Film-Tech

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Reference Manual

Hardware designed by Gary Kephart, Tomlinson Holman & Tim Holmes.
Software engineered by Donald Swearingen
Written by Marco d'Ambrosio, Tomlinson Holman, Tim Holmes, and Fiona Peers Artiaga.

R2 Registration Card

Please take a few minutes to fill out this registration card. It will provide us with helpful information so that we can inform you of software updates or product seminars. (Please print or type)

First name _____ Middle initial

Last name _____

Company name _____

Department/address _____

Additional address information _____

City/Country _____ State _____ ZIP _____

Daytime phone with area code _____ Purchase date (MMDDYY) _____

Product Survey

1. Do you own an Ivie PC-40 Audio Spectrum Analyzer? ❑ Yes ❑ No

2. Have you ever attended a THX Audio Seminar? ❑ Yes ❑ No

3. Are you interested in attended a THX Audio Seminar for the R2? ❑ Yes ❑ No

4. Are you interested in receiving any of the following information:

❑ THX Approved Equipment List ❑ THX Certified Theatre List ❑ THX Newsletter

General Comments:

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Table of Contents

Preface

ABOUT THIS MANUAL

This manual accompanies the THX R2 Spectrum Analyzer software and hardware. It is divided into four parts.

- The *Preface* provides information about the intent and organization of the manual.
- The *Introduction* is an overview of the THX R2 Spectrum Analyzer.
- The *Operation Overview* provides information about each of the menus, sub-menus and options.
- The section on *Using the R2 Analyzer* explains how to use the Analyzer and what information is presented to assist you in analyzing the results of the measurements.

AUDIENCE

This manual is meant for use by theater sound technicians who are familiar with standard industry terminology. Basic understanding of real time acoustic measurements is assumed.

Introduction

THEORY

The THX R2 Analyzer is a classical Real-Time analyzer with some important new additions to sound technology that improve both the accuracy of acoustical and electrical measurements and also the ease with which these measurements can be taken. The R2 has the ability to measure frequency response curves acoustically or electronically, acoustic background noise level, and reverberation. The measurements are displayed on calibrated screens which show simultaneously the noise criteria curves, reverberation vs. frequency required curves, or the like. This development alone reduces the amount of data manipulation which must be done, since in the past an instrument was used to make a measurement, and then the measurements had to be plotted on special graph paper to see how they compared with specific criteria. In the R2 Analyzer, this work is automatic as the screen displays *both* the results of measurements and the appropriate criteria curve simultaneously.

Today, there are many approaches offered for acoustical measurement. While the classical real-time analyzer seems like one of the oldest techniques around, by improving on the method rather than discarding it for newer developments, gains are seen in accuracy. This is because most of the newer methods are at heart based on FFT analysis which has several problems that are hard to surmount. The FFT, for instance, work fundamentally on a linear frequency scale, dividing the spectrum up in equal amounts of Hertz, such as 0-100, through 19,900-20,000 at 100 Hz intervals. The problem with the results then is that at low frequencies there is not much frequency resolution, while at high frequencies there is more frequency resolution than is useful. And it is just at the low frequencies where the most resolution is needed in many room acoustical tasks. A 1/3-octave-band real time analyzer, on the other hand, has constant resolution on a *logarithmic* frequency scale, automatically.

The new improvements to performance accuracy come out of using microphone multiplexing for spatial averaging and from using a computer to calculate the long-term temporal average. While fat capacitors hung on detectors of inexpensive analyzers slow the display down from the jittery type commonly seen, the best approach to the problem of the random nature of the pink noise source used is to calculate the average correctly over many seconds. In this way, high accuracy is achieved. The spatial average is good enough with four microphones that picking up the microphone array and setting it down in a different group of seats in a cinema will usually result in less than a 1 dB change in each 1/3-octave-band, so the results are reliable

from day-to-day and year-to-year in electro-acoustic tuning. It should be pointed out, however, that a parallel filter band real-time analyzer is blind to one important effect, which must be designed into the sound system under test, and that is it is time blind. Thus, it must be combined with other techniques for original system design; the technique is perfectly fine in the day-to-day setup of sound systems of known correct time characteristics such as the THX Sound System.

The R2 Analyzer uses a bank of 1/3-octave-band switched capacitor filters. This technology is extremely stable, not subject to change with time as are some analog implementations. The filters meet ANSI and ISO standards for acoustical measurements. The bank of filters is followed by 31 logarithmic integrated circuit rms detectors which ensure high accuracy of measurements. Thirty detectors are used for the filters centered on the ISO standard center frequencies from 25 Hz to 20 kHz. An additional detector is used for overall SPL or voltage requirements.

EQUIPMENT REQUIREMENTS

The R2 Spectrum Analyzer requires an IBM compatible computer with:

- 640 k RAM
- one 3.5" high density floppy drive
- one serial port
- graphics adapter for a CGA, EGA, VGA, or Plasma screen
- one parallel port, if printing is required

The THX R2 Acoustical Measurement System includes:

1	THX R2 Spectrum Analyzer software package
1	R2 Spectrum Analyzer unit
1	R2 MultiPlexer Unit (microphone MultiPlexer)
4	Microphones and stands
1	Analyzer to MultiPlexer interconnect cable
1	Power cord for the R2 Analyzer

An RS-232 cable, and carrying case may be optionally included.

POWER REQUIREMENTS

The R2 Analyzer may be run from a variety of power line voltages. Instructions on changing the Analyzer to accept different voltages are included in this Manual.

COMPATIBILITY

The R2 software has been tested under Windows 3.1 and will work as a full DOS-screen program. Make sure that any TSRs or other memory resident programs are loaded after Windows, or loaded into high memory in order to maximize the low DOS memory available to the R2 program. The software will run on OS-2 systems as a DOS application.

The software is not currently compatible with soft-PC or other DOS emulation software on the Macintosh platform. Testing is presently underway to test compatibility with Windows NT.

Compatibility with disk compression utilities is currently underway. Use of these utilities is not currently recommended.

R2 Analyzer Operation Overview

FUNCTIONS

The R2 software is a menu-driven system that allows you to choose different operations by using the function keys at the top of your keyboard. The Main Menu branches into four main areas: Real Time Frequency Response (**F1**), Background Noise (**F2**), Reverberation Time Measurements (**F3**), and Configuration (**F9**). The Help Key (**F10**) is available at all levels of the system.

Each of the four main areas includes sub-menus that allow you to further define the parameters of your measurements. Each of these sub-menus is described in detail under the appropriate choice from the Main Menu.

To return to a menu at a higher level, press 'esc' to step back up through the menus, until you reach the desired one. If you press 'esc' at the Main Menu, a prompt will ask if you would like to return to DOS.

Certain menus also repeat within different test programs. There are 21 unique menus, handling 38 applications. The most commonly repeated menus are the Real Time test program menus.

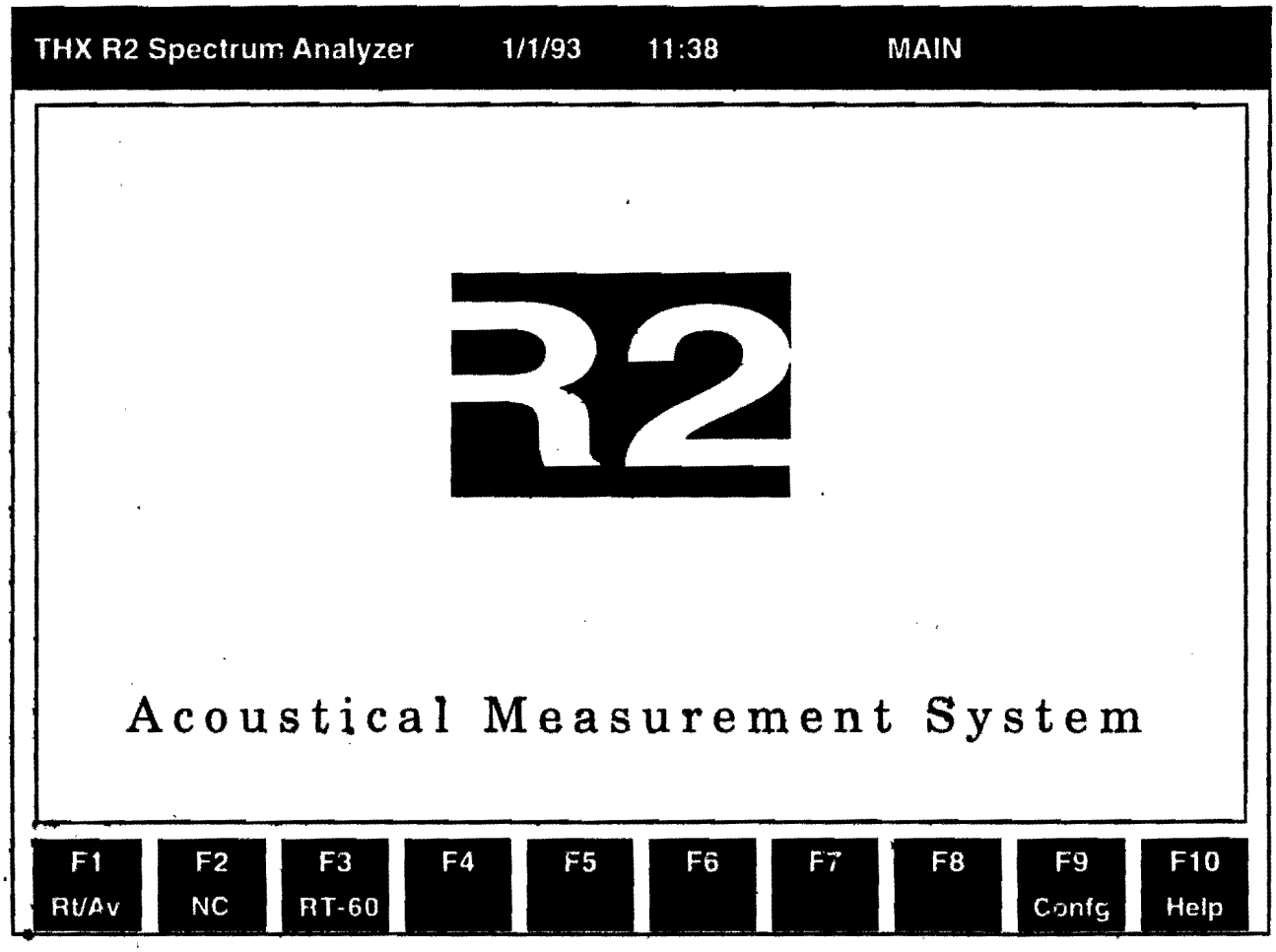
Main Menu

The opening screen displays the R2 logo in the center of the screen - an easy reference to the main menu status. The main menu screen will display, from left to right;

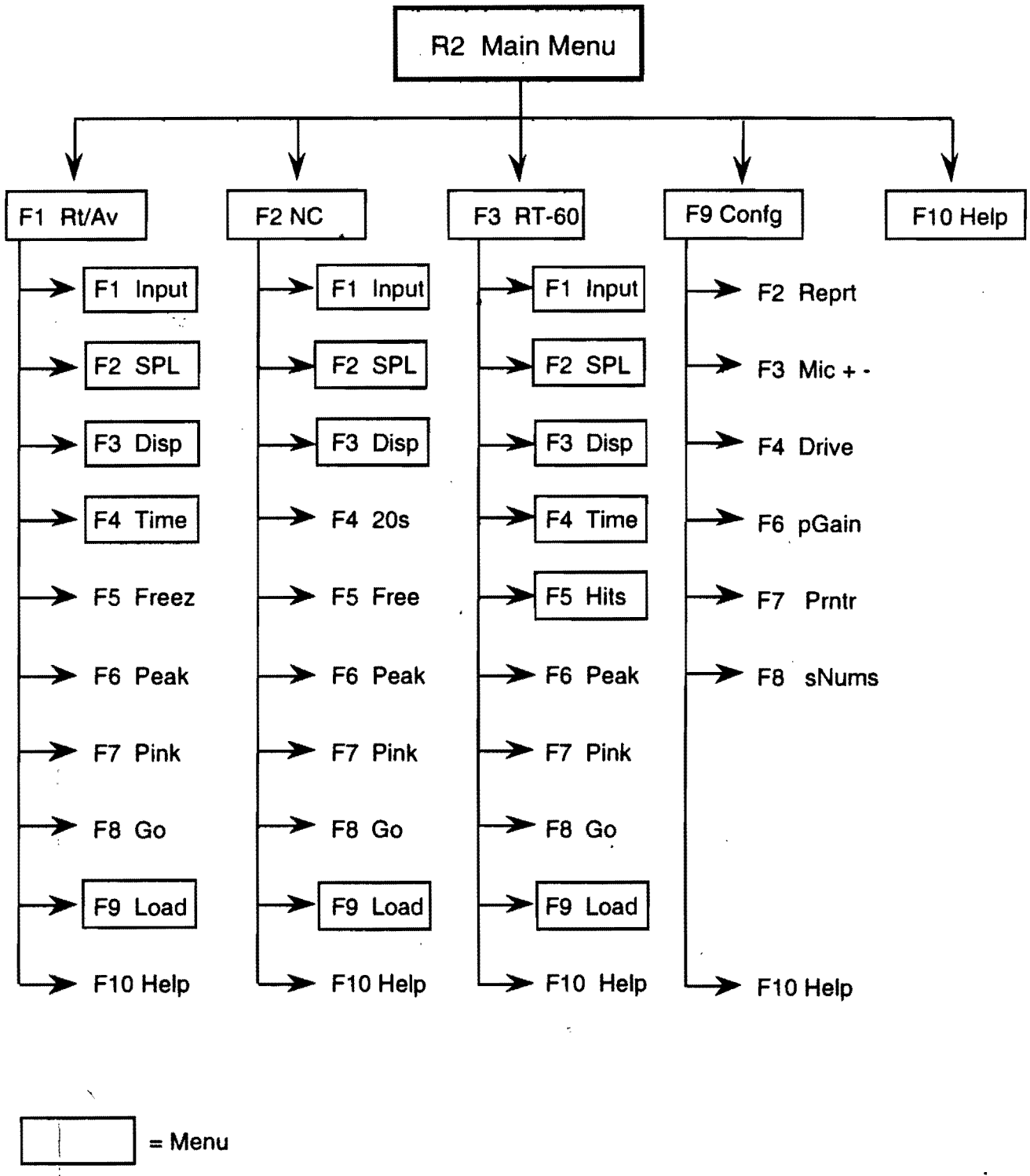
- THX R2 Spectrum Analyzer logo
- today's date
- the current time
- current menu title

Function key headings are displayed along the lower edge of the screen. The menu title and function key headings change as you enter different menus screens.

All lower-level menu screens display the same information as the main menu, plus the graphic window to the left, and the status windows to the right of the screen.



The Main Menu and the primary sub-menus are illustrated below:

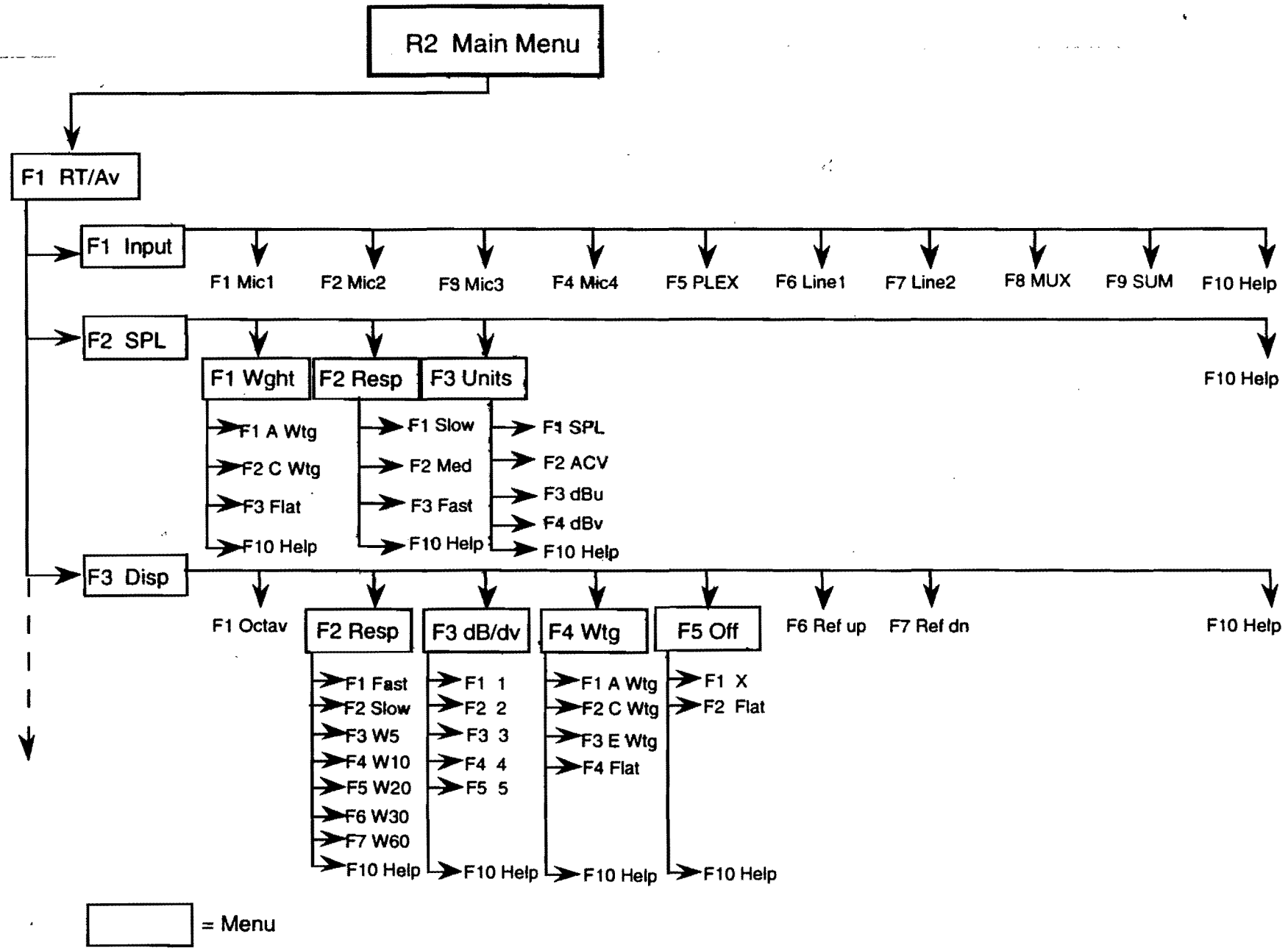


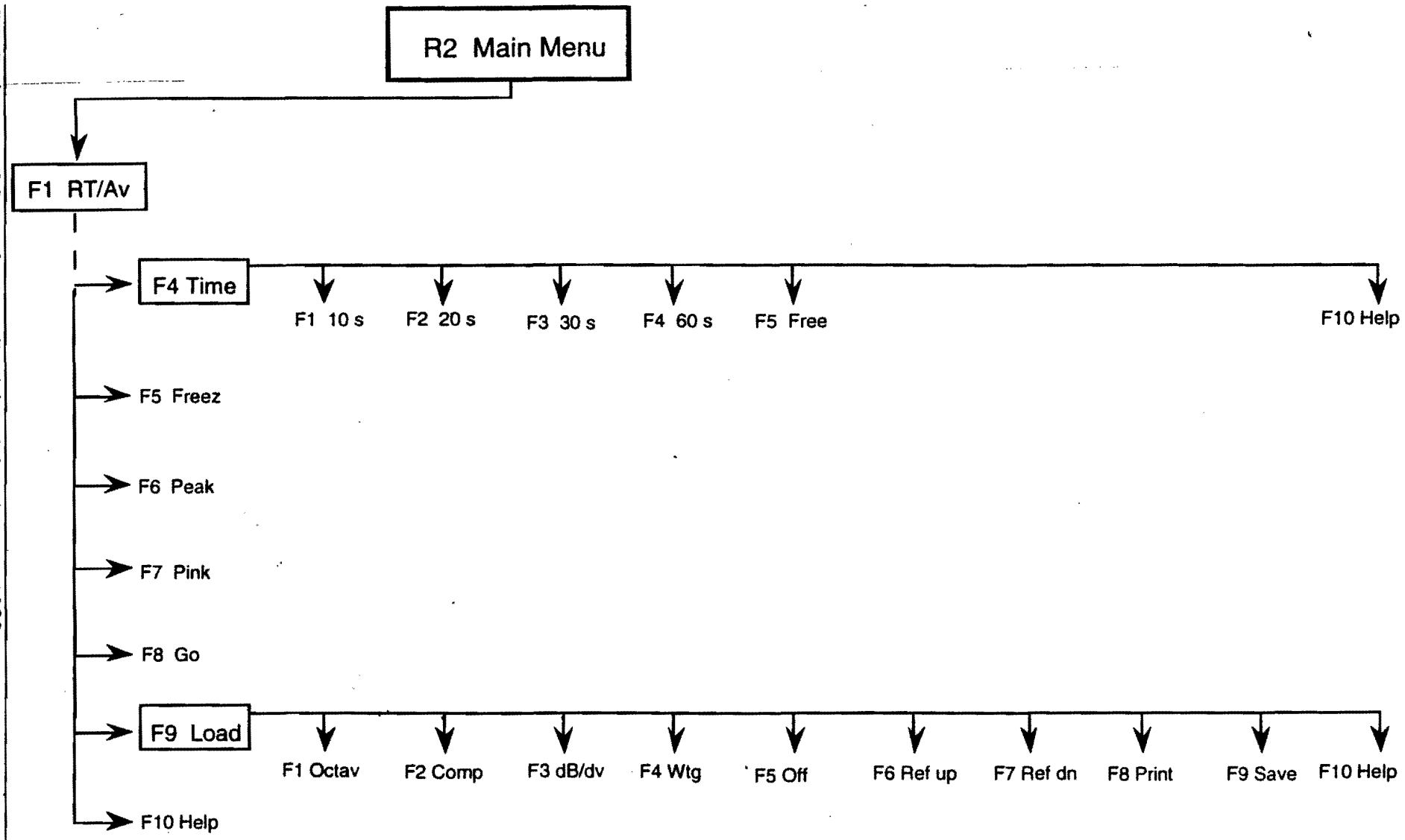
F1 Real-Time Frequency Response

The Real-Time Frequency Response Menu allows you to define the input, SPL, display and time parameters for your measurements. The sub-menu structure for **F1** RT/Av is illustrated on the following pages.

This section includes:

- an illustration of the sub-menu structure
- a brief explanation of the functions and sub-menu choices
- an explanation of the screen layout


R2 Main Menu
F1 RT/Av
F1 Input
F1 Mic1
F2 Mic2
F3 Mic3
F4 Mic4
F5 PLEX
F6 Line1
F7 Line2
F8 MUX
F9 SUM
F10 Help
F2 SPL
F1 Wght
F2 Resp
F3 Units
F10 Help
F1 A Wtg
F2 C Wtg
F3 Flat
F10 Help
F1 Slow
F2 Med
F3 Fast
F10 Help
F1 SPL
F2 ACV
F3 dBu
F4 dBv
F10 Help
F3 Disp
F1 Octav
F2 Resp
F3 dB/dv
F4 Wtg
F5 Off
F6 Ref up
F7 Ref dn
F10 Help
F1 Fast
F2 Slow
F3 W5
F4 W10
F5 W20
F6 W30
F7 W60
F10 Help
F1 1
F2 2
F3 3
F4 4
F5 5
F10 Help
F1 A Wtg
F2 C Wtg
F3 E Wtg
F4 Flat
F10 Help
F1 X
F2 Flat
F10 Help
= Menu


R2 Main Menu
F1 RT/Av
F4 Time
F1 10 s
F2 20 s
F3 30 s
F4 60 s
F5 Free
F10 Help
F5 Freez
F6 Peak
F7 Pink
F8 Go
F9 Load
F1 Octav
F2 Comp
F3 dB/dv
F4 Wtg
F5 Off
F6 Ref up
F7 Ref dn
F8 Print
F9 Save
F10 Help
F10 Help

F1 RT/Av Menu Choices

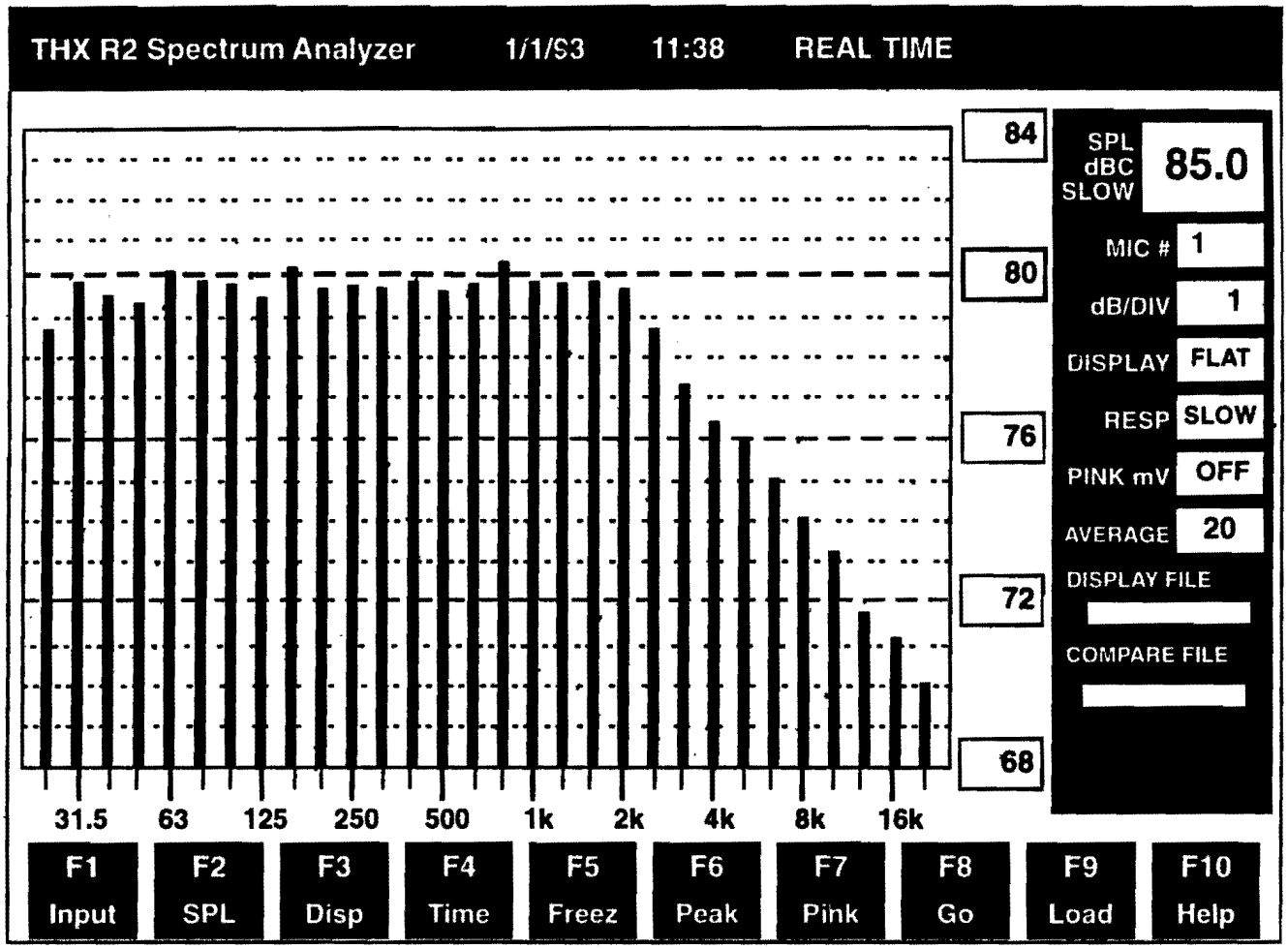
A brief explanation for each of the function keys and sub-menus included in the **F1** Real Time/Averaging choice off of the Main Menu is included in the following table:

F1	**Input**		**Defines input devices. This function has the following sub-menu choices:**
F1	Mic 1		Switches Microphone 1 on/off.
F2	Mic 2		Switches Microphone 2 on/off.
F3	Mic 3		Switches Microphone 3 on/off.
F4	Mic 4		Switches Microphone 4 on/off.
F5	Plex		Multiplexes among defined microphones.
F6	Line 1		Defines Line 1 as an input device, if the R2 microphones are not used.
F7	Line 2		Defines Line 2 as an input device, if the R2 microphones are not used.
F8	MUX		Used for equalization; levels gain for each input device when Lines 1 and 2 are used as input devices.
F9	Sum		Adds Lines 1 and 2 together.
F10	Help		Context Sensitive Help.
F2	**SPL**		**Defines SPL Measurement Parameters. This function has the following sub-menu choices:**
F1	Weighting		Adjusts the spectrum weighting according to the desired measurement method. This sub-menu has the following choices:
	F1	A Wtg.	Defines A weighting for this measurement.
	F2	C Wtg.	Defines C weighting for this measurement.
	F3	Flat	Defines flat weighting for this measurement.
	F10	Help	Context sensitive help.
F2	Response		Defines the response time of the SPL window. This sub-menu has the following choices:
	F1	Slow	Slow response time.
	F2	Fast	Fast response time.
	F10	Help	Context sensitive help.
F3	Units		Defines measurement units for the SPL window. This sub-menu has the following choices:
	F1	SPL	Measures dB SPL.
	F2	ACV	Measures AC volts.
	F3	dBu	Measures dB with reference to .775 volts
	F4	dBv	Measures dB with reference to 1.0 volts.
	F10	Help	Context sensitive help.
F10	Help		Context sensitive help.
F3	**Display**		**Modifies the screen display. This function has the following sub-menu choices:**

F1	Octav		Toggles the display between 1/1 octave and 1/3 octave
F2	Resp		Compares between the current displayed measurement and a defined file.
	F1	Fast	Fast response time.
	F2	Slow	Slow response time.
	F3	W5	Restarts the averaging window every 5 seconds.
	F4	W10	Restarts the averaging window every 10 seconds.
	F6	W30	Restarts the averaging window every 30 seconds.
	F7	W60	Restarts the averaging window every 60 seconds.
	F10	Help	Context sensitive help.
F3	dB/dv		Modifies the display resolution. This sub-menu has the following choices:
	F1	1	1 dB/div
	F2	2	2 dB/div
	F3	3	3 dB/div
	F4	4	4 dB/div
	F5	5	5 dB/div
	F10	Help	Context sensitive help.
F4	Wtg		Defines display weighting. This sub-menu has the following choices:
	F1	A Wtg	Applies A weighting to this measurement.
	F2	C Wtg	Applies C weighting to this measurement.
	F3	E Wtg	Applies E weighting to this measurement.
	F4	Flat	Applies flat weighting to this measurement.
	F10	Help	Context sensitive help.
F5	Off		Applies an offset to the screen display. This sub-menu has the following choices:
	F1	X	ISO 2969 Curve X. Tunes for flat response because the R2 Analyze is boosting high frequencies precisely according to the X curve.
	F2	Flat	No offset
	F10	Help	Context sensitive help.
F6	Ref ⇧		Raises the display reference line. (The display goes down.)
F7	Ref ⇩		Lowers the display reference line. (The display goes up.)
F10	Help		Context sensitive help.

F4	**Time**	**Defines time for the average. This function has the following sub-menu choices:**
F1	10 s	Averages for 10 seconds
F2	20 s	Averages for 20 seconds. This time setting is typically used.
F3	30 s	Averages for 30 seconds
F4	60 s	Averages for 40 seconds
F5	Free	Averages until F8 (stop) is pressed.
F10	Help	Context sensitive help.
F5	**Freeze**	Freezes display.
F6	**Peak**	Shows peak value in each load. Used in fast response mode.
F7	**Pink**	Turns on pink noise generator. Toggles to stop.
F8	**Go**	Starts average. Toggles to stop.
F9	**Load**	**Loads a previously saved file. This function has the following sub-menu choices:**
F1	Octav	Toggles the display between 1/1 octave and 1/3 octave.
F2	Comp	Select file to compare displayed file.
F3	dB/div	Modifies the display resolution.
F4	Wtg	Defines display weighting.
F5	Off	Applies an offset to the screen display.
F6	Ref ⇧	Modifies display. Moves the reference line up.
F7	Ref ⇩	Modifies display. Moves the reference line down.
F8	Print	Prints displayed file.
F9	Save	Saves displayed file.
F10	Help	Context sensitive help.
F10	**Help**	Context sensitive help.

F1 RT/Av Screen Layout



The Real Time screen, entered from **F1** on the main menu screen, contains the following status windows as you read from top to bottom;

- SPL Window. This window has three parameters:
  1. The top parameters identifies the type of measurement made in the SPL window.
  2. Next is the SPL weighting. The value displayed is selected in the Real Time SPL sub-menu.
  3. Next is the SPL response time (fast or slow).

- Microphone #/Line # Window. This window has two parameters:
  1. The constant to the left of the readout reads: "mic#" or "line#" according to the type of input device selected.
  2. The readout to the right displays the actual microphone or line input selected in the Real Time Input sub-menu.

- dB/DIV Window. This window displays the dB/DIV value selected in the Real Time dB/DIV sub-menu.

- Display Window. This window displays the weighting or offset curve selected in the Real Time Display Wtg or Real Time Display Offset sub-menu.

- Resp Window. This window displays the response time (fast or slow) selected in the Real Time Display sub-menu. The function key display toggles to display the opposite of the value chosen for the window to allow you to change the window value at the touch of a key.

- Pink Window. This window displays whether the internal pink noise generator is on or off, as selected in the Real Time sub-menu. **F7** toggles this function on or off.

- Average Window. This window displays the time in seconds used for averaging.

- Display File Window. This window displays the name of the file currently displayed.

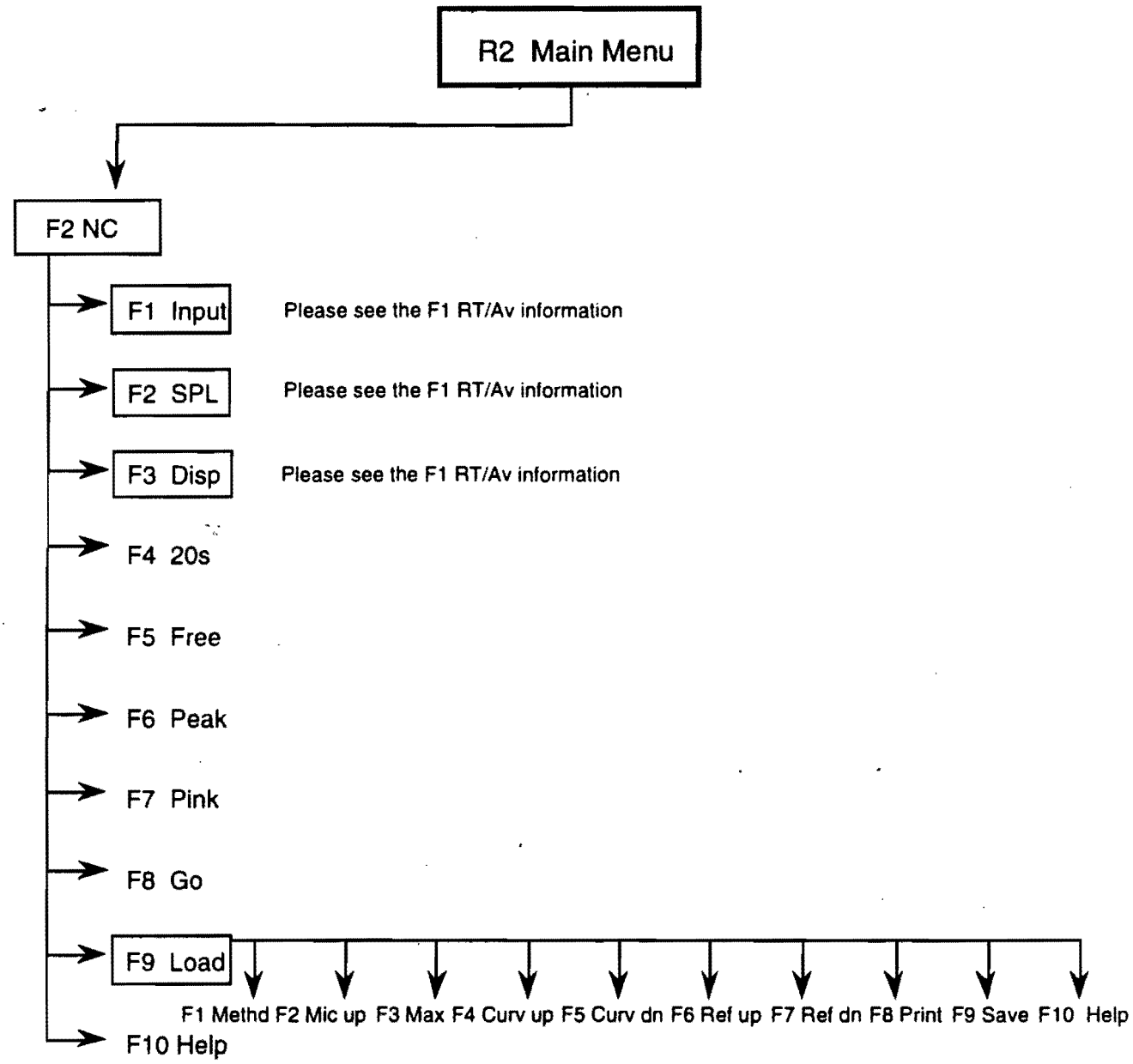
- Compare Window. This window displays the name of the file that is being used for comparison purposes.

F2 Background Noise

The Background Noise Menu allows you to define the input, sound pressure levels, display and time parameters for the background noise included in your measurements. The sub-menu structure for **F2** NC is illustrated on the following page.

This section includes:

- an illustration of the sub-menu structure
- a brief explanation of the functions and sub-menu choices
- an explanation of the screen layout

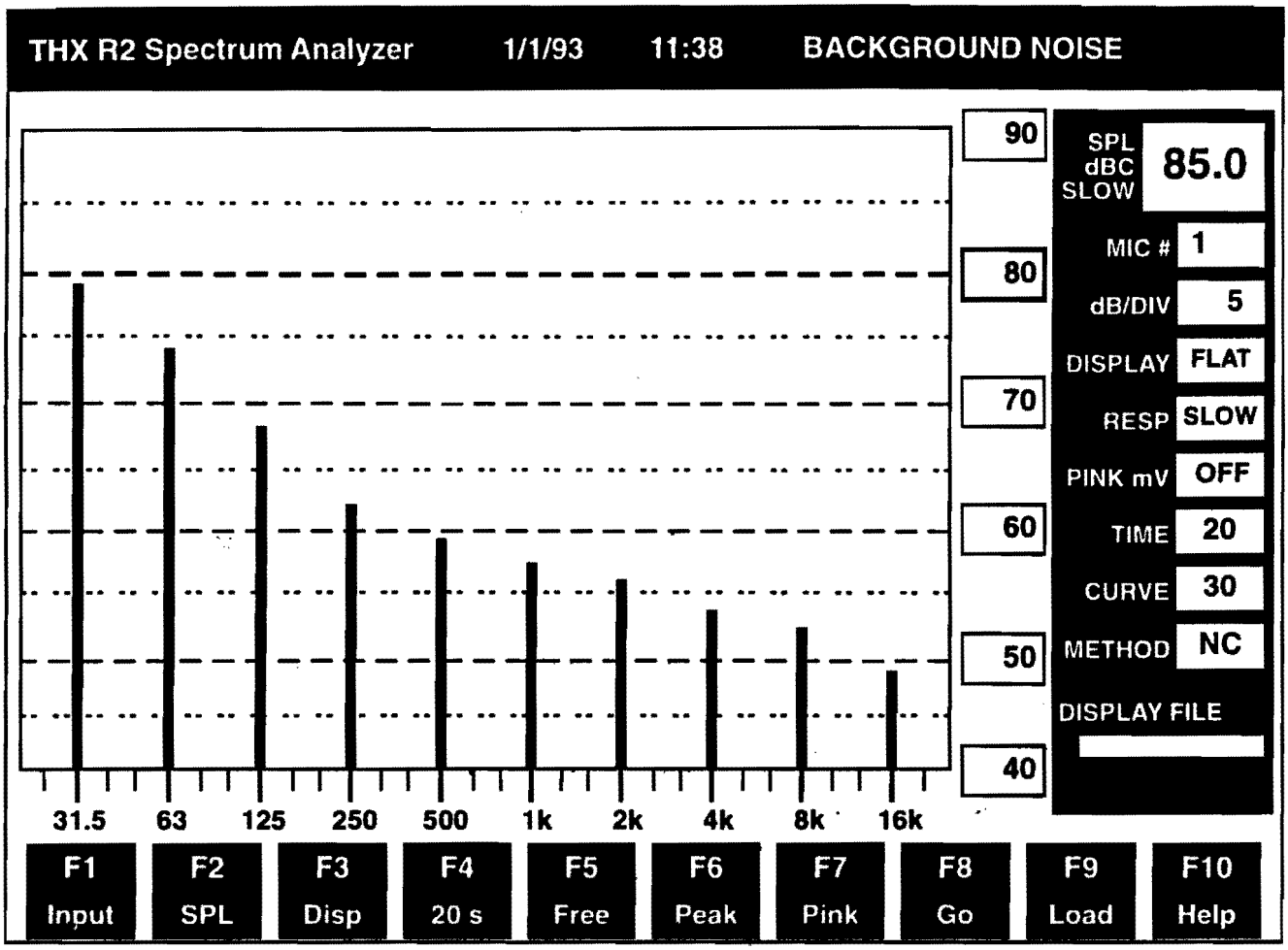

R2 Main Menu
F2 NC
F1 Input
Please see the F1 RT/Av information
F2 SPL
Please see the F1 RT/Av information
F3 Disp
Please see the F1 RT/Av information
F4 20s
F5 Free
F6 Peak
F7 Pink
F8 Go
F9 Load
F1 Methd F2 Mic up F3 Max F4 Curv up F5 Curv dn F6 Ref up F7 Ref dn F8 Print F9 Save F10 Help
F10 Help
= Menu

F2 NC Menu Choices

A brief explanation for each of the function keys and sub-menus included in the **F2** Background Noise choice off of the Main Menu is included in the following table:

F1	**Input**	See the explanation under **F1** RT/Av on page 7.
F2	**SPL**	See the explanation under **F1** RT/Av on page 7.
F3	**Disp**	See the explanation under **F1** RT/Av on page 8.
F4	**20"**	Averages background noise over 20 second intervals.
F5	**Free**	See the explanation under **F1** RT/Av on page 9.
F6	**Peak**	See the explanation under **F1** RT/Av on page 9.
F7	**Pink**	See the explanation under **F1** RT/Av on page 9.
F8	**Go**	Begins measurement of background noise.
F9	**Load**	**Loads a previously saved file. This function has the following sub-menu choices:**
F1	**Methd**	Defines the method for categorizing the measurement. This sub-menu has the following choices:
	F1 NC	Selects the NC noise measurement criteria.
	F2 PNC	Selects the PNC noise measurement criteria.
	F3 RC	Selects the RC noise measurement criteria.
	F10 Help	Context sensitive help.
F2	Mic ⇧	Steps through all the microphones.
F3	Max ⇩	Displays maximum measurement for all microphones, all positions.
F4	Curv ⇩	Moves the NC overlay curve down.
F5	Curv ⇧	Moves the NC overlay curve up.
F6	Ref ⇧	Modifies display. Moves the reference line up.
F7	Ref ⇩	Modifies display. Moves the reference line down.
F8	Print	Prints displayed file.
F9	Save	Saves displayed file.
F10	Help	Context sensitive help.
F10	**Help**	Context sensitive help.

F2 NC Screen Layout



The Background Noise screen contains the same elements as the Real Time menu screen, in the same order, with the addition of Time, Curve and Method windows.

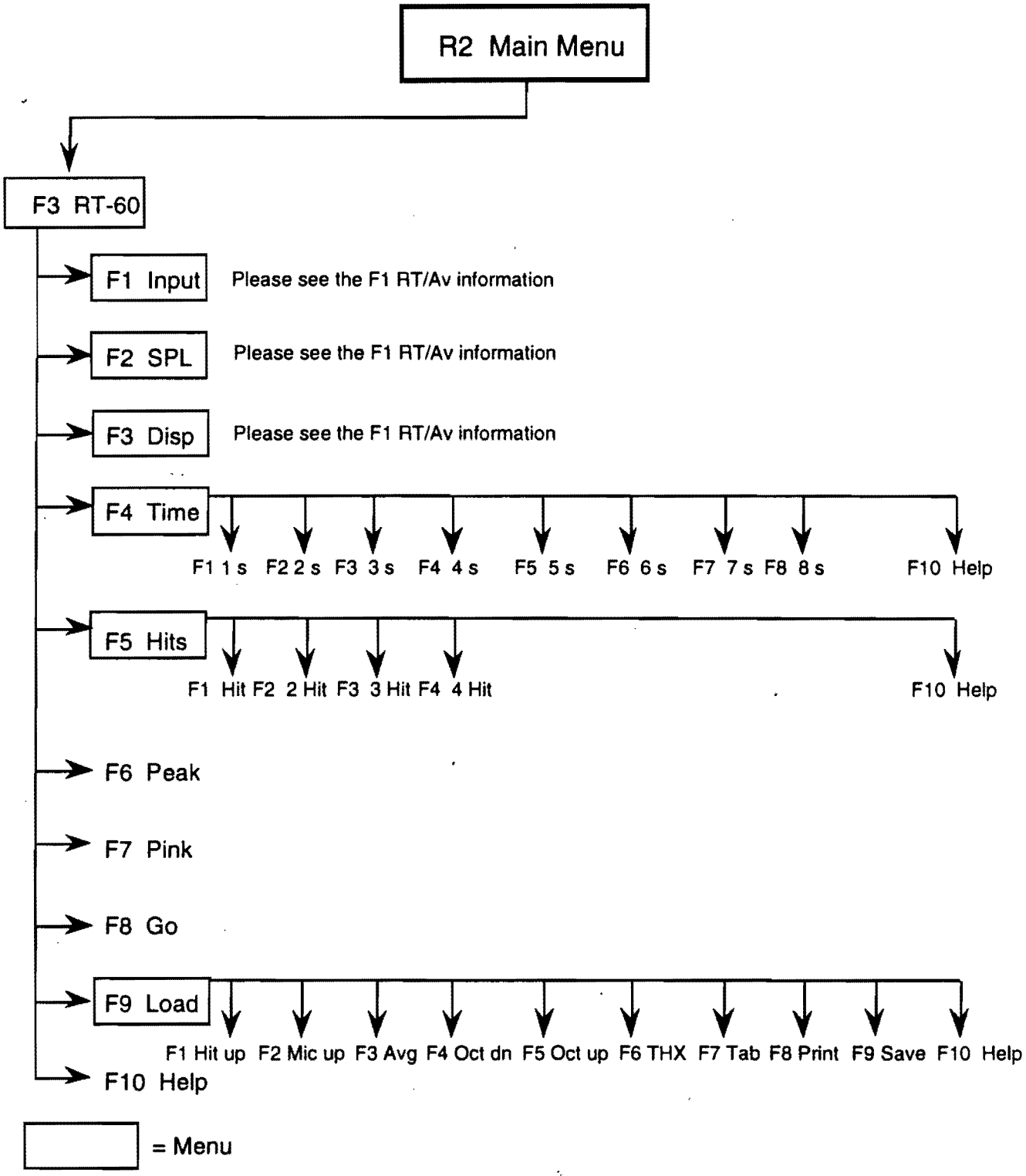
- Time Window. This window shows the test time selected from the Background Noise sub-menu.
- Curve Window. This window shows the NC value that the NC curve represents.
- Method Window. This window shows the background noise evaluation method (i.e., NC, PNC, RC) selected from the Background Noise Method sub-menu.

F3 Reverberation Time Measurements

The Reverberation Time Measurements Menu allows you to define the input, sound pressure levels, display and time parameters for the background noise included in your measurements. The sub-menu structure for **F3** RT-60 is illustrated on the following page.

This section includes:

- an illustration of the sub-menu structure
- a brief explanation of the functions and sub-menu choices
- an explanation of the screen layout


R2 Main Menu
F3 RT-60
F1 Input
Please see the F1 RT/Av information
F2 SPL
Please see the F1 RT/Av information
F3 Disp
Please see the F1 RT/Av information
F4 Time
F1 1 s F2 2 s F3 3 s F4 4 s F5 5 s F6 6 s F7 7 s F8 8 s F10 Help
F5 Hits
F1 Hit F2 2 Hit F3 3 Hit F4 4 Hit F10 Help
F6 Peak
F7 Pink
F8 Go
F9 Load
F1 Hit up F2 Mic up F3 Avg F4 Oct dn F5 Oct up F6 THX F7 Tab F8 Print F9 Save F10 Help
F10 Help
= Menu

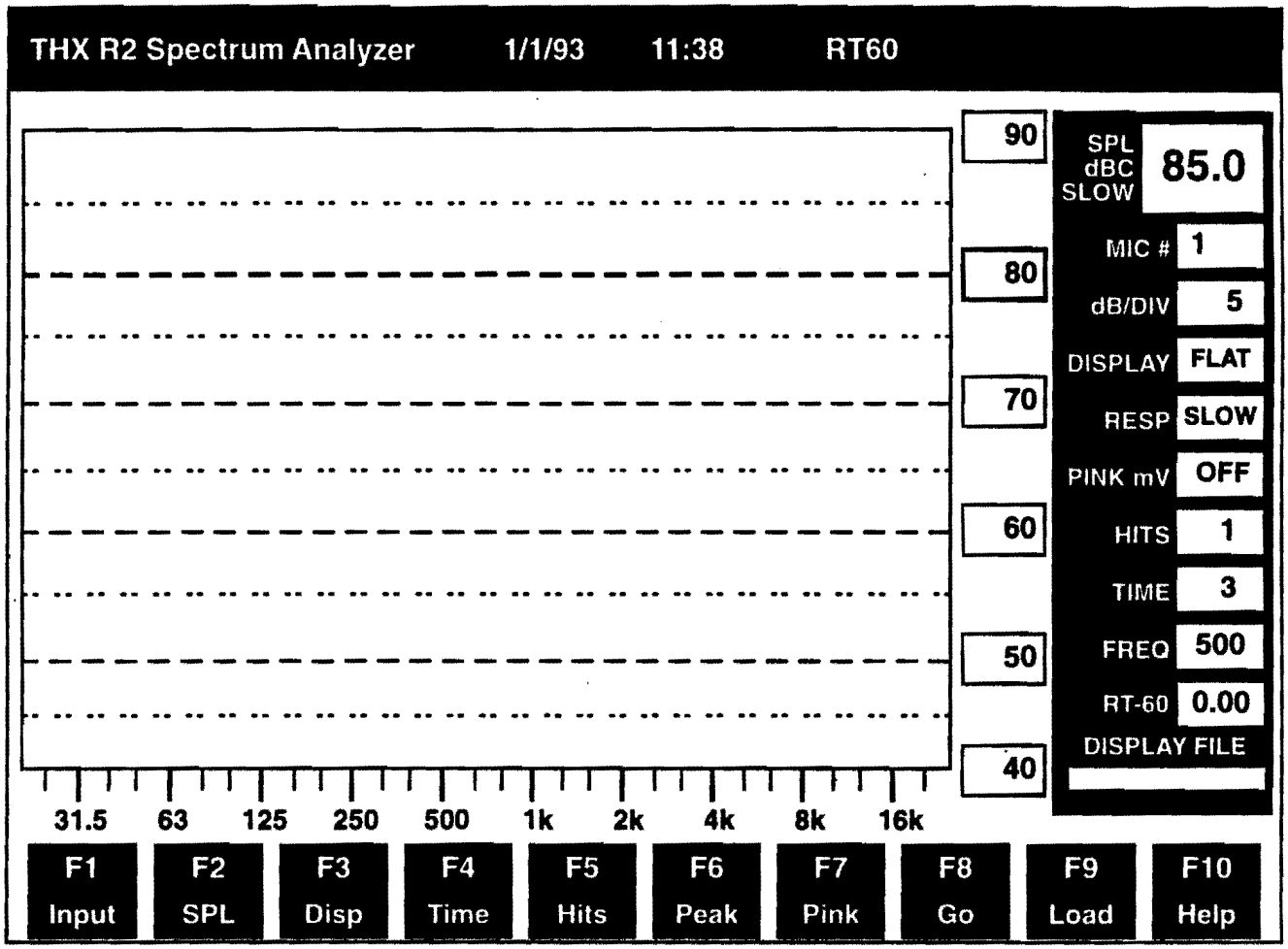
F3 RT-60 Menu Choices

A brief explanation for each of the function keys and sub-menus included in the **F3** Reverberation Time Measurements choice off of the Main Menu is included in the following table:

F1	**Input**	See the explanation under **F1** RT/Av on page 7.
F2	**SPL**	See the explanation under **F1** RT/Av on page 7.
F3	**Disp**	See the explanation under **F1** RT/Av on page 8.
F4	**Time**	**Allows you to estimate the decay time for this measurement. This sub-menu has the following choices:**
F1	1 s	Defines the longest octave band decay time as less than one (1) second.
F2	2 s	Defines the longest octave band decay time as less than two (2) seconds.
F3	3s	Defines the longest octave band decay time as less than three (3) seconds.
F4	4 s	Defines the longest octave band decay time as less than four (4) seconds.
F5	5 s	Defines the longest octave band decay time as less than five (5) seconds.
F6	6 s	Defines the longest octave band decay time as less than six (6) seconds.
F7	7 s	Defines the longest octave band decay time as less than seven (7) seconds.
F8	8 s	Defines the longest octave band decay time as less than eight (8) seconds.
F5	**Hits**	Defines the number of times that the pink noise is stopped abruptly to measure the decay.
F6	**Peak**	See the explanation under **F1** RT/Av on page 9.
F7	**Pink**	See the explanation under **F1** RT/Av on page 9.
F8	**Go**	Begins measurement of background noise.
F9	**Load**	**Loads a previously saved file. This sub-menu has the following choices:**
F1	Hit ⇧	Selects which hit to view.
F2	Mic ⇧	Selects the microphone data to view.
F3	Avg	Displays the average decay.
F4	Oct ⇩	Displays the sound decay of the lower octave band.
F5	Oct ⇧	Displays the sound decay of the higher octave band.
F6	THX	Displays the reverberation data by octave band.
F7	Tab	Displays the reverberation data in tabular form.

F8 Print	Prints displayed file.
F9 Save	Saves displayed file.
F10 Help	Context sensitive help.
F10 Help	Context sensitive help.

F3 RT-60 Screen Layout



The RT-60 menu screen also contains the same elements as the Real Time menu screen, in the same order, with the addition of Hits, Time, Freq. and RT-60 windows.

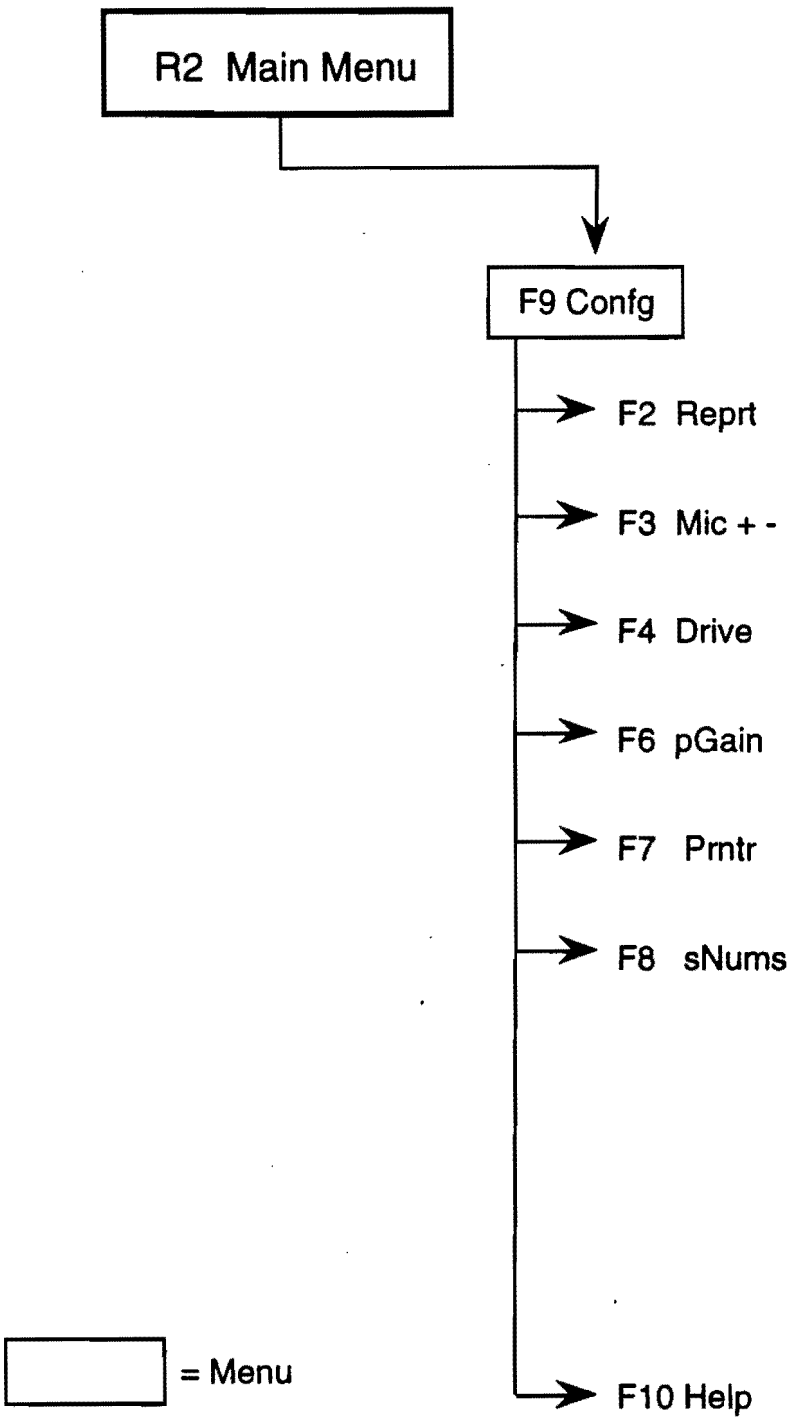
- Hits Window. This window shows the number of test hits selected from the RT-60 Hits sub-menu.
- Time Window. This window shows the test time values selected from the RT-60 Time sub-menu in seconds.
- Freq. Window. This window displays the octave band selected from the RT-60 sub-menu.
- RT-60 Window. This window displays the measured reverberation time value.

F9 Configuration

The Configuration Menu allows you to define the drive, printers and microphones to be used for this measurement. There is no screen for this function. The sub-menu structure for **F9** Confg is illustrated on the following page.

This section includes:

- an illustration of the sub-menu structure
- a brief explanation of the functions and sub-menu choices
- an explanation of the screen layout


R2 Main Menu
F9 Confg
F2 Reprt
F3 Mic + -
F4 Drive
F6 pGain
F7 Prntr
F8 sNums
F10 Help
= Menu

F9 Confg Menu Choices

A brief explanation for each of the function keys and sub-menus included in the **F9** Configuration choice off of the Main Menu is included in the following table:

F2 Rprt	Allows you to enter administrative details about this measurement.
F3 Mic+	Disables any input devices if a hardware failure occurs.
F4 Drive	Specifies the drive where data is to be stored.
F6 pGain	Adjusts the pink noise gain.
F7 Prnt	Selects the printer.
F8 sNums	Displays the serial numbers of the input devices used.
F10 Help	Context sensitive help.

Using the R2 Analyzer

SOFTWARE INSTALLATION

Before installing the R2 software, be sure to make a backup copy using the following procedure. You will need the R2 program diskette and a blank formatted diskette.

1. Exit to the DOS prompt
2. Insert the R2 program diskette into drive A
3. Insert the blank diskette into drive B
4. At the C:> prompt, type **copy A:*.* B:**

After completing the backup procedure, remove the blank diskette from drive B and store it. Install the R2 software using the following procedure:

1. If you are not already at the DOS prompt, exit to the DOS prompt
2. Create a directory called R2 by typing **md R2**.
3. Change directories so that you are working in the R2 directory by typing **cd R2**. The C:> prompt should now display C:R2>
4. Insert the R2 program diskette into drive A
5. At the C:R2> prompt type **copy A:*.* C:\R2**

Files from the R2 program diskette will be copied into the R2 directory on the C drive. When the C:R2> prompt displays, the copying process is complete.

SET UP

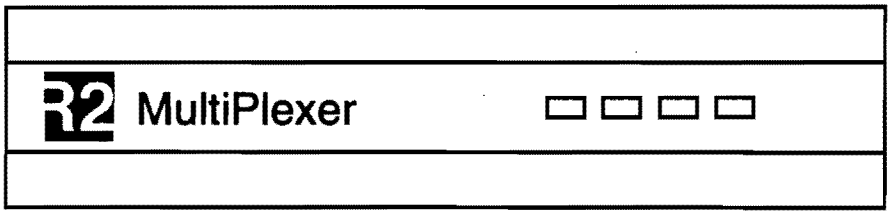
The R2 Analyzer may be run from a variety of voltages. Be sure to verify that your unit is adjusted for the proper voltage by following the procedure below:

1. Remove the line cord from the power module in the rear of the R2 Analyzer
2. Pull out the black panel
3. Move the white pointer to the appropriate position

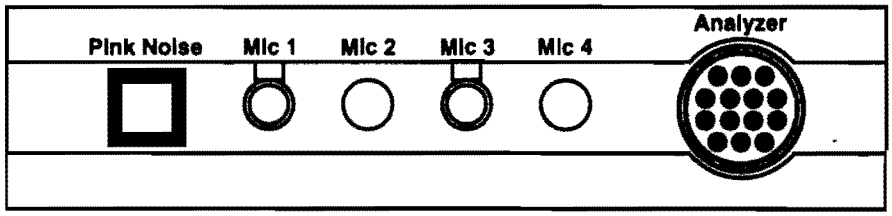
4. Replace the black panel

5. Attach the line cord from the power module in the rear of the R2 Analyzer.

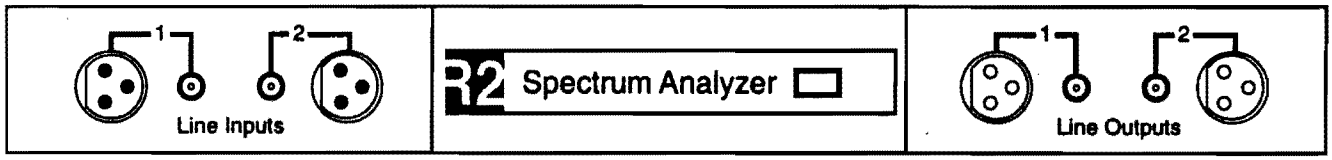
After verifying that the R2 Analyzer is set to the correct voltage, set up the R2 Unit using the graphics on the following pages:



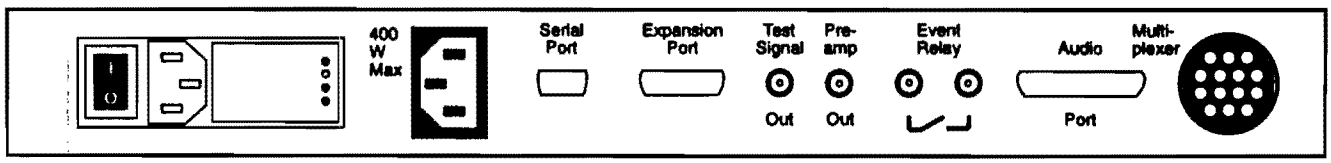
R2 Multiplexer Unit Front Panel



R2 Multiplexer Unit Rear Panel



R2 Analyzer Unit Front Panel



R2 Analyzer Unit Rear Panel

1. Connect the computer and the Spectrum Analyzer by attaching an RS-232 cable to the COM1 port on the back of the computer and to the connection marked "Serial Port" on the back of the Spectrum Analyzer. Use a "straight through" monitor type cable, *not* a null modem cable.

Note: The computer must use the COM1 connection. Some older machines or laptops will require the use of a batch file to direct the computer to the right port. If you need to modify the batch file, enter the following in the batch file:

```
Line #
1       Mode com1:=96,e,7,1
2       cd/r2
3       gothx <adapter>
```

2. Connect the Multiplexer and the Spectrum Analyzer by attaching the multiplex cable to the circular connector marked "Multiplexer" on the back of the Spectrum Analyzer and to the circular connector marked "Analyzer" on the back of the Multiplexer unit.

3. Connect the microphones to connections marked "MIC 1" through "MIC 4" on the back of the Multiplexer unit.

Note: If non-standard microphones are used, connect to "Line 1" and "Line 2" on the front of the Spectrum Analyzer unit via a microphone pre-amplifier. Gain calibration must be done by adjusting the preamp gain when using non-standard microphones.

4. Start the program by typing **gothx** <adapter> (insert the appropriate value: CGA, EGA, VGA or plasma for <adapter>).

Note: If you are running Windows with resolutions other than VGA, disable the screen saver or other TSRs as the R2 screen may not be restored correctly and you may have to exit the program and reboot to restore a correct screen driver.

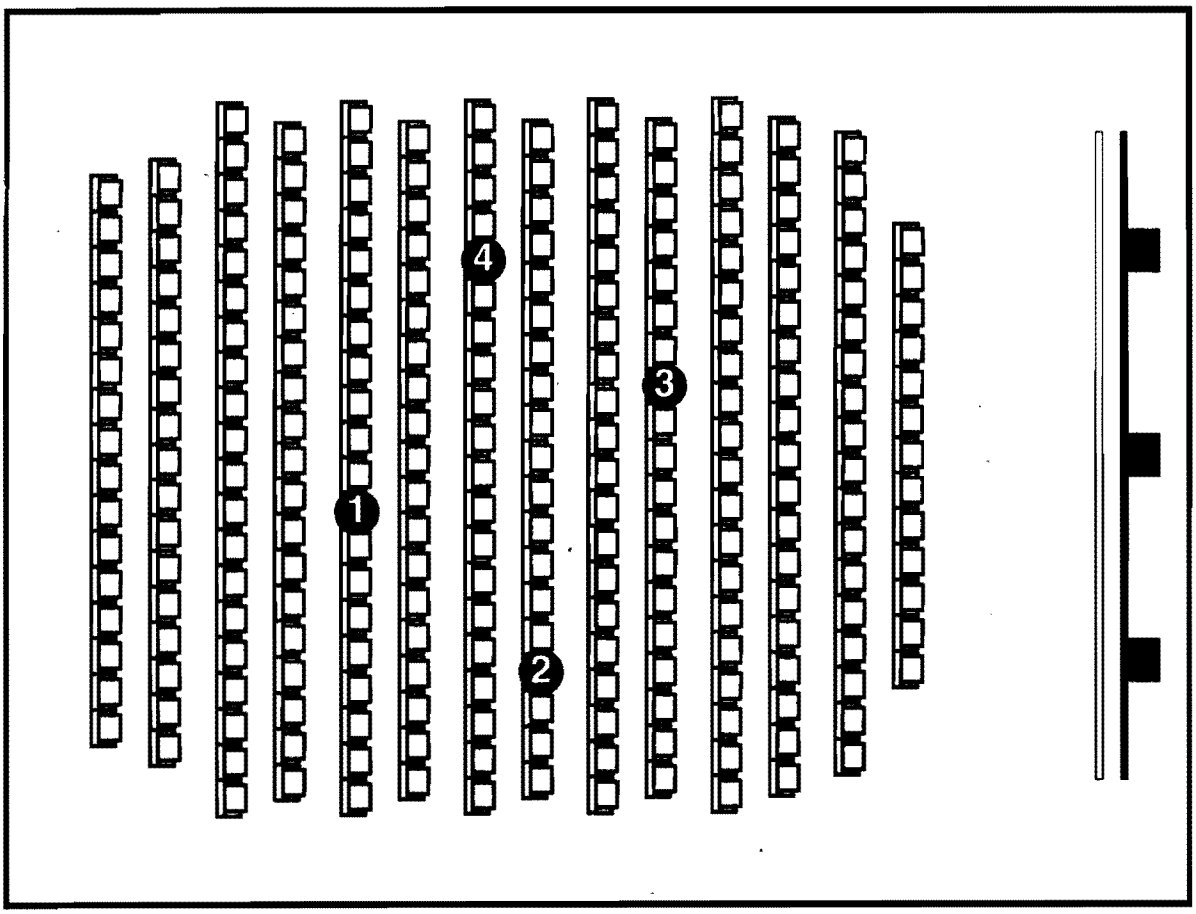
The program will then connect, calibrate, and initialize. This process will take from one to two minutes, depending upon the processing speed of the computer.

Note: To force the program into offline mode, type **gothx** <adapter> **0**.

PLACEMENT OF MICROPHONES

The microphones are pressure response calibrated. For accurate measurements, they should be mounted in their holders so that the diaphragm is at a 90 degree angle to the sound. In most motion picture theaters, the microphones should therefore face the ceiling.

Place the microphones in a diamond shaped array covering approximately the center part of the auditorium, see the illustration below. Avoid placing the microphones near the walls. This placement will provide spatial averaging to create a more consistent tuning throughout the room.



TUNING

Supplement to follow.

TAKING MEASUREMENTS

The following procedures document the recommended method for Real Time Testing, Averaging, Background Noise Testing, and RT-60 Testing. Configuration steps are also provided for reference.

REAL TIME TESTING

The Real Time testing program is activated using the following procedure:

1. Press the **F1** Real Time function key on the Main Menu.

2. Select a data input source by pressing the **F1** Input function key and selecting an input source from the Real Time Inputs sub-menu.

   Note: If the source is line level (i.e. Line #1, Line #2, MUX, or SUM) select the proper line level value from the Real Time Input Units sub-menu that appears when a line source is selected.

3. Select a weighting curve (normally flat) and response integration time (normally slow) for the data input by pressing the **F2** SPL function key on the Real Time menu and choosing a value from the Real Time SPL menu.

4. Configure the graphic window and status window parameters by pressing the **F3** Disp function key on the Real Time menu, and choosing the following graphic screen parameters from the Real Time Display sub-menu.

5. Select a 1/3 or full octave band display by toggling the **F1** Octav function key.

6. Select a fast or slow graphic window response time by toggling the **F2** Fast/ Slow function key.

7. Select the decibels per reference line division by pressing the **F3** dB/div function key on the Real Time Display menu and choosing a decibel value from the Real Time Input Units menu.

8. Select the desired weighting curve by pressing the **F4** Wtg function key on the Real Time Display menu and choosing a weighting value from the Real Time Display Wtg menu.

9. Select the desired offset curve by pressing the **F5** Off function key on the Real Time Display menu and choosing an offset value from the Real Time Display Wtg menu.

10. Scroll the data curve up or down in 5 dB increments by pressing the **F6** RefUp or **F7** RefDn function keys.

11. Return to the Real Time menu.

12. Toggle the internal pink noise generator on and off by pressing the **F7** Pink function key.

13. Freeze the data curve, and enter the save mode, by pressing the **F8** Freez function key. Adjustments to the octave, dB per division, weighting and offset values may also be made at this time.

14. To save the data, press the **F8** function key again, which will now read "Save", and enter the file name. Data may also be printed at this time, by pressing the **F9** function key on the Real Time View menu which will now read "Print".

15. To load stored data files, press the **F9** Load function key in the Real Time Display menu and select the desired file. Once the file is loaded, it may be printed by pressing the **F9** function key, which will read "Print" in the Real Time View menu.

AVERAGING

The Average testing program is activated using the following procedure:

1. Press the **F1** Rt/Av function key on the Main Menu.

2. Select the input sources and values, SPL values, and display parameters as described in the Real Time testing procedure.

3. Select an Averaging test time by pressing the **F4** Time function key on the Average menu and choosing the desired test time.

Note: The Window option is a unique feature in the THX R2 Spectrum Analyzer that allows quick refreshment of an averaging graphic window, eliminating the need for manual restarts of the average.

4. Toggle the internal pink noise generator on or off by pressing the **F7** Pink function key.

5. Press the **F8** Go function key to begin testing. The testing will automatically stop after the selected test time has elapsed. If a 'free' test time is selected, the user must manually stop the test by pressing the **F8** function key again, which will read "Stop".

6. To save the data, press the **F8** function key, which will now read "Save", and enter a file name. The data may also be printed at this time, by pressing the **F9** function key on the Average View menu which will read "Print".

7. To load stored data files, press the **F9** Load function key in the Real Time Display menu and selecting the desired file. Once the file is loaded, it may be printed by pressing the **F9** function key, which will read "Print" in the Average View menu.

BACKGROUND NOISE TESTING

The Background Noise testing program is activated using the following procedure:

1. Press the **F2** NC function key on the Main Menu. Selecting input sources and values, and pink noise status, as described in the Real Time testing procedure.

2. Select a Background Noise test time by pressing either the **F2** 20s function key for a twenty second test time, or the **F3** Free function key for a manual start/stop test time.

3. Press the **F8** Go function key to begin testing. The testing will automatically stop after the selected test time has elapsed.

Note: If a 'free' test time is selected, the user must manually stop the test by pressing the **F8** function key again, which will read "Stop".

4. To save the data, press the **F8** function key again, which will now read "Save", and enter the file name. Adjustments to the Background Noise View and Background Noise Method sub-menus may be made at this time.

5. Press the **F1** Mic Up function key to advance to data input from the next microphone.

6. To display the overall highest level of background noise (maximum level per octave of each of the microphones) press the **F2** MAX function key.

7. Scroll the reference curve in the graphic window up or down using the **F3** RefUp or **F4** RefDn function keys.

8. Scroll the data curve in the graphic window up or down in 5 dB increments by pressing the **F5** CurvUp or **F6** CurvDn function keys.

9. Select the method of background noise testing by pressing the **F7** Methd function key on the Background Noise View sub-menu and selecting the preferred method.

10. Once the test data is in the desired format, it may be saved or printed by pressing the **F8** Save or **F9** Print function keys on the Background Noise View sub-menu.

11. To load stored data files, press the **F9** Load function key in the Real Time Display menu and select the desired file. Once the file is loaded, it may be printed by pressing the **F9** function key, which will read "Print" in the Real Time View menu.

RT-60 TESTING

The RT-60 testing program is activated using the following procedure:

1. Press the **F3** RT-60 function key on the Main Menu.

2. Select the input sources and values, pink noise, and starting, stopping, saving and loading tests, as documented in the Real-Time Testing procedure.

3. Select the number of test hits by pressing the **F2** Hits function key and selecting the number of test hits desired. "Hits" in this case is defined as a bursts of pink noise.

4. Select the time duration of the test hits by pressing the **F3** Time function key and selecting the desired length of the test hits.

THX Certification Test Program

This program requires special software from LucasFilm THX and is available only to THX trained technicians.

Configuration

To configure test reports and microphone usage use the following procedure:

1. Press the **F9** Config function key on the Main Menu.

2. To enter the technician and room names to be saved and printed in the test reports, press the **F2** Reprt function key and enter the data at the prompts.

3. To configure microphone usage, press the **F3** Mics function key.

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