item can be scaled with an additional parameter to achieve more reasonable displays.

Each section contains:

- An image section that is a picture of what the output should look like with position identifiers for locating the data items.
- A data ID section that identifies which parameters to display, and also allows insertion of control commands to forced pagination or line control.

The following is an example of an SCR file. Note that a line containing only a number is specifying that the parameter with that ID# should be placed here.

```
*************************************************************************
This is the sample header section.  Fields that are located here are typically
lot specific information like items found in the 'lot' information.


.HBEGIN                  <- header section delimiter
 System File   : ^
 Log File      : ^
 Date          : ^
 Time          : ^
 Run Time      : ^
 Total Tested  : ^
 Total Passed  : ^
 Total Failed  : ^

 Target Freq   : ^
 ESR           : ^
 Drive Power   : ^
```

```
 Specification
   Max F       : ^
   Min F       : ^
   Max R       : ^

.end             <- End of image section of Header section
201          <- these data items use the default format
200
225
226
231
220
221
222
207 "%10.21f" 0.5  <- this data item uses a special format & scale term
219
218
246
255
250
.page <- this forces a page break to start a new page
.end

.pbegin <- this is the delimiter for the start of the page header
THIS IS THE PAGE HEADER    NUM              FREQ                          R
-------------------------------------------------------------------------
.end
.end

.IBEGIN <- this starts the item section
THIS IS THE ITEM DATA. # = ^        Freq : ^                Resistance : ^
.end
101
107
114
.end


.SBEGIN  <- this starts the summary section

 System File   : ^
 Log File      : ^
 Date          : ^
 Time          : ^
 Run Time      : ^
 Total Tested  : ^
 Total Passed  : ^
 Total Failed  : ^

 Target Freq   : ^
 ESR           : ^
 Drive Power   : ^


 Specification
   Max F       : ^
   Min F       : ^
   Max R       : ^

.end
201
200
```

```
225
226
231
220
221
222
207
219
218
246
255
250
.end
```

The following is a list of all the available data items:

```
#ifndef CUSTMRPT_H
#define CUSTMRPT_H

/*    custmrpt.h

Defines for file driven customized report generator.
Each data item available for output to the report file is assigned
a unique identifier. The report consists of a "lot" header output
when plating begins, item info output after each part is plated
and a "lot" summary output after the last cpart in the "lot" is
plated.

By definition a lot is the group of parts specified by the start
magazine and carrier positions and number of parts to plate command.

Content and format of each section is defined in report definition files.
Each line in the file is a data ID and printf format for that data item.

NOTE
      The printf format should not include escape sequence
      characters such as \n, \t, \f, etc. The scanf function
      prepends these with a "\" and they are then not properly
      interpreted by the fprintf function.

      For now separate filed codes are used to output a \n or \f


#define STR_TYPE 0
#define INT_TYPE 1
#define DBL_TYPE 2
#define LNG_TYPE 3

struct idmap {
    int id;
    void *param;
    int type;
    char dfltfmt[20];
    double dfltscale;
};

#define MAXFMTSZ  130         /* max format string length */

/*************************************************************************
      NEVER NEVER NEVER change, remove, or re-use identifiers
*************************************************************************/

#define ID_COMMENT            -1 /* We DO support comments in the files */
#define ID_NEWLINE            -2 /* "\n" */
#define ID_FORMFEED           -3 /* "\f" */

#define ID_NULL               0  /* string only in format, no data */

#define ID_SYSVERSION         1
#define ID_SYSBUILDDATE       2
#define ID_SYSBUILDTIME       3

#define ID_SCRIPTFILEPATH  18
#define ID_SCRIPTFILENAME  19
#define ID_SCRIPTITMFILENAME  20
#define ID_SCRIPTSUMFILENAME  21
```

```
#define ID_CURRENTDATE          56
#define ID_CURRENTTIME          57
```

The following table lists the Lot File parameters available:

ID	Name	Type	Length	Scalar	Description
200	IDL_LOGFILENAME	STR_TYPE	"%s"	1.0	LogFileName
201	IDL_SYSFILENAME	STR_TYPE	"%s"	1.0	SysFileName
202	IDL_MCTFILENAME	STR_TYPE	"%s"	1.0	MCTFileName
203	IDL_LOGFILEPATH	STR_TYPE	"%s"	1.0	LogFilePath
204	IDL_SYSFILEPATH	STR_TYPE	"%s"	1.0	SysFilePath
205	IDL_MCTFILEPATH	STR_TYPE	"%s"	1.0	MCTFilePath
206	IDL_RPTFMT	INT_TYPE	"%d"	1	rptfmt
207	IDL_TARGETFREQ	DBL_TYPE	"%10.6lf"	1.0	TargetFreq
208	IDL_LOADCAPMODE	INT_TYPE	"%d"	1.0	LoadCapMode
209	IDL_LOADFREQ0	DBL_TYPE	"%10.6lf"	1.0	LoadFreq[0
210	IDL_LOADFREQ1	DBL_TYPE	"%10.6lf"	1.0	LoadFreq[1]
211	IDL_LOADFREQ2	DBL_TYPE	"%10.6lf"	1.0	.LoadFreq[2]
212	IDL_TARGETCAP0	DBL_TYPE	"%7.3lf"	1.0	TargetCap[0]
213	IDL_TARGETCAP1	DBL_TYPE	"%7.3lf"	1.0	TargetCap[1]
214	IDL_TARGETCAP2	DBL_TYPE	"%7.3lf"	1.0	TargetCap[2
215	IDL_CL2_REF	DBL_TYPE	"%7.3lf"	1.0	CL2_Ref
216	IDL_CL3_REF	DBL_TYPE	"%7.3lf"	1.0	CL3_Ref
217	IDL_INSERTCAP	DBL_TYPE	"%7.3lf"	1	InsertCap
218	IDL_DRIVEPOWER	DBL_TYPE	"%7.3lf"	1.0	DrivePower
219	IDL_ESR	DBL_TYPE	"%7.3lf"	1.0	ESR
220	IDL_PLATINGATTEMPTS	INT_TYPE	"%d"	1.0	PlatingAttempts
221	IDL_TOTALPASSED	INT_TYPE	"%d"	1.0	TotalPassed
222	IDL_TOTALFAILED	INT_TYPE	"%d"	1.0	TotalFailed
223	IDL_POSTPLATEMEASERR	INT_TYPE	"%d"	1.0	PostPlateMeasErr
224	IDL_POSTPLATESPECFAIL	INT_TYPE	"%d"	1.0	PostPlateSpecFail
225	IDL_STARTDATE	STR_TYPE	"%s"	1.0	StartDate
226	IDL_STARTTIME	STR_TYPE	"%s"	1	StartTime
227	IDL_STOPDATE	STR_TYPE	"%s"	1.0	StopDate
228	IDL_STOPTIME	STR_TYPE	"%s"	1.0	StopTime
229	IDL_ST_TIME	LNG_TYPE	"%ld"	1	st_time
230	IDL_END_TIME	LNG_TYPE	"%ld"	1.0	end_time
231	IDL_ELAPTIME	LNG_TYPE	"%ld"	1.0	elaptime
232	IDL_NOMSERENB	INT_TYPE	"%d"	1.0	NomSerEnb
233	IDL_NOMLOADENB0	INT_TYPE	"%d"	1.0	NomLoadEnb[0]
234	IDL_NOMLOADENB1	INT_TYPE	"%d"	1	NomLoadEnb[1]
235	IDL_NOMLOADENB2	INT_TYPE	"%d"	1.0	NomLoadEnb[2]

ID	Name	Type	Length	Scalar	Description
236	IDL_NOMRESISTEN	INT_TYPE	"%d"	1.0	NomResistEn
237	IDL_NOML1ENB	INT_TYPE	"%d"	1.0	NomL1Enb
238	IDL_NOMC1ENB	INT_TYPE	"%d"	1.0	NomC1Enb
239	IDL_NOMC0ENB	INT_TYPE	"%d"	1.0	NomC0Enb
240	IDL_NOMQENB	INT_TYPE	"%d"	1.0	NomQEnb
241	IDL_DLT_ENABLED	INT_TYPE	"%d"	1.0	DLT_Enabled
242	IDL_DLT_MAXR	DBL_TYPE	"%7.3lf"	1.0	DLT_MaxR
243	IDL_DLT_MAXF	DBL_TYPE	"%7.3lf"	1.0	DLT_MaxF
244	IDL_DLT_LEVEL	DBL_TYPE	"%7.3lf"	1.0	DLT_Level
245	IDL_DLT_ANGLE	DBL_TYPE	"%7.3lf"	1.0	DLT_Angle
246	IDL_ULIMSERFREQ	DBL_TYPE	"%7.3lf"	1.0	ULimSerFreq
247	IDL_ULIMLOADFREQ0	DBL_TYPE	"%7.3lf"	1.0	ULimLoadFreq[0]
248	IDL_ULIMLOADFREQ1	DBL_TYPE	"%7.3lf"	1	ULimLoadFreq[1]
249	IDL_ULIMLOADFREQ2	DBL_TYPE	"%7.3lf"	1.0	ULimLoadFreq[2]
250	IDL_ULIMRESISTPCT	DBL_TYPE	"%7.3lf"	1.0	ULimResistPct
251	IDL_ULIML1PCT	DBL_TYPE	"%7.3lf"	1.0	ULimL1Pct
252	IDL_ULIMC1PCT	DBL_TYPE	"%7.3lf"	1.0	ULimC1Pct
253	IDL_ULIMC0PCT	DBL_TYPE	"%7.3lf"	1.0	ULimC0Pct
254	IDL_ULIMQPCT	DBL_TYPE,	"%7.3lf"	1.0	ULimQPct
255	IDL_LLIMSERFREQ	DBL_TYPE	"%7.3lf"	1.0	LLimSerFreq
256	IDL_LLIMLOADFREQ0	DBL_TYPE	"%7.3lf"	1.0	LLimLoadFreq[0]
257	IDL_LLIMLOADFREQ1	DBL_TYPE	"%7.3lf"	1.0	LLimLoadFreq[1]
258	IDL_LLIMLOADFREQ2	DBL_TYPE	"%7.3lf	1.0	LLimLoadFreq[2]
259	IDL_LLIMRESISTPCT	DBL_TYPE	"%7.3lf"	1	LLimResistPct
260	IDL_LLIML1PCT	DBL_TYPE	"%7.3lf"	1.0	LLimL1Pct
261	IDL_LLIMC1PCT	DBL_TYPE	"%7.3lf"	1.0	LLimC1Pct
262	IDL_AVGINITIALFREQ	DBL_TYPE	"%10.6lf"	1.0	AvgInitialFreq
263	IDL_AVGINITIALRES	DBL_TYPE	"%7.1lf"	1.0	AvgInitialRes
264	IDL_AVGSERFREQ	DBL_TYPE	"%10.6lf"	1	AvgSerFreq
265	IDL_AVGLOADFREQ0	DBL_TYPE	"%10.6lf"	1.0	AvgLoadFreq[0]
266	IDL_AVGLOADFREQ1	DBL_TYPE	"%10.6lf"	1.0	AvgLoadFreq[1]
267	IDL_AVGLOADFREQ2	DBL_TYPE	"%10.6lf"	1.0	AvgLoadFreq[2]
268	IDL_AVGTRIMSENS0	DBL_TYPE	"%7.3lf"	1.0	AvgTrimSens[0]
269	IDL_AVGTRIMSENS1	DBL_TYPE	"%7.3lf"	1.0	AvgTrimSens[1]
270	IDL_AVGTRIMSENS2	DBL_TYPE	"%7.3lf"	1.0	AvgTrimSens[2]
271	IDL_AVGRESIST	DBL_TYPE	"%7.1lf"	1.0	AvgResist
272	IDL_AVGL1	DBL_TYPE	"%7.3lf"	1.0	AvgL1
273	IDL_AVGC1	DBL_TYPE	"%8.4lf"	1.0	AvgC1
274	IDL_AVGC0	DBL_TYPE	"%7.1lf"	1.0	AvgC0
275	IDL_AVGQ	DBL_TYPE	"%7.0lf"	1.0	AvgQ

ID	Name	Type	Length	Scalar	Description
276	IDL_STDINITIALFREQ	DBL_TYPE	"%7.3lf"	1.0	StdInitialFreq
277	IDL_STDINITIALRES	DBL_TYPE	"%7.3lf"	1.0	StdInitialRes
278	IDL_STDSERFREQ	DBL_TYPE	"%7.3lf"	1.0	StdSerFreq
279	IDL_STDLOADFREQ0	DBL_TYPE	"%7.3lf"	1.0	StdLoadFreq[0]
280	IDL_STDLOADFREQ1	DBL_TYPE	"%7.3lf"	1.0	StdLoadFreq[1]
281	IDL_STDLOADFREQ2	DBL_TYPE	"%7.3lf"	1.0	StdLoadFreq[2]
282	IDL_STDTRIMSENS0	DBL_TYPE	"%7.3lf"	1.0	StdTrimSens[0]
283	IDL_STDTRIMSENS1	DBL_TYPE	"%7.3lf"	1.0	StdTrimSens[1]
284	IDL_STDTRIMSENS2	DBL_TYPE	"%7.3lf"	1.0	StdTrimSens[2]
285	IDL_STDRESIST	DBL_TYPE	"%7.3lf"	1.0	StdResist
286	IDL_STDL1	DBL_TYPE,	"%7.3lf"	1.0	StdL1
287	IDL_STDC1	DBL_TYPE	"%7.3lf"	1.0	StdC1
288	IDL_STDC0	DBL_TYPE	"%7.3lf"	1.0	StdC0
289	IDL_STDQ	DBL_TYPE	"%7.3lf"	1.0	StdQ
290	IDL_LLIMC0PCT	DBL_TYPE	"%7.3lf"	1.0	LLimC0Pct
291	IDL_LLIMQPCT	DBL_TYPE	"%7.3lf"	1.0	LLimQPct
292	IDL_LLIMC0C1	DBL_TYPE	"%7.3lf"	1.0	LLimC0C1
293	IDL_ULIMC0C1	DBL_TYPE	"%7.3lf"	1.0	ULimC0C1
294	IDL_NOMCOC1ENB	INT_TYPE	"%d"	1.0	NomC0C1Enb
295	IDL_STDCOC1	DBL_TYPE	"%7.3lf"	1.0	StdC0C1
296	IDL_AVGC0C1	DBL_TYPE	"%7.1lf"	1.0	AvgC0C1

APPENDIX F SYSTEM MENUS

The following lists the system menus and where they can be accessed.

Main System menu

1. Run Test
    - F1. Start
    - F2. Edit
    - F3. Add
    - F4. Delete
    - F5. Del All
2. Setup Test
    - F1. Start
    - F2. Modify
        - F1. Start
        - F2. Edit
        - F3. Add
        - F4. Delete
        - F5. Del All
    - F3. Measpar
    - F4. Load
    - F5. Save
    - F6. Create
    - F7. Delete
3. View Data
    1. Select Data Set
    2. Display Data
    3. Print Data
    4. Display Distributions
    5. Print Distributions
    6. Modify Test Specifications
        - F1. Edit
        - F2. Add
        - F3. Delete
        - F4. Del All
    7. Re-generate Test Report
    8. Export Test Data
    9. Delete Log File
4. Configure System
    1. Calibrate Instrument
    2. Print/Log File Maintenance
        1. Modify Setup
        2. View Log File
        3. Print Log File
        4. Delete Log File
        5. Select Script File
        6. Select External File
    3. Quick Measure Mode
        1. Make Measurement
        2. Change Current Setup
        3. Measurement Parameters
        4. Sweep Control
            1. Set Sweep Begin
            2. Set Sweep End
            3. Go to Sweep Begin (CNA 300)
            4. Go to Sweep End (CNA 300)

5. Display Sweep
6. Sweep Parameters
    1. Modify Plot Setup
    2. Modify Printer Setup
    3. Display Plot
    4. Save Plot Setup
7. File Maintenance
    1. View Log File
    2. Print Log File
    3. Create Log File
    4. Delete Log File
    5. Load Setup
    6. Save Setup
    7. Create Setup
    8. Delete Setup
8. Internal Parameters
    1. System Parameters
    2. Digital I/O Parameters
    3. External Parameters
    4. FFC Card Parameters (CNA 300)
    5. Calibration File Maintenance
    6. File Path Maintenance
    7. Calibrate Instrument
    8. Alternative Spurious Search

4. Internal Parameters
    1. System Parameters
    2. Digital I/O Parameters
    3. External Parameters
    4. FFC Card Parameters (CNA 300)
    5. Calibration File Maintenance
    6. File Path Maintenance
    7. Plating Rate Control Parameters (CNA 300)
    8. Alternative Spurious Search

APPENDIX G SAMPLE REPORTS

This section contains several sample print reports showing the different type of formats when different tests are selected.

NOTE These printouts do not indicate failed parameters with PASS or FAIL as was displayed on the screen when you ran the tests. An asterisk (*) indicates PASS or FAIL.

Report with Frequency Test ONLY

```
TRANSAT Measurement System LOT REPORT Date : August 31, 1995 Time : 06:34 PM
-------------------------------------------------------------------------------------------------
 Lot Setup:
 Log File Name       : MTEST
 System File         : MTEST
 Calibration File    : SYSTEM
 Report Type         : COMPLETE
 Target Freq    MHz  : 10.000000
 Load CL Mode        : SERIES
 Insert CL       pF  : 0.00
-------------------------------------------------------------------------------------------------
 Specifications:
                      Enable   Upper    Lower
 Series F              1        200.0    -200.0
-------------------------------------------------------------------------------------------------

 TRANSAT Measurement System LOT REPORT      Current Date : August 31, 1995 Time : 06:34 PM
 Lot Name            : MTEST
-----------------------------------------------
Serial Number      F          Err ppm    DP(uW)
-----------------------------------------------
CNA300_1         9.9983578    -164.2     96.89
CNA300_2         9.9983577    -164.2     97.08
CNA300_3         9.9983577    -164.2     97.07
CNA300_4         9.9983577    -164.2     97.07
CNA300_5         9.9983577    -164.2     97.07
CNA300_6         9.9983577    -164.2     97.07
CNA300_7         9.9983576    -164.2     97.06
CNA300_8         9.9983576    -164.2     97.07
CNA300_9         9.9983576    -164.2     97.07
CNA300_10        9.9983576    -164.2     97.09

TRANSAT Measurement System LOT REPORT Date : August 31, 1995 Time : 06:34 PM

-------------------------------------------------------------------------------------------------
 Performance Summary:
 Run Date : 31 Aug 1995 Start : 18:33:57 Stop : 18:34:18
 Number of Measurements made                : 10
 Total number that passed specifications    : 10
 Total number that failed specifications    : 0
 Total number of measurement errors         : 0
 Total number of specification failures     : 0


                        AVG          STD
                       ------       ------
 Series F             9.9983577    0.0000001
-------------------------------------------------------------------------------------------------
```

Report with Frequency, Resistance, L1, C1, C0, C0/C1 and Q Tests

TRANSAT Measurement System LOT REPORT Date : November 8, 1996 Time : 10:46 AM

Lot Setup:
Log File Name : logfile
System File : SYSFILE
Calibration File : SYSTEM
Report Type : COMPLETE
Target Freq MHz : 9.997000
Load CL Mode : SERIES
Insert CL pF : 12.00

Specifications:

	Enable	Upper	Lower
Series F	1	100.0	0.0
R	1	15.0	0.0
L1	1	40.0	0.0
C1	1	26.000	0.000
C0	1	4.1	1.1
Q	1	100.0	0.0
C0/C1	1	400.0	100.0

TRANSAT Measurement System LOT REPORT Current Date : November 8, 1996 Time : 10:46 AM
Lot Name : SYSFILE

Serial Number	F	Err ppm	R	L1	C1(fF)	C0(pF)	Q	DP(uW)	C0/C1
TRANSAT_1	9.9976991	69.9	13.4	16.544	15.318	1.86	77.8	122.847	121.23
TRANSAT_2	9.9976990	69.9	13.4	16.582	15.283	1.86	77.9	122.893	121.51
TRANSAT_3	9.9976992	69.9	13.4	16.564	15.299	1.86	77.5	123.057	121.38
TRANSAT_4	9.9976991	69.9	13.4	16.484	15.374	1.86	77.2	122.981	120.78
TRANSAT_5	9.9976991	69.9	13.4	16.580	15.285	1.86	77.6	123.032	121.49
TRANSAT_6	9.9976992	69.9	13.4	16.593	15.273	1.86	77.6	123.072	121.59
TRANSAT_7	9.9976992	69.9	13.4	16.566	15.297	1.86	77.5	123.051	121.39
TRANSAT_8	9.9976992	69.9	13.4	16.575	15.289	1.85	77.5	123.048	121.24
TRANSAT_9	9.9976991	69.9	13.4	16.631	15.238	1.86	77.8	123.066	121.87
TRANSAT_10	9.9976991	69.9	13.4	16.584	15.281	1.86	77.6	123.048	121.52

TRANSAT Measurement System LOT REPORT Date : November 8, 1996 Time : 10:47 AM

Performance Summary:
Run Date : 8 Nov 1996 Start : 10:46:51 Stop : 10:47:06
Number of Measurements made : 10
Total number that passed specifications : 10
Total number that failed specifications : 0
Total number of measurement errors : 0
Total number of specification failures : 0

	AVG	STD
Series F	9.9976991	0.0000000
R	13.4	0.026177
L1	16.6	0.037838
C1	15.294	0.034994
C0	1.9	0.001051
Q	77.6	0.181573
C0/C1	121.4	0.283101

IMPORTANT

This Addendum is intended for customers who purchase computers independently for CNA applications. Transat control and frequency cards use the computer PCI bus. After installation of PCI cards, the computer BIOS will detect and assign base addresses to each PCI card. You, the customer, must then determine the address assigned to each PCI card and enter this address into the Transat operating software.

The installation disk for the Cna-300/Sys now includes a subdirectory called FindPCI. When the application is installed to a user's computer, this directory will be copied to the 'C' drive of the computer.

The \FindPCI directory has two files:

FindPCI.exe => executable that runs in DOS to locate the PCI address of FFC and/or DIO-24 cards.
FindPCI.dat => file used by the FindPCI executable, it lists the cards to look for

To run the program, go to the FindPCI subdirectory and type the executable name.

C:\> cd:\FindPCI (changes the path to the proper subdirectory)
C:\> FindPCI (executes the program)

The output of the program is a listing of the PCI cards found in the computer, along with their assigned address.

Example output:

```
Fast Frequency Card
        Address: 0xDC00

DIO24
        Address: 0xE040
```

After running the FindPCI program, you must enter the assigned addresses into the CNA System Software.

To do this, you must start the software in Demonstration Mode.

C:\> cd:\testmeas (changes the path to the proper subdirectory)
C:\> testmeas -a (executes the demonstration program)

To enter the address for the PIO24 card used to talk to the CNA: (refer to section 8.4.2, page 58, of the operating manual.)
From the main operating menu select item:

4. Configure System. Then from the Configuration Menu select:
    4. Internal Parameters. Then from the Internal Parameter Menu select:
        2. Digital I/O Parameters. Enter the CNA address parameter:
            CNA PIO-24 Base Address:

To enter the address for the PIO24 card used for External I/O: (refer to section 8.4.3, page 59, of the operating manual.)
From the main operating menu select:

4. Configure System. Then from the Configuration Menu select:
    4. Internal Parameters. Then from the Internal Parameter Menu select:
        3. External I/O Parameters. Enter the I/O address parameter:
            I/O PIO-24 Base Address:

To enter the address for the FFC: (refer to section 8.4.4, page 60, of the operating manual.)
From the main operating menu select:

4. Configure System. Then from the Configuration Menu select:
    4. Internal Parameters. Then from the Internal Parameter Menu select:
        7. FFC Card Parameters. Enter the FFC address parameter:
            Base Address:

After configuring the PCI card addresses, Press the [Esc] key repeatedly to get back to the main operating menu, then simultaneously press the [ALT] and [F10] keys.

After the demonstration mode shut down, turn the computer off, then restart the computer.