

OPERATION MANUAL

MODEL SAM 4040

SIGNAL ANALYSIS METER

This document contains information proprietary to Wavetek. The information in this document is not to be used or duplicated in any manner without the prior approval, in writing, of Wavetek.

Wavetek

CATV Division

5808 Churchman Bypass

Indianapolis, IN 46203-6109

(800)851-1198

(317)788-5960

Fax: (317)782-4607

E-Mail: catvsupport@wavetek.com

Internet: <http://www.wavetek.com>

5/96 Rev. G

Manual Part No.

6510-00-0274

WARRANTY

Wavetek warrants that all Products manufactured or procured by Wavetek conform to Wavetek's published specifications and are free from defects in materials and workmanship for a period of one (1) year from the date of delivery to the original Buyer, when used under normal operating conditions and within the service conditions for which they were designed. This warranty is not transferrable and does not apply to used or demonstration products.

The obligation of Wavetek arising from a Warranty claim shall be limited to repairing, or at its option, replacing without charge, any assembly or component (except batteries) which in Wavetek's sole opinion proves to be defective within the scope of the Warranty. In the event Wavetek is not able to modify, repair or replace nonconforming defective parts or components to a condition as warranted within a reasonable time after receipt thereof, Buyers shall receive credit in the amount of the original invoiced price of the product.

Wavetek must be notified in writing of the defect or nonconformity within the Warranty period and the affected Product returned to Wavetek's factory, designated Service Provider, or Authorized Service Center within thirty (30) days after discovery of such defect or nonconformity. Buyer shall prepay shipping charges and insurance for Products returned to Wavetek or its designated Service Provider for warranty service. Wavetek or its designated Service Provider shall pay costs for return of Products to Buyer.

Wavetek shall have no responsibility for any defect or damage caused by improper storage, improper installation, unauthorized modification, misuse, neglect, inadequate maintenance, accident or for any Product which has been repaired or altered by anyone other than Wavetek or its authorized representative or not in accordance with instructions furnished by Wavetek.

The Warranty described above is Buyer's sole and exclusive remedy and no other warranty, whether written or oral, expressed or implied by statute or course of dealing shall apply. Wavetek specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. No statement, representation, agreement, or understanding, oral or written, made by an agent, distributor, or employee of Wavetek, which is not contained in the foregoing Warranty will be binding upon Wavetek, unless made in writing and executed by an authorized representative of Wavetek. Under no circumstances shall Wavetek be liable for any direct, indirect, special, incidental, or consequential damages, expenses, or losses, including loss of profits, based on contract, tort, or any other legal theory.

Extended Warranty Programs

Extended warranties and service contracts are available for new and currently owned equipment for an additional cost. Contact the Customer Service Department (800 851-1198) for details pertaining to extended warranties and service contracts.

Return Authorization Procedure

The customer **MUST** obtain a RETURN AUTHORIZATION NUMBER from the Customer Service Department (800 851-1198) prior to returning any equipment for warranty or non-warranty repair. Wavetek accepts no liability for any instrument or subassembly returned to the factory without this number. Any correspondence regarding returned instruments or subassemblies should be referenced to that number.

Contents

SECTION 1 - GENERAL INFORMATION

1.1 INTRODUCTION	1-1
1.2 SPECIFICATIONS	1-1
1.2.1 Frequency	1-1
1.2.2 Level Measurement	1-2
1.2.3 Hum Measurement	1-2
1.2.4 Carrier to Noise Measurement	1-2
1.2.5 Frequency Response	1-3
1.2.6 Spectrum Mode	1-3
1.2.7 Depth of Modulation	1-4
1.2.8 Printer Interface	1-4
1.2.9 General	1-4
1.2.10 Powering	1-4
1.2.11 Standard Accessories	1-5
1.2.12 Options	1-5
1.2.13 Optional Accessories	1-5

SECTION 2 - INSTALLATION

2.1 INTRODUCTION	2-1
2.2 UNPACKING AND INSPECTION	2-1
2.3 WARRANTY INFORMATION	2-1
2.4 POWER REQUIREMENTS	2-1
2.5 CABLE SPECIFICATIONS	2-2
2.6 TECHNICAL SUPPORT	2-4
2.7 WORLDWIDE SALES OFFICES	2-4

SECTION 3 - USER INTERFACE

3.1 INTRODUCTION 3-1

3.2 FRONT-PANEL DESCRIPTION 3-1

 3.2.1 Soft Keys 3-1

 3.2.2 Measurement Mode Selection Keys 3-2

 3.2.3 Support Mode Selection Keys 3-3

 3.2.4 Arrow Keys 3-4

 3.2.5 Alpha-Numeric Entry Keys 3-4

 3.2.6 Printing 3-5

SECTION 4 - OPERATION - HOW TO USE THE SAM 4040

4.1 INTRODUCTION 4-1

4.2 SAM 4040 START-UP PROCEDURE 4-1

4.3 SETUP 4-3

 4.3.1 General Setup 4-4

 4.3.2 Measurement Setup 4-7

 4.3.3 How To Setup Your Channel Plan 4-9

 4.3.4 How To Edit Channel Parameters 4-11

 4.3.5 Sweep 4-17

4.4 HOW TO PERFORM LEVEL MEASUREMENTS ... 4-18

4.5 HOW TO MEASURE TILT - BALANCING AN
 AMPLIFIER 4-21

4.6 SCAN MODE 4-22

4.7 HOW TO MEASURE C/N 4-26

4.8 HOW TO MEASURE HUM 4-28

4.9 MODULATION 4-30

4.10 SPECTRUM ANALYZER MODE 4-31

4.11 HOW TO PERFORM SWEEP MEASUREMENTS..	4-33
4.11.1 Introduction	4-33
4.11.2 Operation	4-34
4.12 FILE	4-37
4.12.1 How to Store/View/Print/Delete Measurement Files	4-38
4.12.2 How to Store/Delete Sweep References	4-39
4.13 AUTO	4-40
4.13.1 How to Create/Edit/Delete Test Locations	4-40
4.13.2 How to Perform an Auto Test	4-43
4.13.3 Viewing/Printing Auto Test Files	4-51
4.14 STATUS	4-57
APPENDIX A: STATUS INDICATORS	A-1
APPENDIX B: USER MESSAGES	B-1

MODEL SAM 4040

SECTION 1 GENERAL INFORMATION

1.1 INTRODUCTION

The Wavetek hand-held SAM 4040 performs essential cable TV system preventive maintenance tests with accuracy and ease. Signal levels, hum, C/N, and frequency response can be quickly tested.

The contents of this manual will describe the care and operation of the SAM 4040.

The SAM 4040, conducts a battery of signal level measurements, including a full scan of the cable spectrum to 1 GHz. A proprietary digital signal processing (DSP) technique is used to measure hum and carrier to noise on modulated carriers.

The SAM 4040 is a full-featured signal analysis meter, with a complete spectrum display and analog representation of single channel measurement data. When tuned to a specific channel, a comprehensive set of information is provided: tuned channel, video frequency and level, audio frequency and level, the difference between video and audio carrier levels.

The SAM 4040 is a streamlined, hand-held instrument, that weighs less than five pounds. Its 320 X 240 dot matrix LCD shows measurement data in both graphical and numerical form.

1.2 SPECIFICATIONS

1.2.1 Frequency

Range: 5 to 1,000 MHz

Accuracy: ± 10 ppm at 25°C; ± 10 ppm drift over temp.; ± 3 ppm/year aging

Resolution Bandwidth: 280 kHz

Tuning Resolution: 10 kHz
 Sweep Resolution 250 kHz maximum

1.2.2 Level Measurement

Range: -40 to +60 dBmV
 Resolution: 0.1 dB
 Accuracy: ± 1.0 dB from -20 to + 50°C
 (typical specifications), (relative to 25°C)

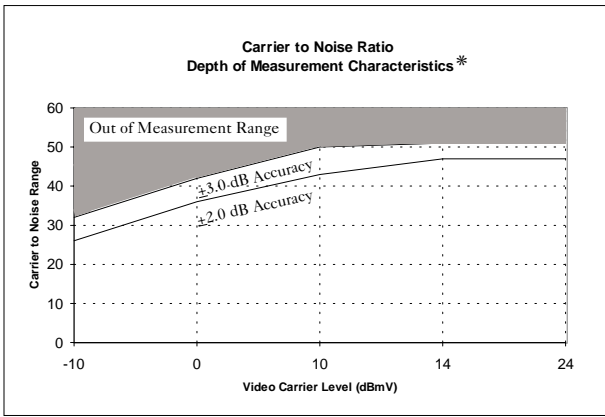
1.2.3 Hum Measurement

(carrier ≥ 0 dBmV) Non-scrambled channels only.

Range: 0 to 10%
 Resolution: $<0.2\%$
 Accuracy: $\pm 0.7\%$

1.2.4 Carrier to Noise Measurement

Non-scrambled channels only. No preselection required for 78 channels at +10 dBmV input level.



*Specified results with the measurement offset within 2 to 3 MHz range above the video carrier.

Range: 52 dB maximum

Resolution: 0.5 dB

1.2.5 Frequency Response

Sweep Rate \approx 1 second

Accuracy: \pm 0.5 dB, normalized (dependent on stability of referenced carriers)

Display Scaling and Range: 1, 2, 5, and 10 dB/division; 6 vertical divisions

Sweep Span: User definable from 5 to 1,000 MHz

Reference Storage: At least 16

Sweep Trace Storage: At least 50

1.2.6 Spectrum Mode

Spans: 3, 5, 10, 20, and 50 MHz (0.3, 0.5, 1, 2, and 5 MHz/div)

Sweep Rates: 2 seconds (50 & 5 MHz)

Display Scaling and Range: 0.5, 1, 2, 5, and 10 dB/division; 6 vertical divisions

Spurious Free Dynamic Range: 60 dB (typical specifications)

1.2.7 Depth of Modulation

Assumes presence of white reference on any VITS line. Non-scrambled channels only.

Range: 80 to 100%

Resolution: <0.5% at 85%

1.2.8 Serial Interface

Serial, RS232; Epson, IBM Printers

1.2.9 General

Log Linearity: ± 0.5 dB (typical)

Flatness: ± 0.5 dB @ 25 °C, @ 20 dBmV

Dimensions: 15.2 cm (W) x 25.4 cm (H) x 5.1 cm (D), 6" (W) x 10" (H) x 2" (D)

Weight: 1.95 kg (4.3 lbs.)

Operating Temperature Range: -20 to +50°C; 0 to 120°F

1.2.10 Powering

Battery Life: 2.5 hours continuous (absolute worst case), replaceable battery cartridge

Charge Time: 4 hours fast charge; 30 hours slow charge (with unit operating)

1.2.11 Standard Accessories

Soft Carrying Case
Field replaceable Battery Cartridge
Battery Charger/AC Adapter
(2) "F" type input connectors
Operations Manual

1.2.12 Options

4040 DIG: Digital Carrier Level Measurement Option
StealthWare: Windows compatible Data Management Package for
Stealth Products

1.2.13 Optional Accessories

P-Stealth	Citizen PN60 (thermal fusion) Printer
1019-00-0457	Optional Battery for PN60 Printer
3010-59-0009	Citizen PN60 Printer Ribbons (2) (included with printer)
1217-50-0159	Citizen PN60 Printer Cable (included with printer)
CBC-1	Cigarette lighter adapter that charges battery in unit - can be used along with SBC-1
1019-00-0437	Charger/Adapter 220VAC to 18 VDC
SBC-1	Charger for one spare Stealth Battery Cartridge
SBC-6	Charger for up to six spare Stealth Battery Cartridges
1217-50-0151	Stealth Serial Printer Cable
1217-50-0149	Channel Plan Transfer Cable

SECTION 2 INSTALLATION

2.1 INTRODUCTION

The Wavetek Model SAM 4040 is a rugged piece of precision test equipment designed for portability. It is well suited for field use.

2.2 UNPACKING AND INSPECTION

The instrument was inspected, and given final operational and quality control tests prior to being carefully packaged for shipment. The unit should operate in accordance with the specifications listed in this manual.

When unpacking the instrument, inspect the shipping container and instrument for shipping damage. If the container is damaged, phone Wavetek immediately. Save the shipping carton and packing materials for possible future use.

FOR CUSTOMER SERVICE call: WAVETEK: (800) 851-1198, International Customers, contact your local Wavetek Representative.

2.3 WARRANTY INFORMATION

The SAM 4040 is covered by a one year parts and labor warranty (for details, see "Warranty", opposite Table of Contents).

2.4 POWER REQUIREMENTS

The SAM 4040 operates on a 12 VDC power source. A battery charger (supplied with the unit) fully recharges the batteries in 4 hours (fast charge), 30 hour slow charge (with unit operating). The instrument can operate on batteries or when connected to the desktop charger.

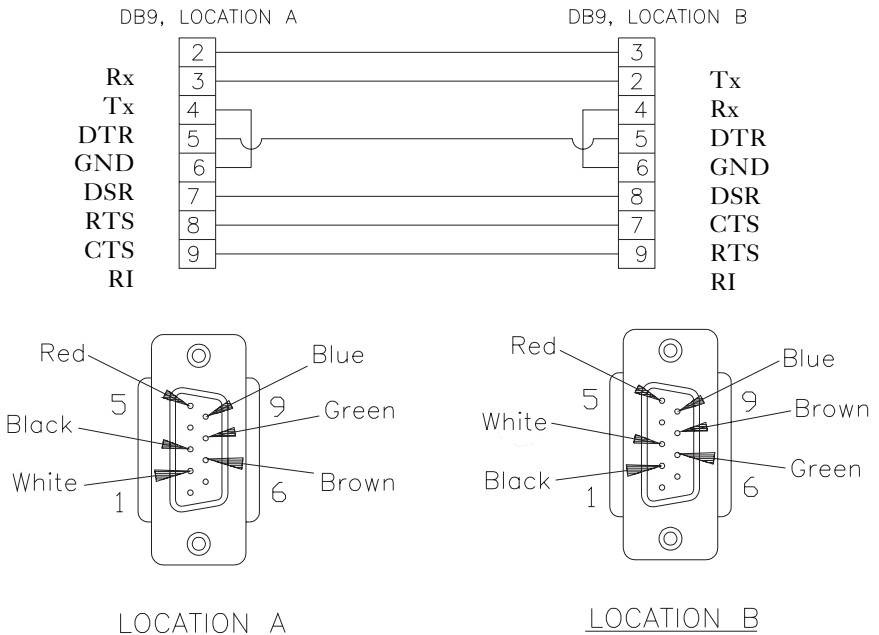
NOTE: The unit is shipped with only a light charge, and will need to be fully charged prior to use.

2.5 CABLE SPECIFICATIONS

There are two cables associated with the operation of the SAM 4040; SAM 4040 to SAM 4040, and a Serial Printer cable. The following information describes each of the associated cables.

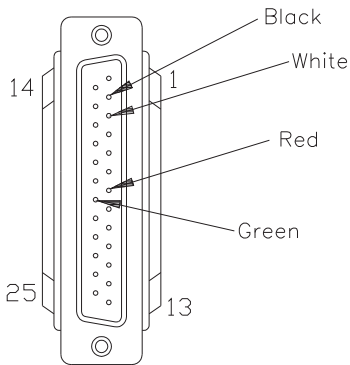
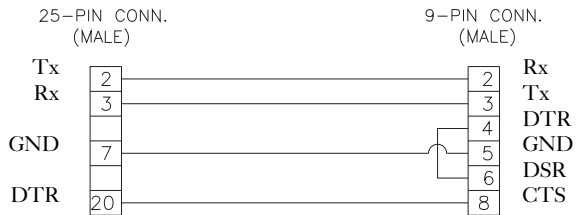
SAM 4040 To SAM 4040

The SAM 4040 to SAM 4040 cable, (1217-50-0149) is used for communications between Stealth SAM units and for downloading sweep files to a PC.

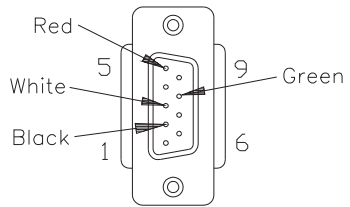


Serial Printer Cable

The Serial Printer Cable, (1217-50-0151) can be used to print data directly from the SAM 4040.



LOCATION A



LOCATION B

2.6 TECHNICAL SUPPORT

Although we've worked hard to make the SAM 4040 as easy-to-use as possible, the wide range of network architectures available today can make proper configuration a difficult task. If you have a problem using your unit you can contact Wavetek's Technical Support for help. You can reach Wavetek's Technical Support, Monday through Friday between 8 am and 5 pm at **(317) 788-5960**. Wavetek also maintains a support forum on the Internet. You can leave messages and a Support Specialist will get back to you at Internet address: CATVSUPPORT@wavetek.com.

If you received your SAM 4040 unit and found it to be damaged or incomplete in any way, phone Wavetek immediately. Save the shipping carton and packing material in the event that you have to return it.

FOR CUSTOMER SERVICE call: WAVETEK (800) 851-1198, International Customers, contact your local Wavetek Representative.

The above numbers can also be accessed on your unit by pressing the **FCN** key followed by the **help** key.

2.7 Worldwide Sales Offices

Austria (Vienna)
Tel: (43) 1-214-5110
Fax: (43) 1-214-5109

Hong Kong
Tel: (852) 2788-6221
Fax: (852) 2788-6220

China (Beijing)
Tel: (86) 10-592-8044
Fax: (86) 10-500-8199

Japan (Tokyo)
Tel: (81) 427-57-3444
Fax: (81) 427-57-5722

France (Paris)
Tel: (33) 1-4746-6800
Fax: (33) 1-4746-5656

Singapore
Tel: (65) 356-2522
Fax: (65) 356-2553

Germany (Munich)
Tel: (49) 89-996-410
Fax: (49) 89-996-41160

United Kingdom (Norwich)
Tel: (44) 1603-404-824
Fax: (44) 1603-483-670

SECTION 3 USER INTERFACE

3.1 INTRODUCTION

This section will help you become familiar with the front-panel controls of the SAM 4040. Included are descriptions of the front-panel and notes on the use of features.

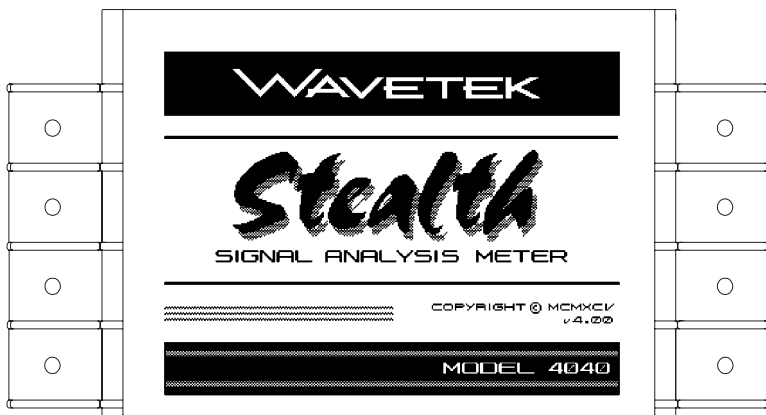
3.2 FRONT-PANEL DESCRIPTION

The hardware portion of the user interface consists of a 320x240 dot matrix LCD and a 40-key keypad. The keypad includes:

- eight Soft keys
- eight Measurement Mode selection keys
- three Support Mode selection keys
- four Arrow keys
- sixteen Numeric Entry keys
- a Power key

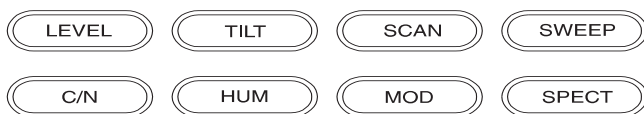
3.2.1 Soft Keys

There are a total of eight vertically oriented soft keys, four on either side of the display. The function of each soft key changes depending on the particular operation being performed. The function is indicated on the display next to the associated soft key. Soft keys are not always active. When a soft key is inactive, it's indicator is either dimmed (grayed) or does not appear at all.



3.2.2 Measurement Mode Selection Keys

Measurement modes are chosen by pressing the appropriate Measurement Mode Selection key. There is a key for each of the eight major measurement functions. These keys are located directly below the display.



LEVEL: Signal level measurements on individual channels are made by entering a specific channel number and pressing the channel key. Measurements can also be made by selecting the carrier with a marker in Scan mode and pressing the Level key.

TILT: Tilt mode simplifies the balancing of pilot levels by displaying a bar graph with a representation of up to nine different user selected video carrier levels.

SCAN: Use Scan mode to get a good look at absolute carrier levels. In this mode a bar graph showing all carrier levels is displayed.

SWEEP: Tests frequency response of the cable system by measuring cable system carrier levels in occupied spectrum areas.

C/N: Measures the C/N (carrier to noise) ratio of the tuned channel or frequency.

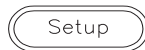
HUM: Measures the hum modulation of the tuned channel in either % or dB as selected by the operator.

MOD: Allows the user to listen to the modulation of the tuned channel or frequency and measure Depth of Modulation of a video carrier.

SPECT: Provides a Spectrum Analyzer display.

3.2.3 Support Mode Selection Keys

Support modes are accessed using the Support Mode Selection keys. There is a key for each of the three support functions. These keys are located below the Measurement Mode Selection keys and to the left of the Arrow keys.



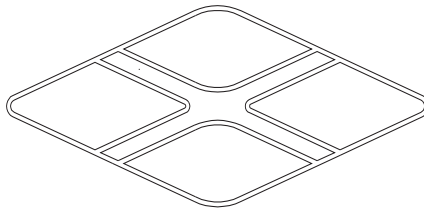
File: Allows the user to access measurement files.

Auto: This function provides automated FCC 24 hour testing capabilities.

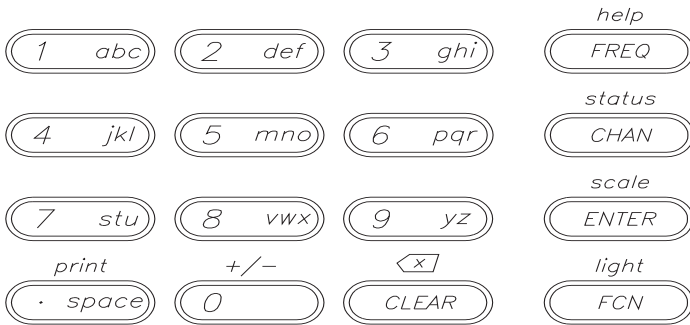
Setup: The setup functions are used to set or adjust the operating parameters of the unit.

3.2.4 Arrow Keys

The four Arrow keys are used for various purposes. Their functions are described in the individual sections for each operating mode. These keys are located below the Measurement Mode Selection keys and to the right of the Support Mode Selection keys.




3.2.5 Alpha-Numeric Entry Keys



The Alpha-Numeric keys are used to enter data as needed during the operation of the unit. There are three indicators associated with keypad entry. These indicators appear in the title bar to the left of the time. The three are as follows:

A_{BC} - alpha entry mode

1_2_3 - numeric entry mode

 - multiple choice mode

Alpha Entry Mode

Most numeric keys have alphabetic characters printed on them. These characters can be accessed when the alpha entry indicator appears in the title bar. In the alpha entry mode, a cursor appears below the active position. Repeated pressing of an alphanumeric key sequences through the values printed on the key. Once the desired character is selected, the cursor is moved to the next position using the **LEFT** or **RIGHT** arrow keys. Special characters are available using the **UP** and **DOWN** arrow keys.

Alpha entry must be terminated by pressing the **ENTER** key.

Numeric Entry Mode

In the numeric entry mode, only the numerals 0 through 9 and the decimal point can be entered. When negative values are allowed, the FCN, +/- key sequence toggles between positive and negative entry. The numeric value may also be incremented and decremented using the **UP** and **DOWN** arrow keys.

Numeric entry must be terminated by pressing the **ENTER** key.

Multiple Choice Mode

This mode allows you to sequence through a series of choices which appear in the edit box.

3.2.6 Printing

Any measurement mode screen can be printed directly. Press the **FCN** key followed by the second function **Print** key to print the current measurement screen. To print a measurement file, simply view the file and print it as you would a current measurement screen.

SECTION 4 OPERATION - HOW TO USE THE SAM 4040

4.1 INTRODUCTION

This section provides detailed operation of the Model SAM 4040. Included are detailed descriptions of the various displays of the selected modes of operation.

4.2 SAM 4040 START-UP PROCEDURE

After the SAM 4040 is properly connected, the next step is to build a channel plan. This channel plan will designate which channels are active in the system, which channels are scrambled, and which channels are inactive. The channel plan can be edited to indicate which channels are to be tested in the Tilt mode, and to label the channels with the programming content or call letters of the broadcaster.

The following procedure describes the steps to prepare the SAM 4040 for use.

Building A Channel Plan

1. To build a channel plan, first enter the setup mode by pressing the **SETUP** key.
2. Press the Channel Plan soft key, and cursor down the menu to Build Channel Plan.
3. Press the **ENTER** key, and you will be prompted at the first step to name the channel plan to be built. The name should be a logical one that will be easy to remember. The location of the headend is usually a good name for the channel plan. When the name is typed in, press the **ENTER** key.
4. The next step is to choose a channel plan from the built-in list that most closely resembles the plan of your system. Typically your system channel plan will be a subset of the built-in plan. Cursor down to the appropriate channel plan and press the **ENTER** key or the **OK** soft key.

5. You will then be prompted to enter the highest frequency that you would like to scan. Type in the frequency and press the **ENTER** key followed by the **OK** soft key. The unit will then commence a scan for the presence of channels. After the scan is done, this phase of the channel plan building process is complete. Press the **Exit** soft key to return to the Channel Plan menu.

Editing A Channel Plan

The next step is to edit the channel plan to characterize it for your particular system. Cursor down to Edit Channel Parameters and press **ENTER**. A listing of all the channels within the frequency range designated in the Build Channel Plan phase will appear on the screen. Notice that there are columns for enabled, channel type, channel number, label, frequency (video carrier), sweep, tilt, and scrambled.

Each of these features for each channel may be edited by cursoring to the channel to be edited and pressing the **Edit** soft key.

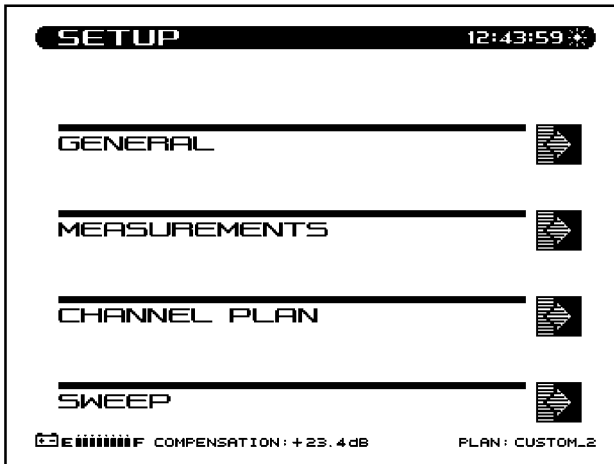
Check the listed channels to ensure that channels that you know are not video are not listed as video channels. If during the Build Channel Plan phase the receiver detects a signal at a video carrier frequency it assumes it is a video channel. Some FM carriers may happen to fall at video carrier frequencies for channels 95-97. Be sure these channels are properly designated as video or single carriers. FM signals may be entered as channels, but must be designated as Single Carriers.

At this time be sure to edit each scrambled channel to ensure that it is designated appropriately. A special algorithm is used to ensure that the peak of these signals is measured.

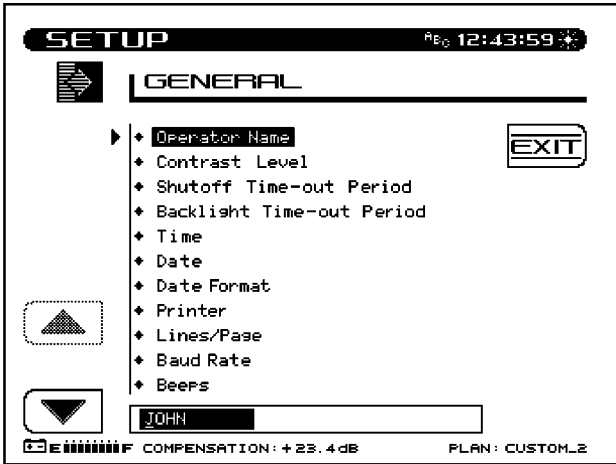
At this time you may also wish to designate tilt channels, and label the channels with call letters, but this is not essential to begin using the SAM 4040.

4.3 SETUP

There are four setup modes for the SAM 4040; General, Measurements, Channel Plan, and Sweep. General setup allows the operator to configure general aspects of the unit (not specifically related to measurements) for personal taste. Measurements setup permits the operator to setup certain parameters that apply to specific measurements. Channel Plan setup allows the operator to configure channel tuning to match the specific characteristics of an individual cable system. Sweep setup lets the operator setup sweep measurement parameters.



4.3.1 General Setup



Use the **Up** and **Down** soft keys to scroll to additional setup items. When lists are being displayed, the up arrow soft key dims when the first item in the list is reached and the down arrow soft key dims upon reaching the last item.

Operator Name

Allows the user to enter the operators name. The name will appear in the header section of the Auto Test report.

Contrast Level

Adjusts the contrast level of the LCD for optimum viewing by the operator. The level is varied on a scale from 1-15. Use the **UP** and **DOWN** arrow keys to adjust the contrast.

Shut-off Time-out Period

In order to conserve battery life, an automatic shut-off feature turns off the unit when it has remained inactive for a period of time. The time out period is programmable to; 1 min, 3 min, 5 min, or always on. The unit can be manually turned off at any time by pressing the **Power** key. Use the **UP** and **DOWN** arrow keys to set the time-out period.

Backlight Time-out Period

An additional means of conserving battery life is an automatic Backlight Time-out. The time out period is programmable to; always off, 5 sec, 10 sec, or always on. Use the **UP** and **DOWN** arrow keys to set the time-out period. The Backlight can be manually turned on/off at any time by pressing the **Function** key followed by the **Light** second function key.

Time

Use the numeric entry keys to enter the time in the HH:MM:SS format (24 hour).

Date

Use the numeric entry keys to enter the date. The date will be displayed in the format chosen in the Date Format setup menu.

Date Format

Use the **UP** and **DOWN** arrow keys to select the desired date format. When the date format is changed, the new format will appear everywhere the date is displayed or printed. The following date formats are available:

- MM/DD/YY
- DD.MM.YY
- YY.MM.DD

Printer

Sets the printer interface to the specific type of printer used. Use the **UP** and **DOWN** arrow keys to select the desired printer. The required serial printer configuration is as follows:

- baud rate consistent with SAM (recommend 9600 or 19.2K)
- 8 data bits
- 1 stop bit
- no parity
- flow control - hardware handshaking

A serial to parallel converter (such as the one manufactured by Black Box Corp.) is required for printing to a parallel printer. The setup is the same as the serial printer configuration.

Lines/Page

The number of Lines/Page (min 30, max 255) can be specified for text printouts. This determines the number of lines that are printed before a form feed command is sent. If no form feeds are desired, enter zero for the Lines/Page.

Baud Rate

The Baud rate is used when establishing communications between the SAM 4040 and another device. The Baud rates available are; 1200, 2400, 4800, 9600 (default), and 19.2k. The **UP** and **DOWN** arrow keys are used to set the Baud rate.

Beeps

The SAM 4040 produces beeps to alert you of certain operating conditions.

The arrow keys are used to turn Beeps on or off as desired.

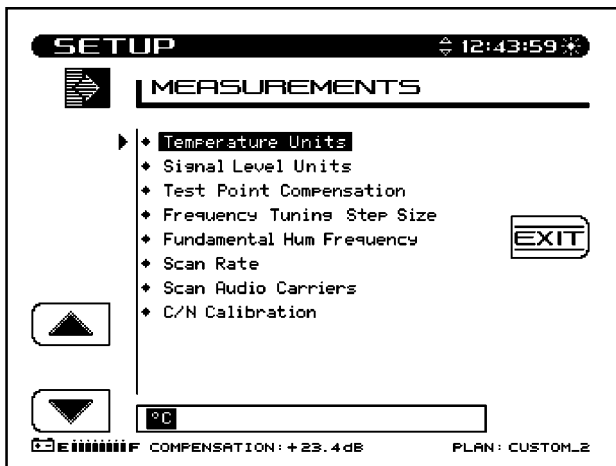
Diagnostics

Note: If the Diagnostics selection does not appear on the screen, keep pressing the Down arrow soft key until it scrolls onto the list.

Press the **ENTER** key to enter the diagnostic mode. The diagnostic mode allows the user to reset the unit to all factory default settings.

Warning: All files and references will be lost when resetting the unit to factory default settings.

4.3.2 Measurements Setup



Temperature Units

Use the **UP** and **DOWN** arrow keys to select the desired temperature units (°C, °F).

Signal Level Units

Use the **UP** and **DOWN** arrow keys to select the desired level units (dBmV, dBμV, dBm).

Test Point Compensation

Test Point Compensation is used to account for losses associated with certain amplifiers. Use the **UP** and **DOWN** arrow keys or the numeric entry keys to enter the Test Point Compensation. (-100.0 to +100.0 dB in 0.1 dB steps).

Frequency Tuning Step Size

The Tuning Step Size can be adjusted using the **UP** and **DOWN** arrow keys or the numeric entry keys (0.01 to 100.00 MHz in 10 kHz steps).

Fundamental Hum Frequency

The fundamental hum frequency to be measured can be selected using the **UP** and **DOWN** arrow keys (60 Hz, 50 Hz, Auto). When Auto is selected, the unit will automatically select 50 Hz on PAL type plans and 60 Hz for NTSC plans.

Scan Rate

Two scan rates are available in the Scan mode, normal and fast. The scan rate is selected using the **UP** and **DOWN** arrow keys. The Fast scan feature allows for rapid scan displays, while sacrificing accuracy. Normal scan rate is slower, but more accurate.

Scan Audio Carriers

If desired, the audio carriers can be omitted resulting in a faster scan. This feature is selected using the **UP** and **DOWN** arrow keys (yes, no).

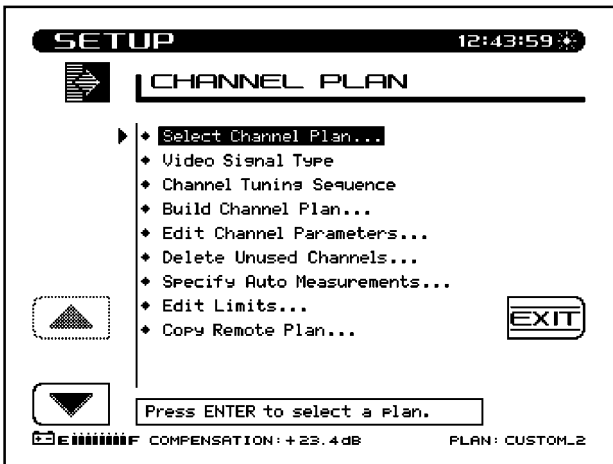
C/N Calibration

To increase the accuracy of the C/N measurements, a noise floor calibration is performed. This allows the user to characterize the noise floor of the unit. To perform the calibration, highlight the selection and press the **ENTER** key. The unit will provide a prompt to ensure that no cable is connected to the RF input. Once verified, press the **OK** soft key to perform the calibration.

The unit will display the system noise level when the calibration is complete.

4.3.3 How To Setup Your Channel Plan

The procedure explained in Section 4.2 should be performed when first using the SAM 4040.



Select Channel Plan

Press the **ENTER** key to call up a list of existing channel plans. If the unit is being used for the first time, the only Channel Plan available will be the standard NCTA plan. Refer to the "Build Channel Plan" section to create a channel plan that matches your system. Use the **UP** and **DOWN** arrow keys to scroll through the list. When the desired channel plan is highlighted, press the **EXIT** soft key to activate the selected channel plan. Channel plans can also be deleted from the list using the **DELETE** soft key. An **OK** and **STOP** soft key is then displayed to confirm or stop the deletion of the channel plan.

The currently active channel plan (as indicated in the lower right hand corner of the screen) cannot be deleted. To delete this plan, first select a different plan by using the arrow keys to highlight another plan and then press the **Load** soft key. The previously active channel plan can now be deleted.

Press the **Info** soft key to view the following channel plan information:

- Plan name
- The Channel Plan that the plan was based on
- The number of enabled channels
- Date the plan was last modified
- Limits
- Video Signal Type

Video Signal Type

The type of video signal to be measured can be selected using the **UP** and **DOWN** arrow keys (NTSC, PAL).

Channel Tuning Sequence

Use the **UP** and **DOWN** arrow keys to select either numeric order or frequency order, for the channel tuning sequence.

Build Channel Plan

Press the **ENTER** key to begin the Build Channel Plan sequence. This sequence allows the user to create a channel plan by "learning" the channels on a cable system.

NOTE: Ensure that the SAM 4040 is connected to the cable system.

Step 1: Enter a name for the new channel plan that will be built.

Use the alphanumeric keypad to enter a channel plan name. Press the **OK** soft key when completed.

Step 2: Select a fixed channel plan to use for building the new plan.

Use the **UP** and **DOWN** arrow keys to select a fixed channel plan to build the new plan from. Press the **OK** soft key when completed.

Step 3: Enter the frequency at which to stop searching for channels.
Press the **ENTER** key followed by the **OK** soft key to set the stop frequency.

The SAM 4040 will sequence through all channels in the selected fixed plan until the stop frequency is reached. This operation can be terminated by pressing the **STOP** soft key. When completed, individual channels contained in the newly built plan can be edited.

NOTE: Some channel plans have interlaced channels. To prevent interference, delete interlaced channels prior to building sweep points.

4.3.4 How To Edit Channel Parameters

This setup feature allows the user to edit existing channel parameters. Press the **ENTER** key to initiate channel parameters editing.

A list of all channels contained within the active plan is presented.

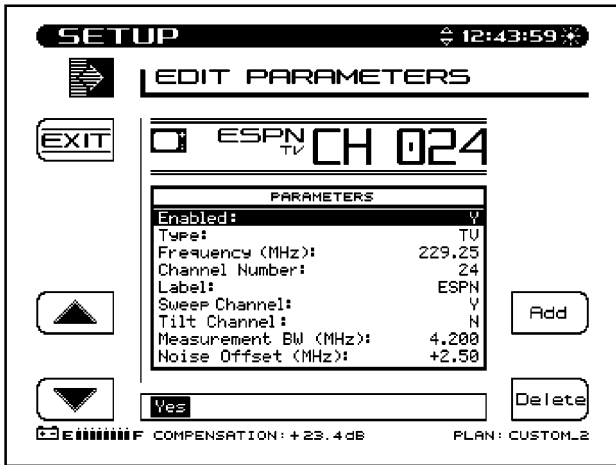
SETUP 12:43:59

CHANNEL PARAMETERS

ENA	TYPE	CHN	LABEL	FREQ	SWP	TLT	SCR
✓	TU	14	QUC	121.25	▪	▪	▪
✓	TU	15	DISY	127.25	▪	▪	▪
✓	TU	16	WETH	133.25	▪	▪	▪
✓	TU	17	CINE	139.25	▪	▪	▪
✓	TU	19	SHOW	151.25	▪	▪	▪
✓	TU	21	NICK	163.25	▪	▪	▪
✓	TU	22	TNN	169.25	▪	▪	▪
✓	TU	23	USA	217.25	▪	▪	▪
✓	TU	24	ESPN	223.25	▪	▪	▪
✓	TU	25	MTU	229.25	▪	▪	▪
✓	TU	26	FMLY	235.25	▪	▪	▪
✓	TU	27	CMYD	241.25	▪	▪	▪
✓	TU	28	LIFE	247.25	▪	▪	▪
✓	TU	29	UHI	253.25	▪	▪	▪
✓	TU	30	CNN	229.25	▪	▪	▪
✓	TU	31	R&E	265.25	▪	▪	▪

COMPENSATION: +23.4dB PLAN: CUSTOM_2

Use the **UP** or **DOWN** arrow keys to select the channel that you wish to edit.



Press the **EDIT** soft key to view and edit the following parameters:

Note: If the parameter that you wish to edit does not appear on the screen, keep pressing the arrow soft key to scroll through the list.

Enabled

Y/N - If the channel is not enabled it will not be included in any measurement modes. At least one channel must be enabled.

Channel Type

TV - Includes standard video carrier with audio carrier offset.

Dual - European system which incorporates video plus two independent audio carriers.

Single Carrier - Can be used for an FM or data carrier.

Digital Carrier - Can be used for 16/64 QAM digital carrier power measurement. Only supported in the Level, Sweep, and Spectrum measurement modes. An RMS detection mode is used when measuring the level of a digital channel.

Frequency

The frequency of the carrier (for TV and DUAL types, this is the frequency of the video carrier) Enter frequency by using the numeric entry keys or the arrow keys.

Channel Number

The channel number of the carrier. Enter channel number by using the numeric entry keys or the arrow keys.

Label

The label is provided to associate a channel's number with it's programming. Using the alpha keys, label the channel with a desired name (up to four characters). "Special" characters can be selected using the up/down arrow keys. The label will appear to the left of the channel number on most screens.

Sweep Channel

Y/N - Designates that the channel will be used for Sweep measurements.

Measurement Bandwidth Adjustments

To edit the bandwidth, cursor to the **Measurement BW** selection. The bandwidth can be adjusted by using the **UP** and **DOWN** arrow keys or by entering a value using the numeric keypad and then pressing the **ENTER** key. The FCC specification for C/N measurements is a bandwidth of 4.200 MHz. CATV organizations outside of the United States may have different requirements.

Noise Offset Frequency Adjustments

The frequency at which the noise level is measured is the Carrier frequency plus the noise offset. To adjust the noise offset, cursor to the **Noise Offset** selection. The offset can be adjusted by using the **UP** and **DOWN** arrow keys or by entering a value using the numeric keypad and then pressing the **ENTER** key.

Tilt Channel

Y/N - Designates which channels are used for the Tilt mode. Up to nine channels can be designated as Tilt channels.

Scrambled

Y/N - Select Yes if the channel is scrambled. When a channel is designated as scrambled, the sweep will only look at the video carrier as a sweep reference, instead of both the video and audio carrier. Note: a diamond will appear to the left of the channel type indicator on most screens.

Audio Offset 1

Specifies the audio offset of the channel.

Audio Offset 2

Specifies the offset for the second audio carrier of a Dual type channel.

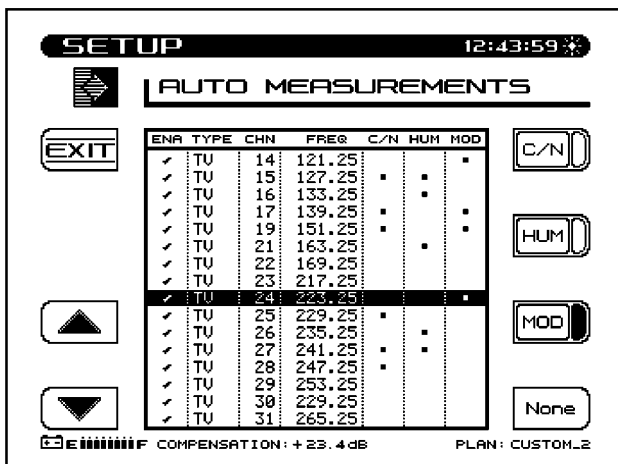
Press the **Exit** soft key to return to the Channel Parameters display.

Delete Unused Channels

Once the channel plan has been built, unused channels can be deleted if desired. Doing this frees memory for other uses and "unclutters" the channel plan. Select the Delete Unused Channels in the Channel Plan menu and press **ENTER**.

Specify Auto Measurements

Press the **ENTER** key to specify the measurements to be taken during the performance of an Auto Test. This feature allows the user to specify which channels, C/N, Hum, and Modulation measurements are made on.



Use the **Up** and **Down** arrow soft keys to cursor to a channel. Use the **C/N**, **HUM**, and **MOD** soft keys to select the desired Auto Test measurements.

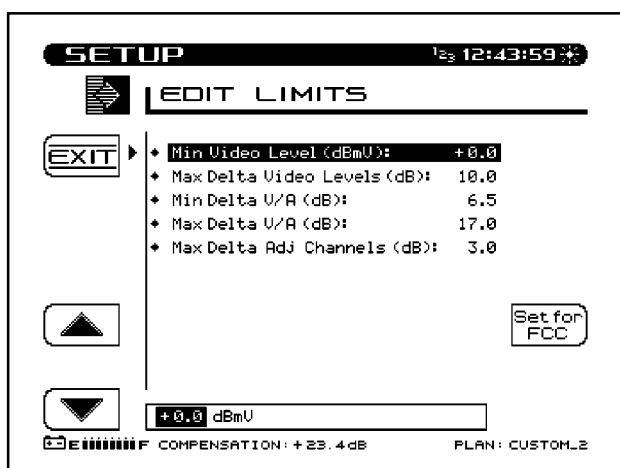
Note: C/N, Hum, and Modulation cannot be measured on a scrambled channel or a sweep point. Hum and Modulation cannot be measured on a Digital type carrier also.

Use the All/None soft key to quickly select or deselect Auto Test measurements. If a test is selected, the **None** soft key is displayed. If no tests are selected for a particular channel, then the **All** soft key is displayed.

Note: Hum measurements include all components < 1 kHz.

Note: Hum will be measured in either % or dB depending on what was selected in Hum mode prior to performing the Auto Test. The units cannot be changed once the Auto Test has been performed.

Edit Limits



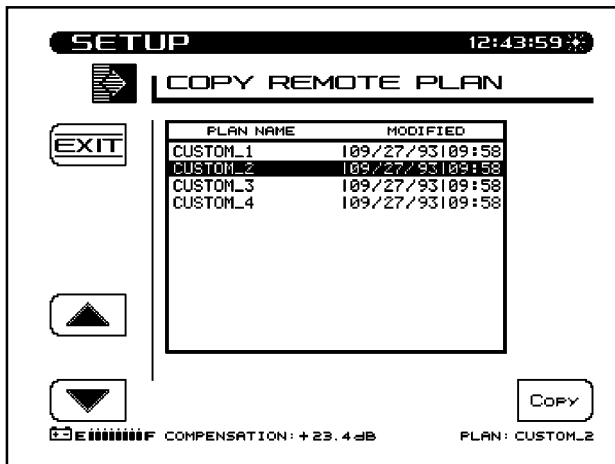
The Edit Limits function works in conjunction with the performance of an Auto Test. As the Auto Test measurements are made, the values are compared to the above limits. Use the **Up** and **Down** arrow soft keys to select the limit to be edited. Use the numeric entry keys or the **UP** and **DOWN** arrow keys to enter a value. Once the value has been entered, press the **ENTER** key to update the display. The Set for FCC soft key can be used to automatically set the limits for FCC specified values.

Copy Remote Plan

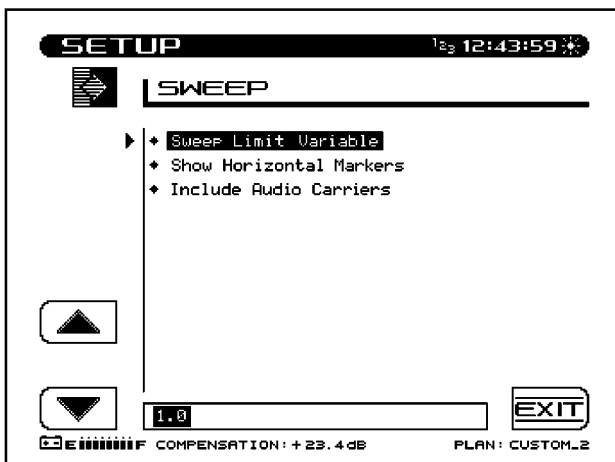
This selection allows you to copy a channel plan from one unit to another.

Connect a cable between the serial ports of two units. Ensure that the baud rate is set the same for each unit (General Setup screen). A baud rate of 19.2K is recommended for copying plans.

Select **Copy Remote Plan** from the menu and press the **ENTER** key. A list of plans located in the remote units memory will appear. Select the plan that you want to copy and press the **Copy** soft key. The selected plan will be transferred from the remote unit and stored in the unit that you are operating. It will also become the active plan.



4.3.5 Sweep



Sweep Limit Variable

The sweep limit variable is used during sweep measurements to show the operator how the response relates to the $(n/10 + x)$ flatness formula. The "x" in the equation is the sweep limit variable. This value is adjustable from 0.0 to 5.0 (default 1.0). Use the **UP** and **DOWN** arrow keys or the numeric entry keys to enter a value.

Show Horizontal Markers

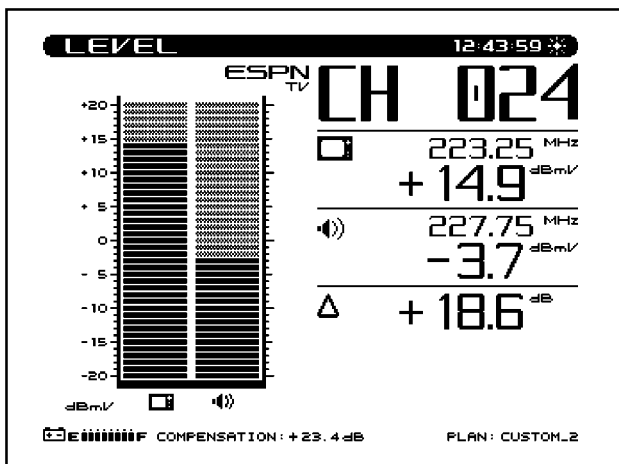
Use the **UP** and **DOWN** arrow keys to display the horizontal markers. The horizontal markers continuously track the maximum and minimum values in the area of the graph between the vertical markers.

Include Audio Carriers

This selection allows the audio carriers to be excluded resulting in a faster sweep. Use the **UP** and **DOWN** arrow keys to include (Yes) or exclude (No) audio carriers.

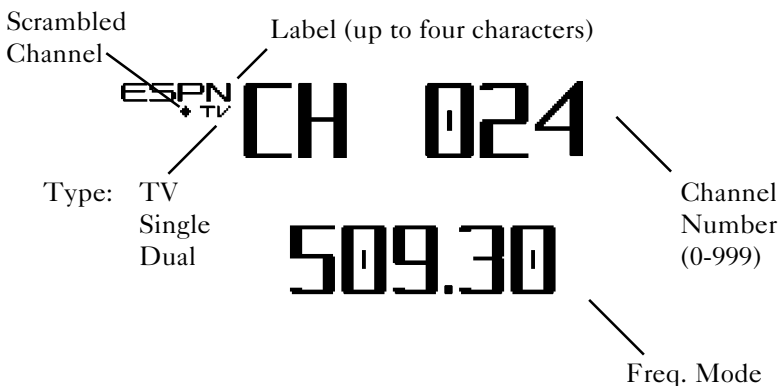
4.4 HOW TO PERFORM LEVEL MEASUREMENTS

Signal levels are measured in the Level and Scan Modes. The Level display provides both a numeric indication of signal level and an analog meter. The audio and video carrier levels of a channel are displayed simultaneously. Alternately, an individual carrier can be measured (as in the case for a data or pilot carrier) or the unit can be tuned to a specific frequency.



Information displayed in the Level mode is as follows:

Information displayed in the Level mode is as follows:



- Channel number or frequency
- Channel label
- Video carrier frequency and level (numerical)
- Audio carrier frequency and level (numerical)
- Analog meter of carrier levels
- Delta between audio and video levels

- Selected channel plan
- Battery status
- Test point compensation (appears only if a nonzero value is programmed during setup) - used to eliminate the test point loss or probe loss from the measurement result to show the signal level "on the system".

Tuning by Channel or Frequency

When the level mode is selected the unit can be tuned by channel or frequency. When in the channel mode, the channel and channel label will appear at the top of the display. The left and right arrow keys can be used to decrement and increment the channels. Channels can also be entered using the numeric keys followed by the **CHAN** key.

To tune by frequency, use the numeric keys to enter a frequency followed by the **FREQ** key. The frequency can then be decremented by using the left key or incremented using the right arrow keys. The step size when tuning by frequency is programmed during setup.

Scale Adjustment

The **UP** and **DOWN** arrow keys can be used to adjust the reference level on the analog meter. This is helpful when the audio and video levels differ by large amounts.

To automatically scale the analog meter, press the **Function** key followed by the **Scale** second function key.

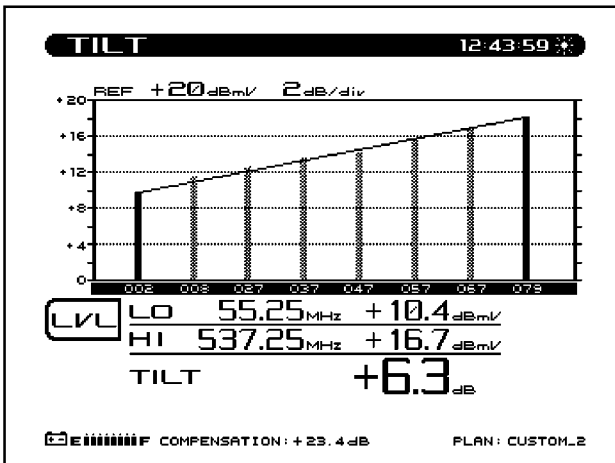
When in the TV channel mode, the level is represented using dual analog meters; one for the video carrier and one for the audio carrier

When in the frequency mode or single channel mode, the level is indicated by a single meter.

4.5 HOW TO MEASURE TILT - BALANCING AN AMPLIFIER

A cable system is designed for unity gain, and the output of each like type of amplifier (trunk, bridger/line extender) output should be as close to identical as physically possible. The amplifiers are set up with specified levels for signals at the high and low end of the spectrum that are used for Automatic Gain Control (AGC) or Automatic Slope Control (ASC). In the amplifier balancing process, these signals are measured and adjusted to specification. Before making an adjustment, ensure that there are no problems in the system that should not be compensated with an adjustment but repaired instead.

To balance the amplifier, ensure that the AGC and ASC is switched off. Tilt mode simplifies the actual balancing by displaying a bar graph with a representation of up to nine different user selected video carrier levels. Adjust the high pilot level to the specified level using the gain control. The gain control tends to affect the overall amplitude throughout the spectrum equally. Adjust the low pilot level to the specified level using the slope control. The slope control affects the low end of the spectrum more than the high end. Due to the interaction between the two controls, repeat this process until the pilots are "balanced". Then switch on the AGC and ASC, wait a moment to measure the signal levels with the AGC and ASC activated.



Information displayed in the Tilt mode is as follows :

- High and low carrier frequencies
- High and low carrier levels
- Tilt measurement
- Reference level and scale
- Selected channel plan
- Battery status
- Test point compensation (appears only if a nonzero value is programmed during setup)

When the **TILT** key is pressed the screen will automatically display up to nine video carrier levels that were defined in the Edit Channel Parameters portion of the Channel Plan Setup menu.

The **UP** and **DOWN** arrow keys can be used to adjust the reference level of the graph.

Level Adjustments

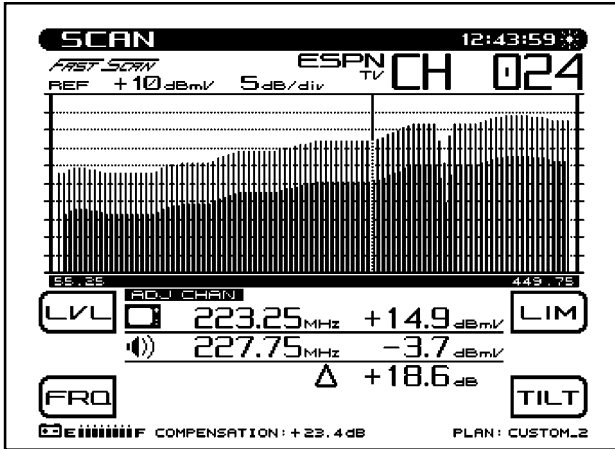
Press the **LVL** soft key to edit the scale and reference level of the Tilt display. To adjust the Scale, use the **UP** and **DOWN** arrow keys to select a scale that will provide the best viewing of the Tilt levels. To adjust the Ref Level, press the Ref Level soft key. Now the Ref Level can be changed by using the **UP** and **DOWN** arrow keys or by entering a numeric value followed by the **ENTER** key. The reference level is at the top of the graph.

NOTE: The reference value is limited by unit and the scale setting.

Pressing the **Auto Scale** soft key will automatically set the reference level for an optimum Tilt display. The **FCN + Scale** key can also be used to automatically set the reference level.

4.6 SCAN MODE

Use the Scan mode to get a good look at absolute carrier levels. In this mode a bar graph showing all carrier levels is displayed. A marker selects which carrier level is displayed on the bottom of the screen.



Information displayed in the Scan mode is as follows:

- Channel number
- Channel label
- Video carrier frequency and level (numerical)
- Audio carrier frequency and level (numerical)
- Histogram graph of carrier levels
- Delta between audio and video levels
- Selected channel plan
- Battery status
- Test point compensation (appears only if a nonzero value is programmed during setup)

When the **SCAN** key is pressed a graph showing all carrier levels is displayed. Use the **RIGHT** and **LEFT** arrow keys to position the marker to on the desired channel. The channel numbers can also be entered directly using the numeric entry keys.

The **UP** and **DOWN** arrow keys can be used to adjust the reference level of the graph.

Level Adjustments

Press the **LVL** soft key to edit the scale and reference level of the Tilt display. To adjust the Scale, use the **UP** and **DOWN** arrow keys to select a scale that will provide the best viewing of the carrier levels. To adjust the Ref Level, press the Ref Level soft key. Now the Ref Level can be changed by using the **UP** and **DOWN** arrow keys or by entering a numeric value followed by the **ENTER** key. The reference level is at the top of the graph.

NOTE: The reference value is limited by unit and the scale setting.

Pressing the **Auto Scale** soft key will automatically set the reference level for an optimum Scan display. The **FCN + Scale** key can also be used to automatically set the reference level.

Frequency Adjustments

Press the **FRQ** soft key to edit frequency range parameters of the Scan display. Use the **UP** and **DOWN** arrow keys or the numeric entry keypad to set the start frequency. Press the **Stop** soft key to adjust the stop frequency. The **Full Span** soft key can be used to set the start and stop frequency to the full range of the unit.

Tilt Compensation

Press the **TILT** soft key to turn tilt compensation on or off. Tilt channels must be programmed in the Channel Plan Edit mode, before this function can be implemented. The tilt is based on the levels of the highest and lowest frequency channels configured for tilt.

When turned on, the compensation value can be adjusted using the **UP** and **DOWN** arrow keys or by entering a numeric value followed by the **ENTER** key. When tilt compensation is in effect, a "TILT ON" indicator appears in the upper portion of the scan screen.

Tilt Compensation

The tilt compensation feature allows the user to enter the cable loss for a particular section of line and then using the scan display adjust the gain of the amplifier to compensate for this loss.

Scan Rate

Two scan rates are available in the Scan mode, normal and fast. The scan rate is selected in the Measurement Setup menu. The Fast scan feature allows for rapid scan displays, while sacrificing accuracy. Normal scan rate is slower, but much more accurate. An indicator appears in the upper left hand corner of the Scan screen when the Fast Scan mode is selected.

Audio Carriers

If desired, the audio carriers can be omitted resulting in a faster scan. This feature is selected in the Measurement Setup menu. An indicator appears in the upper left hand corner of the Scan screen when audio carriers are omitted.

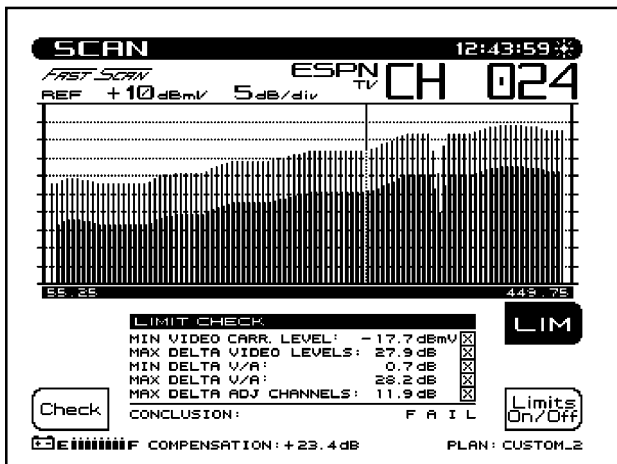
Limits

The Limits feature allows for comparison of the current scan measurement with the "FCC" limits that are defined in Setup. There are two parts to this feature.

When an out of tolerance condition exists a set of annunciators will appear below the scan graph. The annunciators indicate the following out of tolerance conditions:

- Adjacent Channel Error
- Video Level Too High/Low
- Δ VA Too High/Low

The limit annunciators are updated with each scan update.



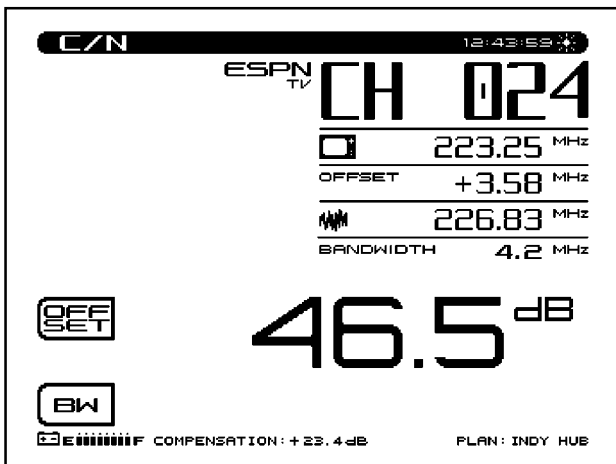
An "aggregate" result summary can be accessed by pressing the **LIM** soft key. This performs a limit check of all channels contained within the scan and reports an overall pass/fail conclusion. The aggregate limit check is not performed with each scan update, however, a **Check** soft key is provided to repeat the limit check whenever desired.

The **Limits On/Off** soft key toggles the limit check feature on & off. When turned off, the limit annunciators do not appear.

4.7 HOW TO MEASURE C/N

It is a good engineering practice to use a bandpass filter on the input of the receiver when making C/N measurements. This is to ensure accuracy and extend measurement range. If a preamplifier is used to boost test point levels prior to measurement, it should be placed between the bandpass filter and the receiver. This measurement is simply a comparison in amplitude between the video carrier reference signal and the noise (FCC limit: > 43 dB). The noise measurement must be made at least 2 to 2.5 MHz from any other carrier on the system.

In the C/N mode the carrier to noise ratio of the tuned channel or frequency is displayed. The C/N measurement bandwidth and the frequency offset for the noise measurement may be controlled from the screen. A proprietary DSP technique allows C/N measurements on modulated carriers (non-scrambled channels). The measurement is made by measuring the video carrier level and then tuning to the offset frequency. Once a quiet line is found, the unit will then measure four consecutive frames and average the values together. The value is then corrected for the selected bandwidth, and the C/N ratio is computed. If the mode is selected before a carrier is available on the input, it will cause the readings to be wrong. If this occurs, change to another mode or channel and then return to the desired channel.



Information displayed in the C/N mode is as follows:

- Channel number
- Channel label
- Carrier frequency
- Noise offset frequency
- Noise frequency
- Bandwidth
- C/N ratio
- Channel plan
- Battery status

To make a carrier to noise measurement, press the **C/N** key. The C/N ratio of the tuned channel or frequency will be displayed.

Bandwidth Adjustments

To edit the bandwidth, press the **BW** soft key. The bandwidth can be adjusted by using the **UP** and **DOWN** arrow keys or by entering a value using the numeric keypad and then pressing the **ENTER** key. The FCC specification for C/N measurements is a bandwidth of 4.200 MHz. CATV organizations outside of the United States may have different requirements.

Noise Offset Frequency Adjustments

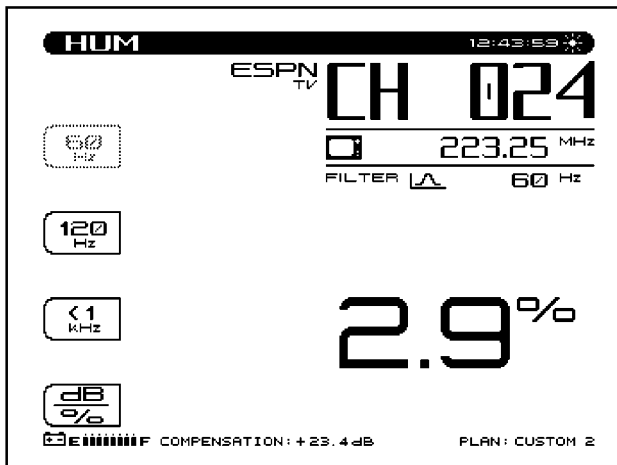
The frequency at which the noise level is measured is the carrier frequency plus the noise offset. To adjust the noise offset, press the **OFFSET** soft key. The offset can be adjusted by using the **UP** and **DOWN** arrow keys or by entering a value using the numeric keypad and then pressing the **ENTER** key.

Note: BW and Noise Offset values can be defined individually for each channel (see section 4.3.4 "How to Edit Channel Parameters"). When tuning by channel number, the BW and Noise Offset values are obtained from the channel plan. After tuning to a channel, the values can be adjusted using the Offset and BW soft keys. However, these adjustments will affect the C/N screen only and will not change the setup values in the channel plan.

4.8 HOW TO MEASURE HUM

Hum is undesirable modulation of the television video carrier by power line frequencies and harmonics (e.g., 60 or 120 Hz), or other low frequency disturbances (FCC limit: < 3%). To measure Hum, simply press the **Hum** key when tuned to any non-scrambled channel. In the Hum mode the hum modulation of the tuned channel or frequency will be displayed in either % or dB as selected by the operator. Soft keys allow the operator to select 60, 120 (50, 100 Hz), or <1,000 Hz filters for this measurement to help in troubleshooting.

A 60 Hz modulation component suggests a possible corroded connector, a 120 Hz component tends to indicate a possible failure related to the DC supply in the amplifier - possibly a capacitor going bad and aggravating the ripple. A proprietary DSP technique enables Hum measurements on modulated carriers (non-scrambled channels).



- Channel number
- Channel label
- Video carrier frequency
- Hum value
- Hum filter frequency
- Channel plan
- Battery status

The SAM4040 has been given the capability of measuring the 1Hz Hum component. To activate this feature, set the Fundamental Hum Frequency in the MEASUREMENTS setup screen to 1Hz. The filter options on the Hum screen will then become; 1Hz, <50Hz, and, <1kHz.

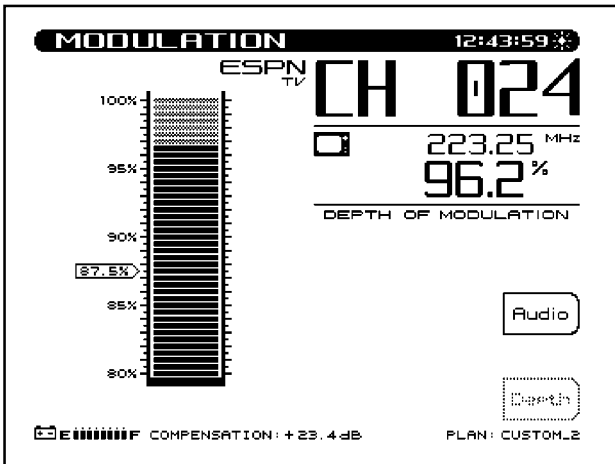
Note: The <1kHz setting does not include the 1Hz component, it only includes 50 to 1000Hz.

NOTE: HUM measurements taken while the desktop charger is in use will affect the HUM reading. For the most accurate reading disconnect the charger prior to taking HUM measurements.

4.9 MODULATION

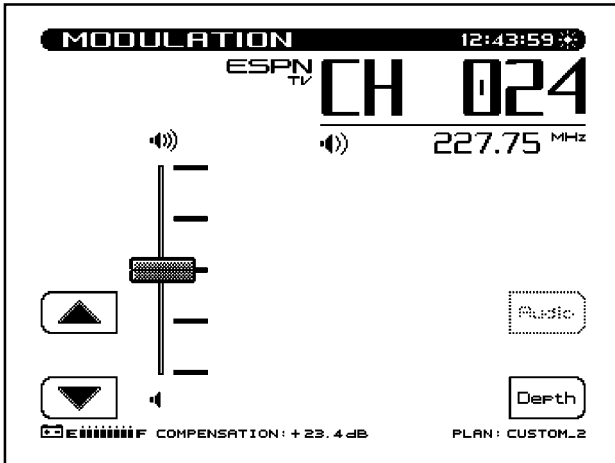
This function allows you to monitor the video depth of modulation in graphical and precise numerical format. A marker is placed at the optimal modulation level (NTSC 87.5%, PAL 90%) to assist technicians while making adjustments.

An **Audio** and **Depth** soft key is used to select the type of modulation to be displayed.



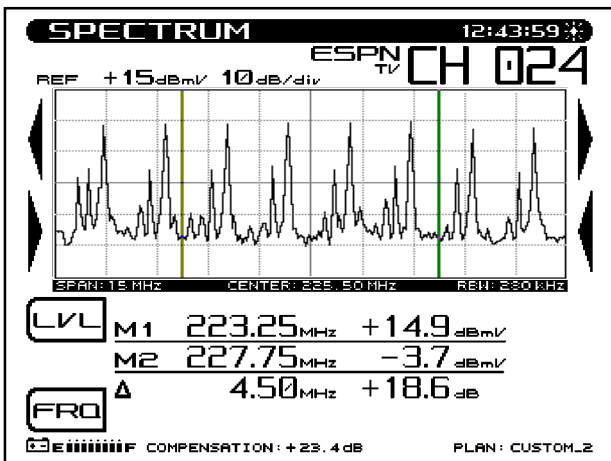
An additional feature is the ability to listen to the audio modulation of the tuned channel or frequency. Use the **Audio** soft key to listen to the audio modulation.

Use the **UP** and **DOWN** arrow soft keys to adjust the volume.



4.10 SPECTRUM ANALYZER MODE

The spectrum analyzer display provides a view of the system spectrum with variable spans from 50 MHz to 3 MHz and a dynamic range of better than 60 dB. When the **Spectrum** key is pressed, the following screen is displayed.



Level Adjustments

A **LVL** (level) soft key is used to adjust the vertical parameters of the graph. These parameters include Max Hold, Ref Level and Scale.

The Max Hold function ensures that the highest signal over multiple sweeps is displayed. When the Max Hold soft key is pressed, as indicated in the left hand corner of the display, the highest signal level is displayed. The M1/M2 readings correspond to the max hold levels. As multiple sweeps are performed, the maximum level trace will only change if new sweep levels exceed the existing levels.

The reference level is located at the top line of the graph. The Ref Level can be adjusted using the cursor keys or by entering a numeric value followed by the enter key.

The scale parameter (1,2,5, & 10 dB/Div) can only be adjusted with the cursor keys. For example, if the reference level was set at 0 dB and the scale was set at 10 dB/div the first horizontal grid line above the center would be equal to -30 dB. Press the **LVL** soft key to return to the main spectrum analyzer display.

Frequency Adjustments

Press the **FRQ** soft key to edit frequency range parameters of the Spectrum Analyzer display. Use the **UP** and **DOWN** arrow keys or the numeric entry keypad to set the center frequency. Press the **Span** soft key to adjust the span frequency. The **Full Span** soft key can be used to set the start and stop frequency to the full range of the unit. Press the **FRQ** soft key to return to the main spectrum analyzer display.

How To Make FCC In-Channel Response Measurements

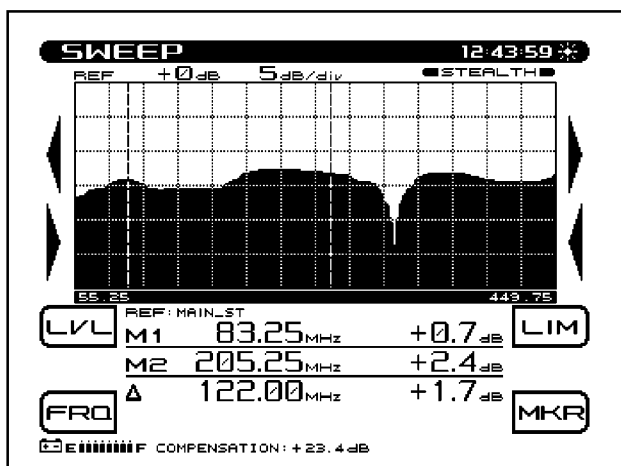
(FCC limit: $< \pm 2$ dB)

The frequency response of any channel can be measured using the spectrum analyzer mode. A flat signal source must be inserted at the input of the modulator or processor. In testing a modulator this source may be a full field multiburst signal, or a sweeping function generator. For a processor, a bench sweep generator or a broadband noise source may be used. The response is monitored with the Stealth receiver in the spectrum analyzer mode. A 5 or 10 MHz span may be used. The “Max Hold” function is used to ensure that the peak levels are measured at all frequencies. The scale may be set to as low as 0.5 dB/div, but the operator will use the appropriate scale setting to enable display of the full response on screen. The operator then positions the markers at the maximum and minimum points of the display and reads the “delta” indicated at the bottom of the screen. The FCC requirement is a window of ± 2.0 dB, which means the delta should be < 4 dB.

4.11 HOW TO PERFORM SWEEP MEASUREMENTS

4.11.1 Introduction

Sweep mode tests the frequency response of the cable system by measuring existing carriers. Any system carrier can be used as a data point, even scrambled. A previously stored response can be used as a reference to the current measurement. Sweep references are selected in the file setup menu.



4.11.2 Operation

Frequency Adjustments

The **FRQ** (frequency) soft key is used to set the start and stop frequency. A start and stop soft key is displayed to select the parameter to be changed. The frequency is varied by using the cursor keys or a specific value can be entered using the numeric keys followed by the **ENTER** key.

A sub-function under the frequency soft key is **Marker Zoom**. This will change the start and stop frequency to coincide with the M1/M2 values. The soft key will change to Undo to return to original start and stop values. Press the **FRQ** soft key to return to main sweep display.

Level Adjustments

A **LVL** (level) soft key is used to adjust the vertical parameters of the graph. These parameters include Ref Level and Scale. The reference level is the midpoint level displayed on the graph. The Ref Level can be adjusted using the cursor keys or by entering a numeric value followed by the enter key.

The scale parameter (1,2,5, & 10 dB/Div) can only be adjusted with the cursor keys. For example, if the reference level was set at 2 dB and the scale was set at 5 dB/div the first horizontal grid line above the center would be equal to 7 dB. An **Auto Scale** soft key will automatically set the reference level for an optimum sweep display. The **FCN + Scale** key will also automatically scale the sweep display. Press the **LVL** soft key to return to main sweep display.

Marker Adjustments

The sweep display includes horizontal and vertical markers. The vertical markers appear on the graph at all times. The vertical markers are labeled M1 & M2. M1 is always to the left of M2. The markers cannot be adjusted to crossover each other. The vertical markers are adjusted using the top two sets of soft keys corresponding to the displayed arrows. The horizontal markers are turned on and off in the Sweep setup screen. The horizontal markers are not adjustable, they automatically track the max and min values in the area of the graph between the vertical markers. The numeric value for Max/Min appears below the sweep graph. This is the maximum level minus the minimum level for the area of the graph between (and including) the vertical markers.

Note the "M1" and "M2" indicators to the left of the marker frequencies below the graph. The inverse highlighting of the "M2" indicator means that marker #2 is currently active. There can be only one active marker at a time. This is the marker that was last adjusted using the left/right arrow soft keys. The frequency of the active marker can be entered directly using numeric keys. The numerals appear on the screen as they are entered. The location of the entry field corresponds to the marker being set (M1 or M2). When the edit box is being displayed, neither marker is active.

Limit Adjustments

A **LIM** (limits) soft key is used to turn the limits function on/off, adjust limits, and specify the amp number. If the limits function is off, the adjust limits and amp number soft keys are disabled and dimmed. The limits on/off soft key toggles to enable or disable the limits function. When the limits function is turned on, and the adjust limits soft key is pressed the limits can be adjusted using the **UP** and **DOWN** arrow keys. The limits can also be set by entering an Amp # using the numeric entry keys or the **UP** and **DOWN** arrow keys. The amp number is used in the flatness formula, $(n/10 + x)$. The x in the equation is configured in the sweep setup screen as the sweep limit variable.

If any portion of the sweep that is currently being displayed exceeds the limits an X is placed in the pass/fail box. Press the **LIM** soft key to return to main sweep display.

NOTE: The limit function checks only the area of the sweep between the current start and stop frequencies.

Sweep References

The Sweepless® sweep system works using the reference comparison method, commonly called “normalization”. With this method, the response at the test point is compared to a reference that was stored at the first amplifier or fiber node, or at a headend or hub site. The sweep trace shows the difference between the sweep levels at the reference point and the sweep levels at the current test point. This works because cable systems are designed according to a “unity gain” principle, which means that the output of each amplifier in the cascade is ideally identical to that of the first amplifier.

Tilt Compensation

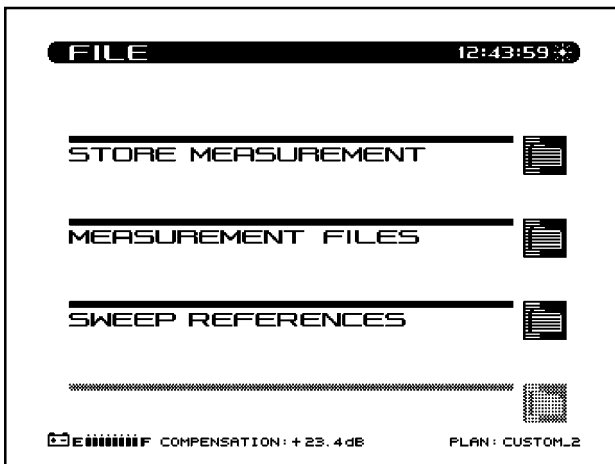
Press the **TILT** soft key to turn tilt compensation on or off. Tilt channels must be programmed in the Channel Plan Edit mode, before this function can be implemented. The **TILT** soft key will be inactive if there are no tilt channels defined in the Receiver's channel plan. The tilt is based on the levels of the highest and lowest frequency channels configured for tilt.

When turned on, the compensation value can be adjusted using the **UP** and **DOWN** arrow keys or by entering a numeric value followed by the **ENTER** key. When tilt compensation is in effect, a "TILT" indicator appears in the upper portion of the sweep screen.

The tilt compensation feature allows the user to enter the cable loss for a particular section of line and then using the sweep display adjust the gain of the amplifier to compensate for this loss.

4.12 FILE

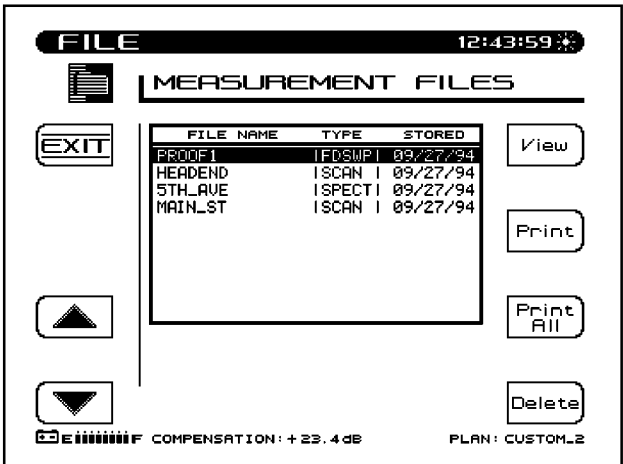
The File menu consists of three File submenus; Store Measurement, Measurement Files, and Sweep References.



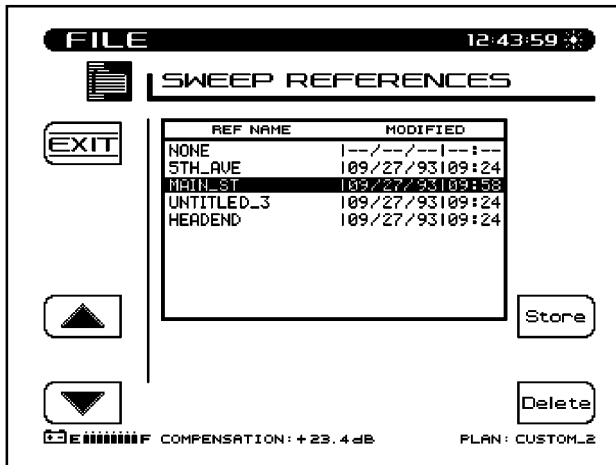
4.12.1 How to Store/View/Delete Measurement Files

The Store Measurement feature allows the user to store sweep, spectrum and scan measurements. To store a measurement, press the **File** key while taking the measurement. Press the **Store Measurement** soft key to access the measurement files. To store the measurement, press the **Store** soft key. The unit will then prompt for a file name. Once a name is entered, press the **OK** soft key to execute the operation.

To view measurement files, press the **Measurement Files** soft key. A listing of all currently stored measurement files is displayed. Use the **UP** and **DOWN** arrow keys to select the file to be viewed. Once selected, press the **View** soft key. Scan measurements can be stored, but can only be viewed/printed using the Stealthware Data Analysis software. Once a file is selected it can be printed using the **Print** soft key. All measurement files, with the exception of scan files, can be printed using the **Print All** soft key. Use the **Delete** soft key to delete all unwanted files.



4.12.2 How to Store/Delete Sweep References



The Sweep References soft key allows the user to select, store or delete sweep references. After a sweep measurement is made, a sweep reference can be stored. The unit must remain in the Sweep screen for a minimum amount of time before a reference can be stored. When first entering the Sweep screen, a wait indicator appears above the sweep graph. A reference cannot be stored until the wait indicator goes away. Press the **Store** soft key to name and store the sweep measurement as a reference.

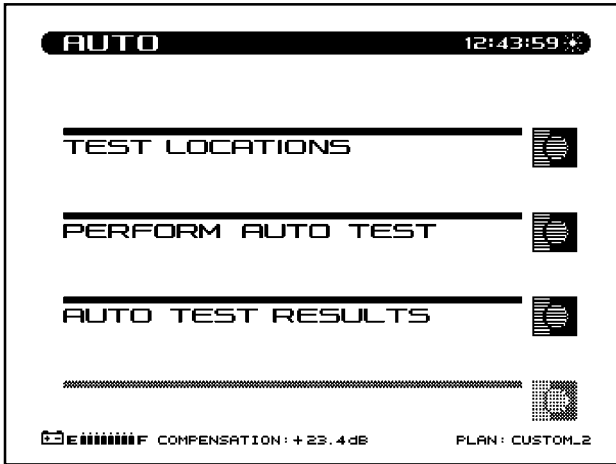
NOTE: The Store soft key is only active if Sweep was the most recent mode selected prior to pressing the File key.

Sweep references can be deleted, by pressing the **Delete** soft key. To select a reference, use the **UP** and **DOWN** arrow keys to highlight the desired reference and then press the **ENTER** or **SWEEP** key to return to the Sweep screen.

If the channel plan has changed since a reference has been stored, the reference is obsolete and can no longer be used. If an obsolete reference is selected, a warning message will appear upon entering Sweep mode, and the default reference will be used. It is recommended that obsolete references be deleted in order to free memory for additional references and files.

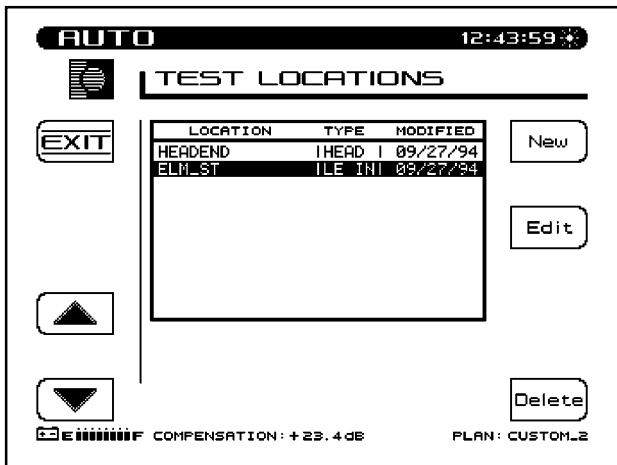
4.13 AUTO

The Auto menu consists of three File submenus; Test Locations, Perform Auto Test, and Auto Test Results.

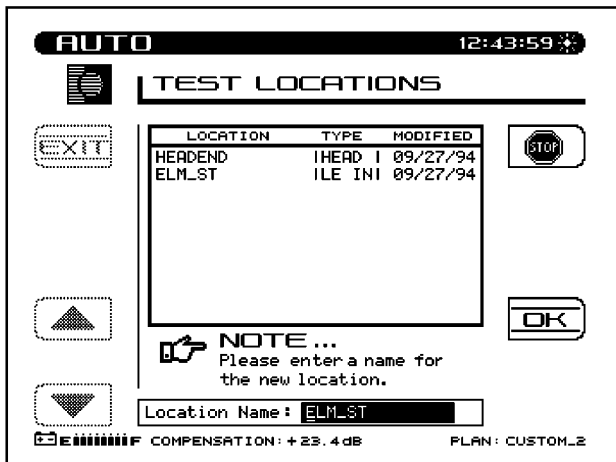


4.13.1 How To Create/Edit/Delete Test Locations

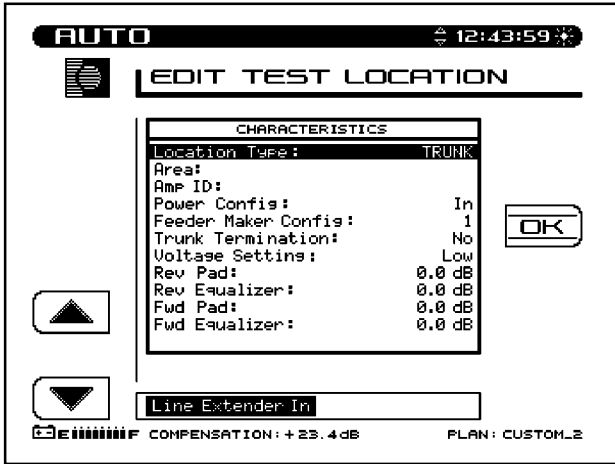
Test Locations allow the user to create specific test point location parameters used in the Auto Test report. The Test Locations can be created directly on the Stealth unit, or using the SteathWare Data Analysis software and downloaded to the Stealth unit. The Test Location is used to identify where the data is collected. The user then simply selects the corresponding location, and the location data is automatically included in the Auto Test report.



Press the **New** soft key to create a new Test Location file.



The unit will then prompt for a file name. Once a name is entered, press the **OK** soft key to execute the operation.



Each location in the list has an associated type and values for the descriptive parameters. The parameters are shown in the following table.

<u>Parameter</u>	<u>Min</u>	<u>Max</u>	<u>Default</u>	<u>Units</u>
1 Area	15 column alpha numeric field			
2 Amp Id	15 column alpha numeric field			
3 Power Configuration	IN / OUT / THROUGH			
4 Feeder Maker Config	1	9	1	
5 Trunk Termination	NO	YES	NO	
6 Voltage Setting	LOW / MID / HIGH			
7 Rev Pad	-100.0	+100.0	0.0	dB
8 Rev Equalizer	-100.0	+100.0	0.0	dB
9 Fwd Pad	-100.0	+100.0	0.0	dB
10 Fwd Equalizer	-100.0	+100.0	0.0	dB

There are five types of locations associated with a cable system: Trunk Amp, Headend, Line Extender, Fiber Node, and Field Test. Some of the parameters do not apply to certain types of locations. The following table shows which of the parameters in the table above apply to each of the location types.

<u>Characteristic</u>	<u>Trunk</u>	<u>Head</u>	<u>Extender</u>	<u>Fiber</u>	<u>Field</u>
1 Area	yes		yes	yes	yes
2 Amp Id	yes		yes	yes	
3 Power Configuration	yes		yes	yes	
4 Feeder Maker Config	yes		yes	yes	
5 Trunk Termination	yes		yes	yes	
6 Voltage Setting	yes		yes	yes	
7 Rev Pad	yes		yes	yes	
8 Rev Equalizer	yes		yes	yes	
9 Fwd Pad	yes		yes		
10 Fwd Equalizer	yes		yes		

Editing of location files is done by pressing the **Edit** soft key. The optional fields will be enabled or disabled according to the location type selected (see table above).

Use the **Up** and **Down** arrow soft keys to scroll to the desired parameter. Use the **UP** and **DOWN** arrow keys or the numeric entry keypad to enter the desired value. Once all the desired parameters have been entered, press the **OK** soft key.

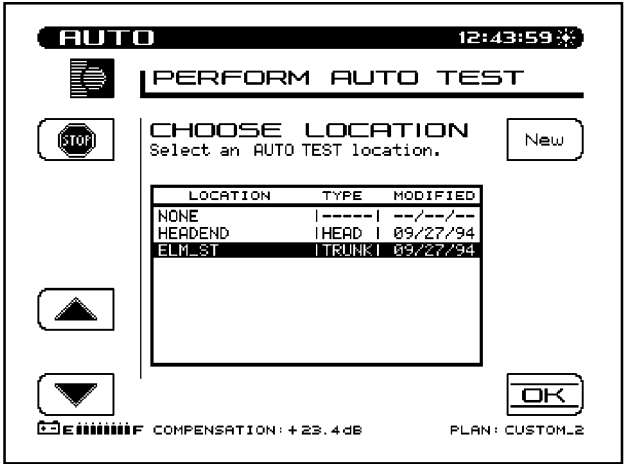
The **Delete** soft key is used to delete a specific location file.

4.13.2 How To Perform An Auto Test

The Auto Test mode provides automated FCC 24 hour testing capabilities. Video & audio carrier levels will be measured for each enabled channel. Additionally, the following can be selectively measured for each channel: C/N, Hum, and Modulation. See Section 4.3.3 How To Setup Your Channel Plan for instructions on how to enable these individual measurements. Tests can be made immediately or at timed intervals, with the instrument sleeping between tests to conserve battery life. Upon test completion, the test results can be viewed on the LCD display before printing or downloading to a PC.

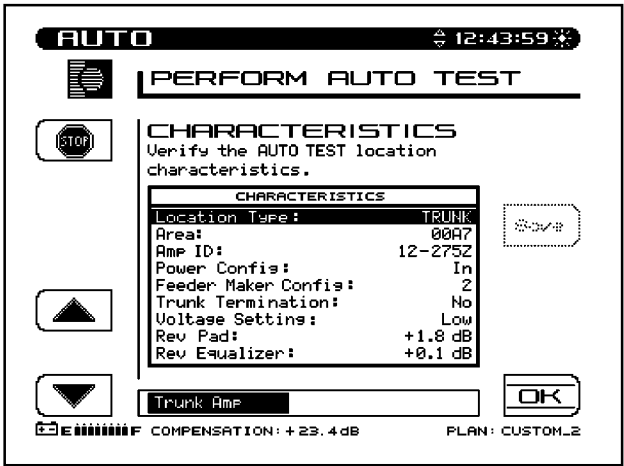
Press the **Perform Auto Test** soft key to enter the Auto test mode. The instrument provides a step-by-step procedure on how to perform an Auto Test.

Auto Test Location



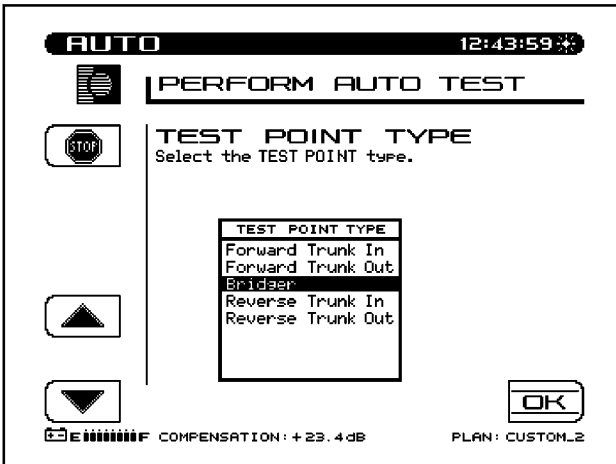
Using the **Up** and **Down** arrow keys, select an Auto Test location. Select **NONE** if location information is not desired. Press the **OK** soft key when completed. To create a new Auto Test location, press the **New** soft key.

Auto Test Characteristics



Use **Up** and **Down** arrow keys to scroll through the location characteristics for the test being performed. Press the **ENTER** key after each parameter is entered to update the display. If changes are made and you want them updated in the location file, press the **Save** soft key. If changes are made and the **Save** soft key is not pressed, the changes will only affect the Auto Test that is about to be performed. Press the **OK** soft key when completed.

Test Point Type

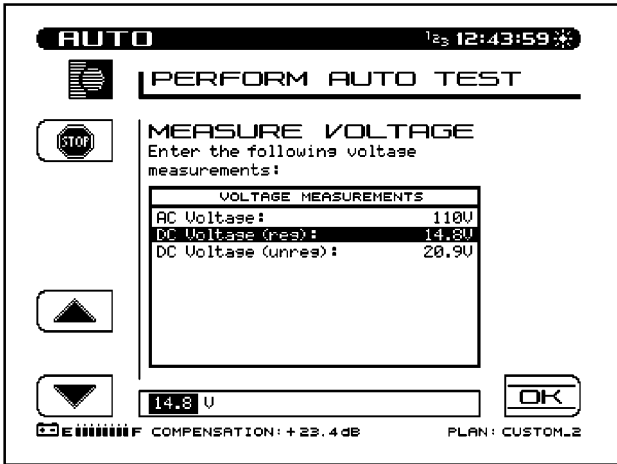


Use the **Up** and **Down** arrow keys to select the Test Point type. When the desired Test Point type is selected, press the **OK** soft key. The following is a list of Test Point types available:

Trunk Amp: Forward Trunk In
Forward Trunk Out
Bridger
Reverse Trunk In
Reverse Trunk Out

Line Extended: Line Extended In
Line Extended Out

Voltage Measurements

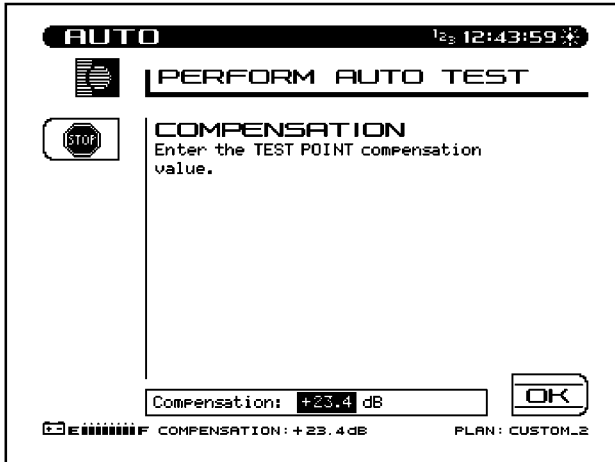


Use the numeric entry keys to enter the following system voltage measurements:

- AC Voltage
- DC Voltage (regulated)
- DC Voltage (unregulated)

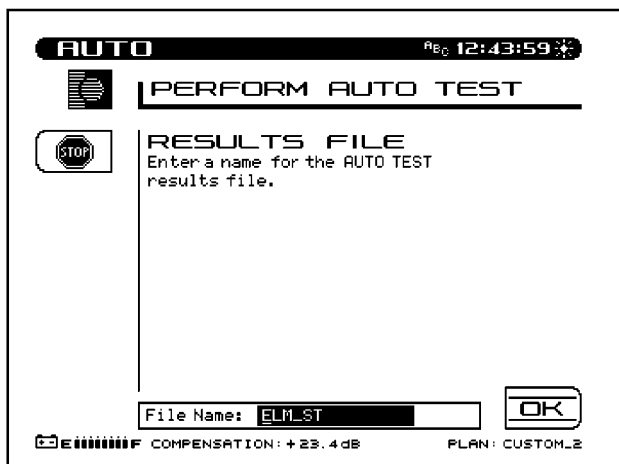
The voltage measurement are printed in the Auto Test report. Press the **OK** soft key when completed.

Test Point Compensation



Test Point Compensation is used to account for losses associated with certain amplifiers. Use the **UP** and **DOWN** arrow keys or the numeric entry keys to enter the Test Point Compensation. (-100.0 to +100.0 dB in 0.1 dB steps). Press the **OK** soft key when the desired value has been entered.

Results File



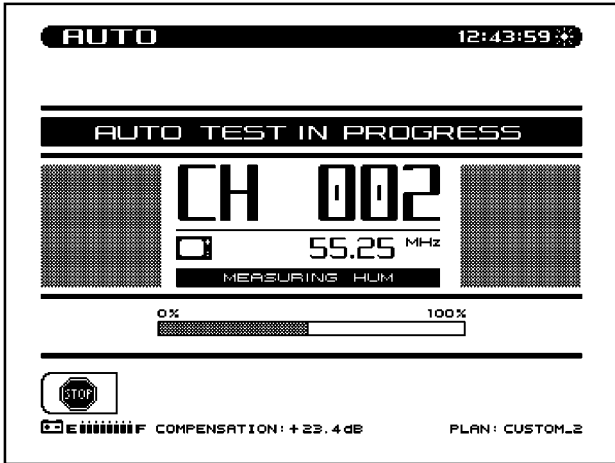
Enter a file name for the Auto Test results to be stored. If an existing file name is used, a warning message will appear prompting the user to overwrite the existing file or create a new one. When the desired file name has been entered, press the **OK** soft key to proceed with the Auto Test.

Type Of Test

Press the **Immediate** soft key to commence the Auto Test. Press the **Scheduled** soft key to perform the Auto Test repeatedly at scheduled intervals.

Immediate

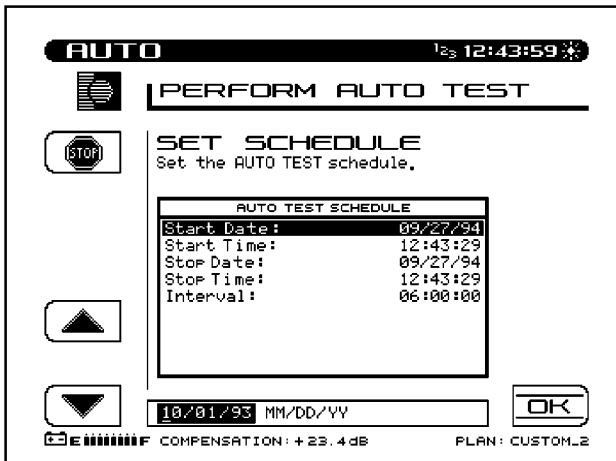
If the Immediate mode is selected the unit will commence the Auto Test sequence. Prior to starting the test, the unit will prompt you to enter the ambient temperature. The temperature displayed is the temperature sensed by the unit. Use the numeric entry keys to enter the ambient temperature. Press the **OK** soft key when the desired temperature has been entered. While the Auto Test is in progress, the following screen is displayed:



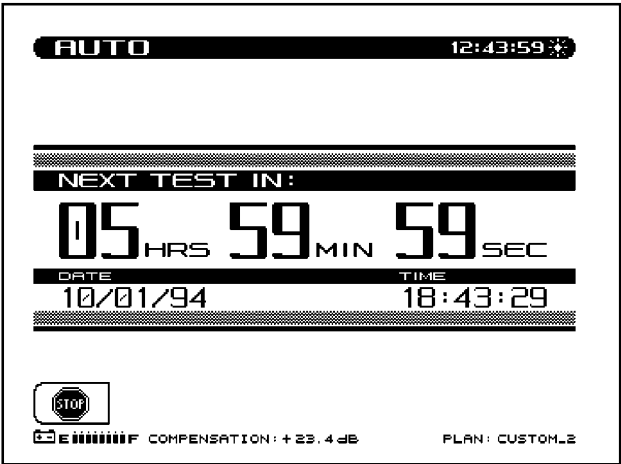
While the Auto Test is in progress, the measurement currently being performed (i.e. Level, C/N, Hum, or Modulation) is indicated on the screen. A bar graph showing the percentage of completion is displayed.

Scheduled

If the Scheduled mode is selected, the start, stop, and interval information must be entered prior to commencing the Auto Test.



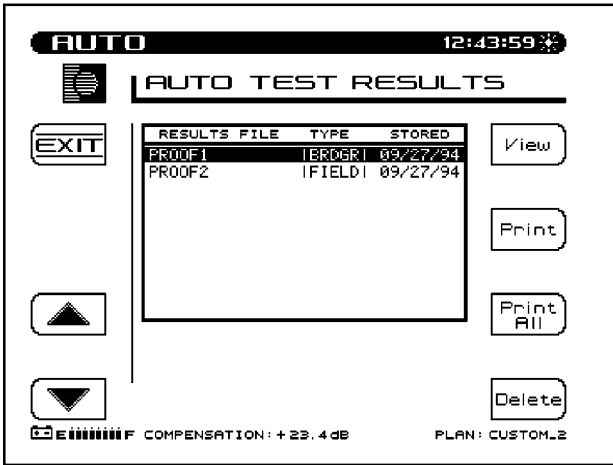
Using the numeric entry keys, enter the start and stop information for the date and time as well as the interval amount. Press the **ENTER** key after each parameter is entered to update the display. Use the **Up** and **Down** arrow soft keys to select the parameter to be entered. Press the **OK** soft key to commence the Schedule Auto Test. If the first interval is to commence immediately, the unit will prompt you to enter the ambient temperature. The temperature displayed is the temperature sensed by the unit. Use the numeric entry keys to enter the ambient temperature. Press the **OK** soft key when the desired temperature has been entered. If the first interval is to commence immediately, the "Auto Test In Progress" screen is displayed. When the unit is between testing intervals, the following screen is displayed:



When the unit is between testing intervals it will enter a sleep mode in order to conserve battery life. All other unit functions are disabled during the performance of the Auto Test.

4.13.3 Viewing/Printing Auto Test Files

Upon completion of the Auto Test, the unit will enter the Auto Test Results Mode to display the Auto Test files. This allows the user to view or print the Auto Test results. Use the **Up** and **Down** arrow soft keys to select a file, then press the **View** soft key. A **Print All** soft key is available to print all intervals from all files in the directory to the printer. The **Info** soft key displays the Test Location Characteristics for the selected file.



A table with all testing intervals and test site information is now displayed. If the Auto Test was performed immediately, then only one interval is displayed. If the Auto Test was performed using scheduled intervals, then all the interval numbers are displayed. The **Print All** soft key is used to send all intervals in the directory to the printer.

AUTO 12:43:59

AUTO TEST RESULTS

EXIT **View**

INTERVALS					
INT	DATE	TIME	TEMP	P/F	
1	07/20/94	15:18	75F	X	
2	07/20/94	21:18	70F	✓	

24hr Report

Print All

OPERATOR: JOHN
 FILE: PROOF1

LOCATION NAME: ELMST
 LOCATION TYPE: TRUNK
 TEST POINT TYPE: BRIDGER
 TEST POINT COMPENSATION: +23.4 dB

▲ **▼**

COMPENSATION: +23.4 dB **PLAN: CUSTOM_2**

Information provided on each interval includes:

- Interval number
- Date measurement was made
- Time measurement was made
- Temperature
- Pass/Fail test results

An "X" in the Pass/Fail column indicates an overall failure of the measurements taken during that interval. A check mark indicates that all measurements were within the specified limits.

To comply with FCC 24 hour testing requirements, the 24hr Report soft key is provided. When the **24hr Report** soft key is pressed, the unit will automatically format and print the highlighted interval plus the next three intervals. The following is an example of a 24 Hour Test Report:

 WAVETEK STEALTH 24 HOUR TEST REPORT

Model: 4040 Serial No: 1234567 Cal Date: 06/21/95

Operator: JOHN File: PROOF1

 Location Name: 1028_ELM_ST
 Location Type: Trunk
 Test Point Type: Forward Trunk In
 Test Point Compensation: +0.0 dB

 Area: 00A7
 Amp ID: 12-275Z
 Power Config: In
 Feeder Maker Config: 1
 Trunk Termination: No
 Voltage Setting: Low
 Reverse Pad: +0.0 dB Reverse Equalizer: +0.0 dB
 Forward Pad: +0.0 dB Forward Equalizer: +0.0 dB

 AC Voltage: 110 V DC Voltage (reg): 14.8 V (unreg): 20.9 V

	#1	#2	#3	#4	
Date:	07/04/95	07/04/95	07/05/95	07/05/95	
Time:	17:00:00	23:00:00	05:00:00	11:00:00	
Temp:	+75 F	+61 F	+59 F	+83 F	
	Video	Video	Video	Video	24 Hr
Chan	Level	Level	Level	Level	Deviation
	(dBmV)	(dBmV)	(dBmV)	(dBmV)	(dB)
2 *	+9.6	+8.8	-17.7 LO	+10.7	28.4 HI
3 *	+9.9	+8.6	-5.8 LO	+8.9	15.7 HI
4	+9.2	+8.3	-2.9 LO	+10.1	13.0 HI
5	+9.3	+8.2	+9.3	+11.5	3.3
6	+8.1	+9.1	+8.6	+11.0	2.9
14	+9.7	+8.7	+9.0	+11.0	2.3
15	+9.3	+7.6	+9.6	+10.6	3.0
16	+10.2	+8.0	+10.7	+10.5	2.7
17	+9.6	+7.4	+9.4	+10.8	3.4
18	+9.2	+8.0	+10.0	+10.2	2.2

LIMIT CHECK	Limit	1	2	3	4	
Min Video Carrier Level:	+0.0 dBmV			X		Fail
Max Delta Video Levels:	10.0 dB	X				Fail
Min Delta V/A:	6.5 dB			X	X	Fail
Max Delta V/A:	17.0 dB	X		X	X	Fail
Max Delta Adjacent Channels:	3.0 dB	X	X	X	X	Fail

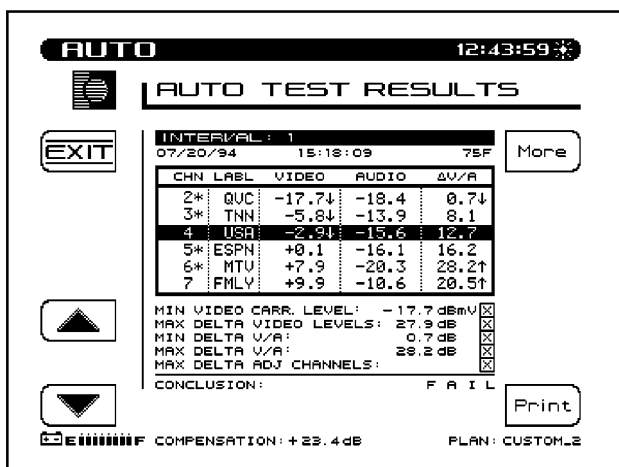
24 Hour Video Deviation: 8.0 dB Fail

Conclusion: F A I L

 Reviewed: _____ Date: _____

The channels with the asterisks indicate those channels that exceeded the Max Delta Adjacent Channels limit. The limits that the readings were compared to, are printed at the bottom of the report. To the right of the limits, the report displays each interval that failed the specific limit. If a particular measurement was not within the specified limit, a HI/LO marker is printed next to the reading indicating the direction that the measurement was out of specification.

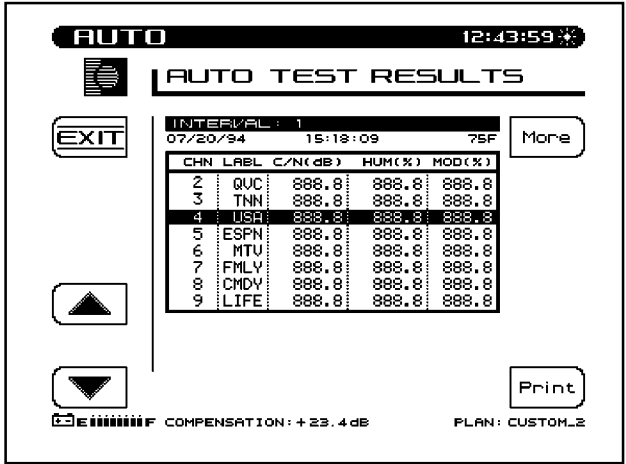
Each interval can be selected and viewed as desired. Use the **Up** and **Down** arrow soft keys followed by the **View** soft key to view specific interval test results.



The test results along with the limits comparison is displayed. The asterisks and up/down arrows have the same meaning as on the single interval report printout. The limit that was exceeded along with the measurement reading is displayed on the lower portion of the screen. When viewing the list of Level measurements, the following symbols will appear to the right of the measurement if an error occurred:

- < under range
- > over range
- E synthesizer unlocked

Use the **More** soft key to toggle between Level measurements, C/N, Hum, and Modulation measurements.



When viewing the list of C/N, Hum, and Modulation measurements, the following symbols will replace the measurement value if an error occurred:

- UNDER - under range
- OVER over range
- ERROR - synthesizer unlocked

The **Print** soft key can be used to print out the following report:

```

-----
WAVETEK STEALTH AUTO TEST REPORT
Model: 4040                Serial No: 1234567          Cal Date: 06/21/95
-----
Operator: JOHN             File: PROOF1             Inverval: 1
Date: 07/20/95            Time: 15:18:09          Temp: 75 F
-----
Location Name:             1028_ELM_ST
Location Type:             Trunk
Test Point Type:          Forward Trunk In
Test Point Compensation:   +0.0 dB
-----
Area:                      00A7
Amp ID:                    12-275Z
Power Config:              In
Feeder Maker Config:      1
Trunk Termination:        No
Voltage Setting:           Low
Reverse Pad: +0.0 dB       Reverse Equalizer: +0.0 dB
Forward Pad: +0.0 dB       Forward Equalizer: +0.0 dB
-----
AC Voltage: 110 V          DC Voltage (reg): 14.8 V (unreg): 20.9 V
-----
Chan  Label  Video      Audio      Delta V/A      C/N      Hum      Mod
      (dBmV)  (dBmV)      (dB)
2 *   QVC   -17.7 LO   -18.4      0.7 LO        43.9     1.4     86.3
3 *   TNN   -5.8 LO   -13.9      8.1           ---      ---      ---
4     USA   -2.9 LO   -15.6      12.7          ---      0.9     ---
5 *   ESPN +0.1      -16.1      16.2          48.2     ---      ---
6 *   MTV  +7.9      -20.3      28.2 HI       ---      ---      88.2
7     FMLY +9.9      -10.6      20.5 HI       ---      ---      ---
8     CMDY +6.9      -11.5      18.4 HI       ---      12.7    ---
9     LIFE +9.1      -11.1      20.2 HI       ---      ---      ---
10 *  VH1  +8.5      -13.3      21.8 HI       57.9     ---      ---
11 *  CNN  +4.1      -12.0      16.1          ---      ---      ---
12   A&E  +4.3      -3.4       7.7          ---      ---      87.5
13   CINE +7.1      -4.2      11.3         ---      2.1     ---
14 *  SHOW +6.3      -7.5       3.8          ---      ---      ---
15 *  NICK +10.2 HI   -8.2       18.4 HI       55.1     ---      86.9
-----
LIMIT CHECK                Limit                Actual
Min Video Carrier Level:   +0.0 dBmV           CH 2    -17.7 dBmV   Fail
Max Delta Video Levels:    10.0 dB             CH 2 & 15 27.9 dB   Fail
Min Delta V/A:             6.5 dB              CH 2     0.7 dB      Fail
Max Delta V/A:             17.0 dB             CH 6     28.2 dB     Fail
Max Delta Adjacent Channels: 3.0 dB              Fail
-----
Conclusion:                                     F A I L
-----

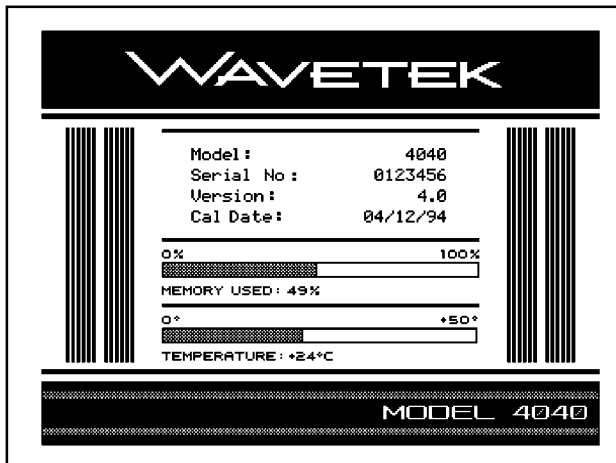
```

Reviewed: _____ Date: _____

This report is similar to the 24 hour report with only one interval being reported. The 24 hour video deviation information is not present.

4.14 STATUS

To view the Status screen, press the **FCN** key followed by the **Status** second function key. The Status screen provides unit information to the user. An important feature is the amount of memory currently being used. This allows the user to decide if unwanted files should be deleted to make more memory available for newer files.



APPENDIX A STATUS INDICATORS/ICONS

INTRODUCTION

There are numerous status indicators/icons displayed on the SAM 4040. The following is a list of all status indicators/icons and an explanation of each. The status indicators are displayed in the title bar as shown in the example below.



🔓 = unlocked

🔋 = low battery

FCN = function key pressed

αβγ = alpha entry mode

123 = numeric entry mode

↕ = arrow key selection mode

◆ = backlight on (manual operation)

✱ = backlight on (auto operation)



- Video Carrier



- Audio Carrier



- Single Carrier



- DUAL Carrier



- Band Pass Filter (Hum screen)



- Low Pass Filter (Hum screen)



- Noise (C/N screen)

APPENDIX B USER MESSAGES

INTRODUCTION

There are numerous user messages that will appear on the unit. Some messages can be caused by improper operation or unit malfunction. The following list provides an explanation of the condition that caused the message to appear, followed by the suggested response:

Message	ERROR... No STEALTH telemetry!
Condition	No telemetry established between Transmitter and Receiver
Response	Check connection and ensure telemetry frequencies are matched.
Message	SORRY... The selected reference cannot be used!
Condition	The channel plan has been changed or a different channel plan has been selected since storing the reference.
Response	Delete the incompatible reference and select another or store a new reference.
Message	ERROR... The synthesizer has become unlocked!
Condition	The PLL synthesizer has become unlocked.
Response	Indicates a problem with the circuitry, service is required.
Message	ERROR... The noise frequency is out of range!
Condition	The noise offset frequency plus the carrier frequency exceeds the range of the unit.
Response	Choose a smaller noise offset frequency value.

Message	ERROR... Insufficient signal level to perform the measurement!
Condition	A minimum carrier level is required for C/N and HUM measurements.
Response	Choose another channel or frequency with greater than the minimum level.
Message	SORRY... This is an illegal name and cannot be used.
Condition	An illegal name has been entered.
Response	Choose another name.
Message	WARNING...A reference with this name already exists. Overwrite?
Condition	A reference with the same name currently exists.
Response	Overwrite the existing reference or choose another name.
Message	SORRY... This is an invalid name. Please try again.
Condition	An invalid name has been entered.
Response	The name must contain at least one character.
Message	SORRY... There is not enough memory to store a new reference!
Condition	Memory is currently at maximum capacity.
Response	Delete unwanted files to make more memory available.
Message	WARNING... The selected reference will be deleted!
Condition	A reference file is about to be deleted.
Response	Press OK to delete.

Message	ERROR... The selected reference has been corrupted!
Condition	The reference cannot be used because of a non-volatile memory failure.
Response	Delete the corrupted reference and select another.
Message	SORRY... Not enough sweeps have occurred to store an accurate reference. Please allow more time in SWEEP.
Condition	An attempt to store a reference without sufficient sweeps.
Response	Allow more time in Sweep Mode.
Message	ERROR... A system error has occurred!
Condition	A system error has been detected.
Response	Restart the unit and try again.
Message	ERROR... There is no response from the printer!
Condition	The printer is not responding to the unit.
Response	Check printer connection and compatibility.
Message	SORRY... There is nothing to print! Please select a measurement mode before attempting to print.
Condition	An attempt to print was made without being in a measurement mode.
Response	Choose a measurement mode.
Message	WARNING... A sweep file with this name already exists. Overwrite?
Condition	A sweep file with the same name currently exists.
Response	Overwrite or choose another name.

Message	SORRY... There is not enough memory to store a new file!
Condition	Memory is currently at maximum capacity.
Response	Delete unwanted files to make more memory available.
Message deleted!	WARNING... The selected sweep file will be
Condition	A sweep file is about to be deleted.
Response	Press OK to delete.
Message	ERROR... The selected sweep file has been corrupted!
Condition	The file cannot be used because of a non-volatile memory failure.
Response	Delete the corrupted file and select another sweep file.
Message	ERROR... A system error has occurred! Please select another mode.
Condition	A system error has been detected.
Response	Select another measurement mode or restart the unit and try again.
Message	ERROR... At least two tilt channels must be programmed and enabled! Please select another mode.
Condition	Tilt mode is selected with less than two tilt channels programmed.
Response	Edit channel plan to program at least two tilt channels.
Message	WARNING... The selected plan will be deleted.
Condition	A channel plan is about to be deleted.
Response	Press OK to delete, STOP to

cancel.

Message	SORRY... The active plan cannot be deleted!
Condition	An attempt to delete the active channel plan.
Response	Select a different plan as the active plan, then delete the desired plan.
Message	ERROR... This plan is corrupted and cannot be used!
Condition	The plan cannot be used because of a non-volatile memory failure.
Response	Delete the plan and then choose another.
Message	WARNING... A plan with this name already exists. Overwrite?
Condition	A channel plan with the same name currently exists.
Response	Overwrite or choose another name.
Message	SORRY...This is the name of a fixed plan and cannot be used.
Condition	An attempt was made to name a channel plan with the name of a fixed plan.
Response	Choose another name.
Message	ERROR... The stop frequency has been set too low.
Condition	The stop frequency has been set below the lowest channel in the selected fixed plan.
Response	Enter a higher stop frequency.
Message	SORRY... This cannot be completed due to a system error.
Condition	A system error was detected.
Response	Restart the unit and try again.
Message	WARNING... This channel will be deleted!
Condition	A channel is about to be deleted.

	Response	Press OK to delete, STOP to cancel.
Message	SORRY... The last channel cannot be deleted!	
	Condition	An attempt was made to delete the last channel of a plan.
	Response	A channel plan must contain at least one channel. If desired, delete the entire plan.
Message	WARNING... This operation cannot be undone!	
	Condition	An operation has been selected that will make permanent changes to a stored file.
	Response	Press OK to execute, STOP to cancel.
Message	SORRY... There is not enough memory to store the new plan!	
	Condition	Memory is currently at maximum capacity.
	Response	Delete unwanted files to make more memory available.
Message	WARNING... There is not enough memory to save the changes!	
	Condition	Memory is currently at maximum capacity.
	Response	Delete unwanted files to make more memory available.
Message	SORRY... Some channels may not have been converted due to a system error.	
	Condition	A system error was detected.
	Response	Restart the unit and try again.
Message	WARNING... All files and stored settings will be lost!	
	Condition	The unit is being reset to the factory default settings.

Response Press OK to reset settings, STOP to cancel.

Message ERROR... C/N cannot be measured on a scrambled channel!

Condition A channel that has been programmed as scrambled in setup has been selected in C/N mode.

Response Select a channel that is not scrambled. C/N measurements are not possible on a scrambled channel.

Message ERROR... Hum cannot be measured on a scrambled channel!

Condition A channel that has been programmed as scrambled in setup has been selected in Hum mode.

Response Select a channel that is not scrambled. Hum measurements are not possible on a scrambled channel.

Message SORRY... No more tilt channels can be programmed.

Condition The maximum number of tilt channels has been reached.

Response To program another tilt channel, an existing tilt channel must be reprogrammed as a non-tilt channel.