



DSA 1491

Professional Multi-stream Satellite, Broadcast
TV, CATV, ASI, IPTV
DIGITAL SIGNAL ANALYZER

User Manual





Copyright

© 2015 Sencore, Inc. All rights reserved.
3200 Sencore Drive, Sioux Falls, SD USA
www.sencore.com

This publication contains confidential, proprietary, and trade secret information. No part of this document may be copied, photocopied, reproduced, translated, or reduced to any machine-readable or electronic format without prior written permission from Sencore. Information in this document is subject to change without notice and Sencore Inc. assumes no responsibility or liability for any errors or inaccuracies. Sencore, Sencore Inc, and the Sencore logo are trademarks or registered trademarks in the United States and other countries. All other products or services mentioned in this document are identified by the trademarks, service marks, or product names as designated by the companies who market those products. Inquiries should be made directly to those companies. This document may also have links to third-party web pages that are beyond the control of Sencore. The presence of such links does not imply that Sencore endorses or recommends the content on those pages. Sencore acknowledges the use of third-party open source software and licenses in some Sencore products. This freely available source code can be obtained by contacting Sencore Inc.

About Sencore

Sencore is an engineering leader in the development of high-quality signal transmission solutions for the broadcast, cable, satellite, IPTV, telecommunications, and professional audio/video markets. The company's world-class portfolio includes video delivery products, system monitoring and analysis solutions, and test and measurement equipment, all designed to support system interoperability and backed by best-in-class customer support. Sencore meets the rapidly changing needs of modern media by ensuring the efficient delivery of high-quality video from the source to the home. For more information, visit www.sencore.com

- **Dolby Digital Information**

This product contains circuitry licensed from Dolby Laboratories.
“Dolby Digital”, “DolbyE”, “AC-3” and “EAC-3” are licensed trademarks of Dolby Laboratories.

Revision History

Date	Version	Description	Author
11/30/2015	1.0	Operations Manual for DSA 1491	G.A.K.

Table of Contents

INTRODUCTION	8
PACKAGE CONTENTS	8
CD DISC CONTENTS	9
SMART SOFTWARE	9
SYSTEM INFORMATION	9
SECTION 1: UNIT FAMILIARIZATION	10
1.1 FRONT PANEL FAMILIARIZATION	10
1.2 RIGHT SIDE PANEL FAMILIARIZATION	11
1.3 TOP SIDE PANEL FAMILIARIZATION	12
1.4 HOME MENU ICON FAMILIARIZATION	13
1.5 POWERING ON/OFF	15
1.6 POWER ADAPTER	15
1.7 BATTERY CHARGING/MANAGEMENT	15
1.8 BATTERY REPLACEMENT	17
SECTION 2: QUICK START GUIDE.....	18
2.1 NAVIGATION	18
2.2. NAVIGATION – EXERCISE.....	19
2.3 DROPDOWN MENU SELECTIONS.....	20
2.4 MEASUREMENT SIGNAL SELECTION	21
2.5 METER TUNING.....	21
2.6 QUICK START MEASUREMENTS	22
2.7 ENTERING FIELD VALUES	23
SECTION 3: METER CONFIGURATION.....	24
3.1 CONFIG PUSHBUTTON (QUICK VIEW) MENU	24
3.11 VOLUME	24
3.12 BRIGHTNESS	25
3.13 VIDEO OUT	25
3.14 VIDEO IN.....	25
3.15 IMAGE FORMAT	26
3.16 ASI IN.....	26
3.17 RF IN	26
3.18 LTE Filter.....	26
3.19 BATTERY SAVING	27
3.20 CONFIGURATION MENU	27
3.2 CONFIGURATION MENU	28
3.21 METER CONFIGURATION	28
3.22 TV Configuration	32
3.23 SAT Configuration	33
3.23.1 LNB L.O.	33
3.23.2 KU BAND.....	34
3.23.3 C BAND.....	34
3.23.4 LNB 1 DiSEqC	34
3.23.5 LNB 2 DiSEqC	35
3.23.6 DUAL LNB.....	35
3.23.7 SAT EXPERT	35
3.23.8 PLS CONFIGURATION	35
3.24 CATV Configuration	36
3.24.1 LNB L.O.	36

3.24.2 C/N TYPE	36
SECTION 4: SATELLITE MEASUREMENTS	40
4.1 SATELLITE PLAN SELECTION	40
4.2 SATELLITE MEASUREMENTS	41
4.21 Main Measurement Page	41
4.22 Satellite Analog Main Measurement Page	42
4.23 Constellation & Info Measurement Page	42
4.3 SATELLITE MPEG SERVICE LIST	44
4.31 MPEG Service Page Description	44
4.32 MPEG Video Service Monitoring	45
4.4 SATELLITE MEASUREMENT POPUP MENU	45
4.41 DVB-S2 Multi stream Selection Popup Menu	46
4.5 SATELLITE SPECTRUM ANALYZER	47
4.6 SATELLITE SPECTRUM ANALYZER POPUP MENU	48
4.7 SATELLITE SPECIAL FUNCTIONS	49
4.71: AT SCR – Single Cable Router Test Function	50
4.72: DUAL LNB – Dual Satellite Metering Function	50
4.73: DiSeqC – Dish Motor Control Function	52
4.74 SAT FINDER Function	52
4.75 BUZZER & NOISE. MARGIN GRAPH Function	55
4.76 MULTI-FREQ L-BAND FUNCTION	56
4.77 SAT POINTER Function	57
4.78 Azimuth & Elevation	58
4.8 SATELLITE MEMORY MANAGEMENT	59
4.81 SAVE DATALOGGER – Satellite Auto Measure & Store	59
4.82 RECALL DATALOGGER - View Satellite Data Log File	61
4.83 MANUMEMORY – Creating or Editing Satellite Plans	62
4.84 FILE MANAGER – Renaming or Deleting Files	63
4.9 SATELLITE HELP	65
4.10 SATELLITE TS STREAMING LAN/USB	66
4.11 SATELLITE – VISUALIZE NIT	68
4.12 SATELLITE – SINGLE CHANNEL LOGGER - MONITORING	68
5.1 TV PLAN SELECTION	70
5.2 TV DIGITAL & ANALOG MEASUREMENTS	71
5.21 Main Digital TV Measurement Page	71
5.22 Analog TV Measurements	72
5.23 FM RADIO TUNING & MEASUREMENT	73
5.3 TV MPEG SERVICE LIST	74
5.31 TV MPEG Service Page Description	74
5.32 TV Constellation & Monitoring	75
5.33 TV MPEG Video Service Monitoring	76
5.4 TV MEASUREMENT POPUP MENU	76
5.41 TSstreaming	77
5.42 MINISPECTRUM	78
5.43 VISUAL NIT	79
5.44 CHANNEL LOGGER	79
5.5 TV SPECTRUM ANALYZER	81
5.6 TV SPECTRUM ANALYZER POPUP MENU	82
5.62 Spectrum Analyzer Marker Bandwidth Measurement	83
5.63 Spectrum Analyzer Delta Marker Measurement	83
5.7 TV SPECIAL FUNCTIONS	85

5.71 TV BUZZER & NOISE MARGIN GRAPH TEST	86
5.72 TV ATTENUATION TEST.....	87
5.8 TV MEMORY MANAGEMENT	88
5.81 AUTOMEMORYtv – Scan TV Channels to Create a Channel Plan.....	88
5.82 SAVE DATALOGGER – TV Auto Measure & Store	90
5.83 RECALL DATALOGGER - View TV Data Log File	91
5.84 MANUMEMORY – Creating or Editing TV Channel Plans	92
5.85 TV FILE MANAGER – Renaming or Deleting Files.....	94
5.9 TV “HELP” SIGNAL DISCOVERY	95
5.10 TV BAR SCAN TEST	96
SECTION 6: CATV MEASUREMENTS	98
6.1 CATV PLAN SELECTION.....	98
6.2 CATV DIGITAL MEASUREMENTS	99
6.21 Main Digital Measurement Page Description	99
6.22 Analog CATV Measurement Page	101
6.23 CATV Constellation & Info Measurement Page	102
6.3 CATV MPEG SERVICE LIST	103
6.31 CATV MPEG Service Page Description	103
6.32 CATV MPEG Video Service Monitoring.....	104
6.4 CATV MEASUREMENT POPUP MENU	104
6.41 TSstreaming	105
6.42 MINISPECTRUM	106
6.43 VISUAL NIT.....	107
6.44 CHANNEL LOGGER.....	107
6.5 CATV SPECTRUM ANALYZER	109
6.6 CATV SPECTRUM ANALYZER POPUP MENU	110
6.62 CATV Spectrum Analyzer Delta Marker Measurement	111
6.63 Spectrum Analyzer Marker Bandwidth Measurement.....	111
6.7 CATV SPECIAL FUNCTIONS.....	112
6.71 CATV LEAKAGE TEST	113
6.72: CATV INGRESS TEST.....	115
6.73 CATV BUZZER & NOISE MARGIN GRAPH TEST	116
6.8 CATV Memory Management.....	117
6.81 AUTOMEMORYtv – Scan CATV Channels to Create a Channel Plan	117
6.82 SAVE DATALOGGER – CATV Auto Measure & Store	118
6.83 RECALL DATALOGGER - View CATV Data Log File.....	120
6.84 MANUMEMORY – Creating or Editing CATV Channel Plans	121
6.85 CATV FILE MANAGER – Renaming or Deleting Files.....	123
6.9 CATV HELP	124
6.10 CATV BAR SCAN TEST	125
6.11 CATV BAR SCAN – TILT TEST	127
SECTION 7: AUDIO/VIDEO IN/OUT MONITORING.....	128
7.1 HDMI OUTPUT MONITOR – USING AN EXTERNAL HDMI MONITOR.....	128
7.2 ANALOG AUDIO/VIDEO MONITOR - USING AN EXTERNAL NTSC OR PAL MONITOR	130
7.3 AUDIO/VIDEO IN	130
SECTION 8: ASI MEASUREMENTS	131
8.1 ASI OUTPUT – DEMODULATED TV- RF TO ASI OUTPUT	131
8.2 ASI INPUT MPEG MONITORING/TESTING.....	132

DSA 1491– User Manual

8.21 ASI Input - MPEG Service List Page Description	132
8.22 TV MPEG Video Service Monitoring.....	133
SECTION 9: ASI-IP ANALYZER	135
9.1 ASI – IP ANALYZER: BITRATE/SERVICES ANALYZER (PAGE 1)	136
9.2 ASI – IP ANALYZER: TR 101-290 ANALYSIS (PAGE 2).....	137
9.3 ASI – IP ANALYZER: PSI/SI TABLE ANALYSIS (PAGE 3).....	139
9.3 ASI – IP ANALYZER: IP MEASUREMENTS (PAGE 4)	140
SECTION 10: OPTIC POWER MEASUREMENTS	143
10.1 OPTIC POWER FUNCTION	143
10.2 OPTICAL INPUT CONNECTORS.....	144
SECTION 11: SCREEN SHOT CAPTURES	145
11.1 CAPTURING SCREEN SHOTS TO A USB MEMORY STICK	145
SECTION 12: GPS MEASUREMENTS	146
SECTION 13: REMOTE MEASUREMENT APPLICATION.....	147
13.1 CONNECTING.....	147
13.2 USER AND PASSWORD ENTRY	148
13.3 REMOTE CONTROL – SETTINGS/MONITOR OVERVIEW.....	149
13.4 SETTINGS - MONITOR.....	149
13.5 MONITORING - MEASURE.....	150
13.6 MONITORING – SPECTRUM.....	151
13.7 MONITORING – TS ANALYZER	151
13.8 SETTINGS – LOGGER	152
13.9 LOGGER - MEASURE.....	154
13.10 MEMORY – MEM PLAN AND LOGGERS LOGGERS	154
SPECIFICATIONS.....	157
APPENDIX A – NORTH AMERICA CHANNEL PLANS	162
APPENDIX B - CLEANING/ MAINTENANCE INFORMATION.....	169
APPENDIX C - WARRANTY/SERVICE INFORMATION	170

Introduction

Thank you for choosing the Sencore DSA 1491. This instrument is an all format TV/RF signal analyzer providing today's engineer a complete tool in resolving digital video broadcast, transport, or reception challenges. Capable of testing and analyzing digital satellite transponder signal quality, broadcast channels (models available for 8VSB, DVB-T, and ISDB-T), and cable QAM channels, ASI digital interface transport streams and MPEG IP based streams it is an all-in-one analyzer. The DSA 1491 features a large color touch control screen eliminating multiple menus and pushbuttons to achieve a new plateau in user friendliness, with selections virtually at your finger tip. The large screen further provides unprecedented resolution so you won't miss problems when analyzing critical constellation and spectrum analyzer test screens.

The DSA 1491 provides powerful digital TV/RF analysis including MER, BER, PER, EVM, noise margin, constellation, and spectral analysis tests. A simple pass or fail indication simplifies interpretation. Additionally, the modulation type, FEC value, encryption type, network and program names, video/audio program identification lists, and non-encrypted video is displayed providing advanced signal analyzing.

The DSA 1491 further provides a full arsenal of unique special tests and control features to assist technicians in troubleshooting all satellite, cable and TV reception systems. Advanced features include an integrated Spectrum Analyzer, SatFinder, DiSEqC commands, Dual LNB monitoring, SCR commands, BarScan, Tilt, Leakage, Ingress, and Logger tests. The DSA 1491 comes equipped with protective case, power adapters, USB cable and SMART software.

Package Contents

Great care is taken to ensure the DSA 1491 shipped from the Sencore factory is free of defects, contains the supplied accessories and is securely packaged. Please inspect the package and contents upon receipt. If there has been significant damage please contact Sencore Inc. for further instructions. It is recommended that you save all packing materials for return shipping to Sencore when calibration or service is needed.

Please inspect the contents to be sure you have received all the intended items and supplied accessories. Your DSA 1491 is shipped with the following:

- Instrument DSA 1491
- Soft Carry Case with carry strap
- AC Power Adapter/Battery Charger
- Automotive Power Cable
- Software CD Disc
- USB 2.0 Cable
- Replacement F Connector "Barrel"
- DisEqC Switch (2 way)
- F Push-On Connector
- Video/Audio Cable mini to RCA phono

CD Disc Contents

The supplied CD disc contains several files. It contains a pdf version of this manual for your reference. It also contains a PC software program called “SMART” which is explained in the next section on this page. The CD also includes a pdf file of the SMART Software Users Guide which provides instructions on how to install, license, connect and use the SMART software. The CD further contains a driver file used for the USB connection from the PC to the DSA 1491 when establishing a connection for the SMART software.

SMART Software

The SMART (**S**ystem **M**onitoring **A**cquisition & **R**eprogramming **T**ool) Software is provided at no additional charge. The software is provided on the CD shipped with the instrument. This software is used to interface with the meter and provide the following functions: custom channel plan programming, meter “cloning”, logger file download and export in xls, firmware updates and more. Please read the SMART Users Guide supplied on the CD with the instrument for information on how to install, use, and obtain the free license for the software.

System Information

The DSA 1491 provides unit information on its initialization screen when powering on. Should you seek Sencore technical or service assistance, please note the information on this initialization screen and have it available. Please note the hardware or “HW” value and the firmware revision or “FW” value.

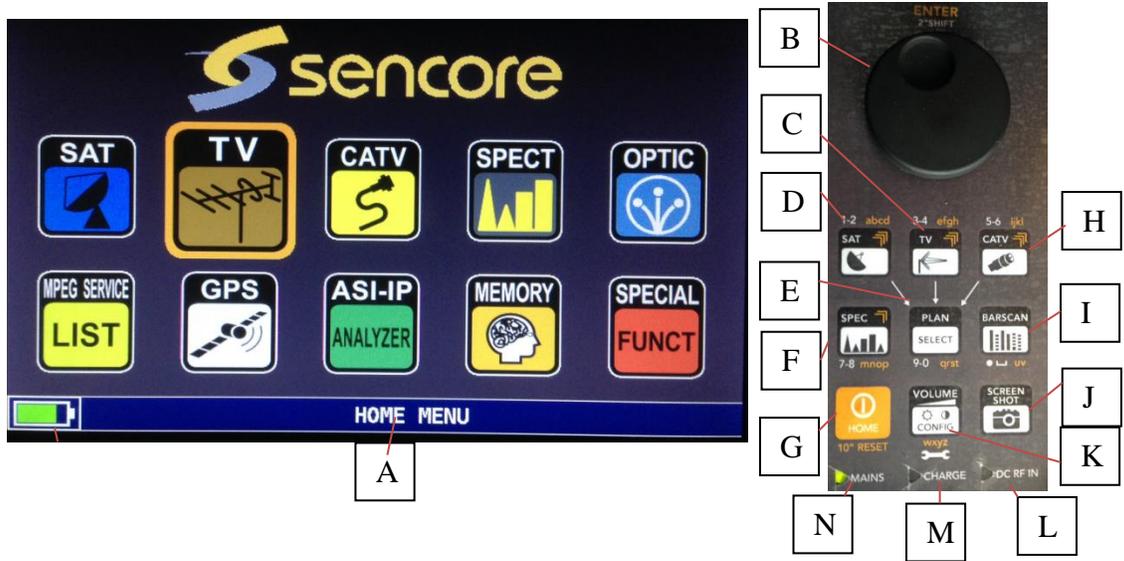


A continuous screen with the same information is available in the METER CONFIGURATION menu. Touch the CONFIG pushbutton at the bottom right of the meter. On the menu that appears, touch the “CONFIGURATION MENU” listing at the bottom and on this menu touch the “METER INFO” listing.

This screen also indicates the existence and or activation of optional features such as DOLBY and ASI Input/Output. If installed and active, these features indicate “OK” in the initialization screen.

Section 1: Unit Familiarization

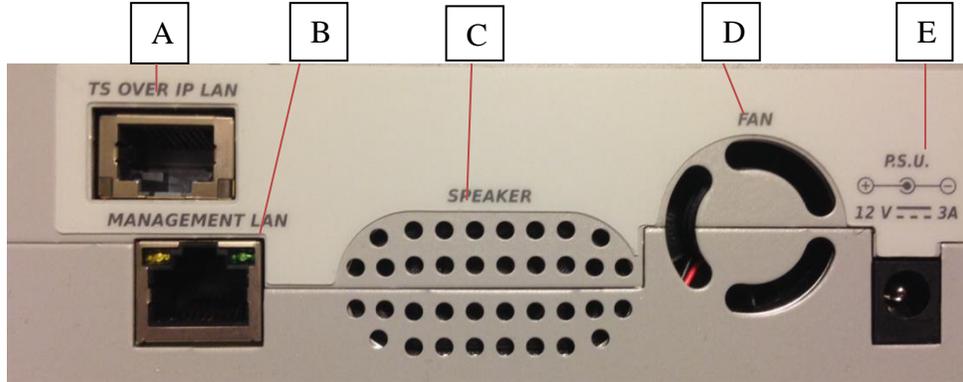
1.1 Front Panel Familiarization



Ref.	Main Function	Description	Second Function
A	Color LCD Display with touch screen	Shows all icons, setup, test data, menus, information,	Select menu items or tests by touching the screen
B	Control Wheel – Enter Pushbutton	Rotate -Increments field selection on the display	Push ENTER button to enter a field for test or selection
C	TV Measure Pushbutton	Selects Broadcast TV Measurements	Select numeric 3-4, ijkl letters
D	Satellite Measure Pushbutton	Selects Satellite Measurements	Select numeric 1-2, abcd letters
E	Plan Pushbutton	Selects channel or transponder tuning plans	Select numeric 9-0, qrst letters
F	Spectrum Analyzer Pushbutton	Selects the Spectrum Analyzer function	Selects/Increments through test pages
G	Power and Home Pushbutton	Press 2-3 sec to power on or off, press briefly to return Home menu	Press/hold 10 seconds or more to reset unit
H	CATV Pushbutton	Selects Cable Measurements	Select numeric 5-6, ijkl letters
I	Barscan Pushbutton	Selects Barscan Measurement	Select characters, uv letters
J	ScreenShot Pushbutton	Press to capture/save display screen to USB memory	
K	Volume and Configure Menu Pushbutton	Controls volume of internal speaker, provides path to configuration menu	Press to Brightness/Volume Menu, configuration menu
L	DC RF Light	Indicates LNB/DC voltage to RF Input	
M	Battery Charge Light	Indicates battery is being charged	
N	AC Main Indicator	Indicates AC power present to meter	

1.2 Right Side Panel Familiarization

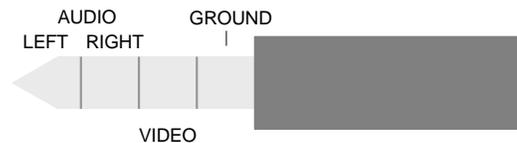
The right side panel of the DSA 1491 contains several interface connection jacks along with an air intake fan and internal speaker. The following section provides a brief description.



Ref.	Main Function	Description	Second Function
A	TS Over IP LAN Port	RJ45 Port for IPTV input/output	RJ45 Port for video-IP input Analysis
B	Management LAN Port	RJ45 Connector for LAN connection,	Meter Setup and remote /control application
C	Internal Speaker	Opening for sound from internal speaker	
D	Inlet for cooling fan	Opening – Internal Cooling Fan	DO NOT BLOCK AIR FLOW
E	Power Supply Input	Jack – Connect Power Adapter 12VDC @ 3A (Center – Pos.)	

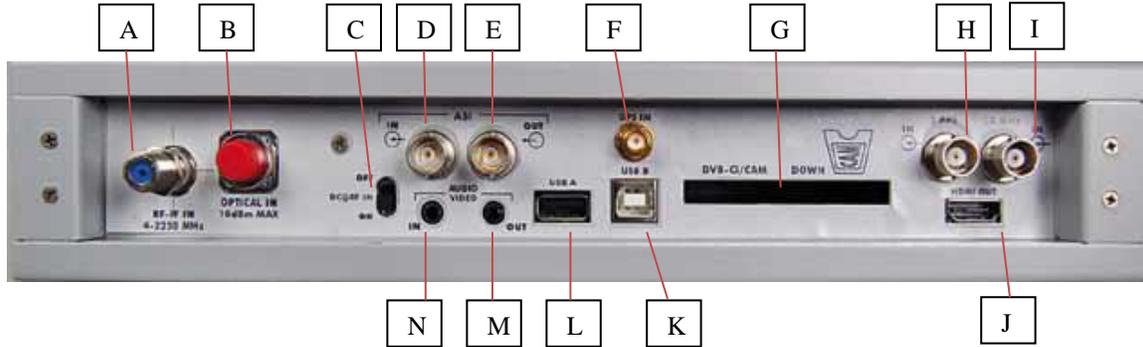
The Audio/Video IN and OUT jacks require a mini plug connector with the following wiring.

Note: Please do not block the inlet air flow (D) and the opening on the units opposite side. The fan is automatically controlled and turns on and off randomly as needed to cool the internal circuits.



1.3 Top Side Panel Familiarization

The top side panel of the DSA 1491 contains most of the input/output interface connection jacks. It further includes a switch and DVB-C CAM receptacle. The following section provides a brief description.

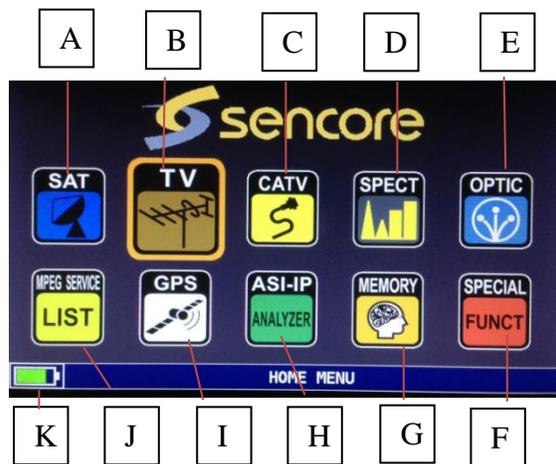


Ref.	Main Function	Description
A	RF-IF Input Jack	RF-IF Input for satellite, cable or broadcast channel
B	Optical Input	Provides input of optical measurements
C	DC Switch ON/OFF	Switch for LNB or DCV voltage to RF output jack to power LNB or active device
D	ASI Input – BNC	ASI Input: Active only on the DSA1490-ASI model.
E	ASI Output - BNC	Provides an ASI demodulator output of the tuned TV-RF channel
F	GPS Input Option	SMA 50 ohm Connector, GPS measurements
G	CAM Socket	Conditional Access Card Socket
H	1 PPS Option	Input Connector for 1PPS time/frequency reference
I	10 MHz In Option	Input Connector for 10MHz frequency reference
J	HDMI Output	Outputs display screen with audio/video service to an HDMI monitor, Touch screen is disabled
K	USB B Connector Communications Port	Port for interface with PC for file upload, firmware updates
L	USB A Connector	Port for USB memory stick – stores screen shots, logs, captures, etc.
M	A/V Output	Analog SD audio/video output
N	A/V Input	Analog SD audio/video input

1.4 Home Menu ICON Familiarization

The Home Menu of the DSA 1491 is the first menu you see when powering on the meter. You may return to this menu from any other menu by briefly pressing the HOME pushbutton. The Home Menu shows icons representing tests or functions you may select to begin using the meter. You may alternately choose to directly to satellite, tv or cable tv measurements by pushing the SAT, TV or CATV pushbutton.

The color LCD screen includes a durable touch control panel. Touch the screen with your finger or with the included stylus at the location of the screen icon when you wish to select a field or function. The stylus is stored in the padded carrying case by opening the flap of the padded carrying case on the right side of the meter. Using the stylus, helps keep the meter's screen clearer and cleaner.



The icons on the Home Menu screen quickly take you to measurement features provided by the meter. The following section briefly describes the icons.

A: SAT: Touch to select satellite tuning plan/transponder, perform digital measurements on satellite transponders, view satellite spectrum analyzer, and log satellite measurements.

B: TV: Touch to select TV Broadcast tuning plans, perform measurements on a TV-RF channel, view broadcast channel(s) on spectrum analyzer, and log broadcast channel measurements to memory – logger

C: CATV: Touch to select TV CABLE channel tuning plans, perform measurements on a digital or analog cable channels, view cable channel(s) on spectrum analyzer, log cable channel measurements to memory – logger

D: SPEC: Touch to view spectrum analyzer display for frequency spectrum viewing of the currently selected satellite, TV or cable measurement channel/transponder(s).

E. OPTIC: Optional Feature: Touch for measurements of the optical input power and power loss when comparing the active input power to a saved reference power level.

F. SPECIAL FUNCT: Touch to see extended or special functions associated with the selected satellite, broadcast TV, or cable TV measurement mode.

G. MEMORY: Touch to manage logger files, start channel logs, or recall log files.

H. ASI/IP Analyzer: Touch for selection of ASI Transport Stream Content and ETR 101 290 analysis. This entry also provides IPTV Analysis with the IP de-encapsulation analyzing function which is an optional licensed feature.

I. GPS: Optional Feature - Provides global positioning system measurements or plots of transmitter received levels.

J. MPEG SERVICE LIST: Touch to display the program list of the selected channel or transponder. Includes program name, V-PID, A-PID, Encrypted Yes/No

1.5 Powering ON/OFF

The DSA 1491 is powered on and off with the orange front panel pushbutton labeled “HOME” located at the bottom right of the instrument front panel. The HOME pushbutton has a circle with a line in it on the pushbutton. This is a universal on/off symbol.

To turn the meter on, momentarily press the HOME pushbutton and release. You will hear the fan turn on briefly and after a boot delay see a meter information screen. When initializing, the display screen may briefly indicate “AUTO OFF ACTIVE.” This indicates the Battery Saving feature is set to “ON” to auto shutoff the meter after a period of non use. Please refer to the BATTERY SAVINGS feature section 3.19 on page 27 of this manual for information on this feature. Please also see the CONFIG section 3.21.1 of this manual on page 28 for more information on the TIMER OFF feature which may also be set to automatically power the unit off after a set delay.

To turn the meter off, press and hold down the POWER pushbutton for 2-3 seconds and release. When powering off the DSA 1491 should you wish to turn it back on again, please wait 5 seconds after powering down the instrument before you turn it back on again. This gives the internal circuits time to reach a full shutdown state for proper initialization.

1.6 Power Adapter

The DSA 1491 is supplied with a DC power supply that is used to power the instrument and to indirectly charge its internal battery. The power supply/adaptor is a regulated 12 VDC with a positive center terminal on the connector to the instrument. The power supply is rated for ACV inputs ranging from 100-240 VAC @ 50/60 Hz and can deliver up to 3.0 amp of DC output current.

The Power Supply/Adapter provided with the DSA 1491 meets industry and safety regulatory standards. This insures safe instrument operation. Therefore, it is recommended that you use only the provided Power Adapter.

NOTE: When powering the DSA 1491 use only the supplied Power Adapter or a power supply/adaptor which strictly meets all technical specifications and industry safety (CE, UL etc) requirements.

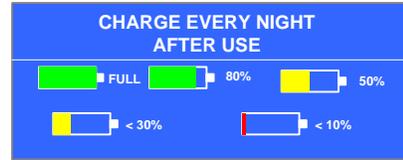
1.7 Battery Charging/Management

The latest battery technology, hyper lithium polymer (Li Po) battery, powers the DSA 1491 for portable testing applications. The battery pack provides years of dependable service. The battery pack requires no routine maintenance but it is advisable to be familiar with some handling, charging, storing, and disposal characteristics.

Some charging management practices may extend the battery pack’s useful life. Also the DSA 1491’s power management features may provide added use time on a single

charge. This section covers the meter’s battery condition indicator, battery charging recommendations and battery power management features.

When operating from the battery, a battery indicator icon at the bottom left of the measurement screen indicates the remaining battery charge. Battery indicators include a full charge 100%, 80%, half charge 50%, 30%, and 10% charge indicators. The presence of the battery icon indicates the meter is operating under battery power. When the power supply/adapter is used to power the meter, the battery icon is replaced by an AC plug icon.



The DSA 1491 uses a special battery charging/management circuit to monitor and manage battery charging. Battery charging is managed by the meter’s charging circuits with sensors inside the battery pack. You should never remove the battery and attempt to charge the battery with an adjustable power supply.

A Li Po battery contains no memory or conditioning affects like other battery technologies so a full discharge and recharge cycle is not beneficial. After use, it would be advisable to charge the battery. If used daily, charge the battery pack every night for best battery life.

Avoid a complete discharge state or prolonged low charge of the battery as this can have an adverse effect. Charge the battery after continuous use in which the battery charge is low or depleted. Also, Li Po batteries gradually discharge over a very long period of time (> 4 months) when stored or not used. Recharge the battery every 3-4 months when not used or in storage. *NOTE: Do not leave the battery in a discharged state. If stored, or not used, periodically charge the battery.*

Battery operating time varies considerably depending on use and power management settings. Expect approximately 4 – 5 hours depending on power management settings and LNB powering. To extend the useable battery measurement time on a single charge, the DSA 1491 offers three power management features including: 1) Unit Auto Off, 2) Display Light Timer and, 3) Backlight Brightness. Please see the METER CONFIGURATION Menu (Section 3) of this manual for details on these settings. For maximum battery use time, set the BATTERY SAVING setting to the “ON” position. A lower display backlight brightness level greatly extends battery use time. Set the BRIGHTNESS setting as low as you can, depending on your tolerance for display brightness and the light in the testing environment.

1.8 Battery Replacement

The Li Po Battery is a 7.4V, 4.8 Ah, 35.5 wH battery pack located at the rear of the instrument in a battery compartment. The battery compartment can be accessed by removing screws and the rear cover plate. The battery pack has a connector that can be disconnected from the circuit board enabling the battery to be removed as a component and replaced.

To remove the battery for replacement:

1. Open the meter front cover flap. Undo the two snaps of the meter's front cover flap at the top of the meter. Work free the Velcro connection at the top back of the meter behind the meter connection panel. Pull out the flap and flip to the front making an opening for the meter to be removed from the case cover.
2. Remove the 4 screws from the battery compartment cover at the back of the meter.
3. **Gently** press up on the clip which holds the battery connector to the circuit board and pull the connector from the circuit board socket.
4. **Gently** pull the battery free from the battery compartment and lift from the compartment. *Use care not to damage the four side pads and battery wrap material.*
5. Feed the wire and connector through the opening and remove the battery.
6. Install the identical factory replacement by reversing the above steps.



Handling: Handle the Li Po battery pack with extreme care not to drop, short out the battery, or damage its protective wrap.

Replacement: You need to be absolutely sure you have the proper replacement Li Po battery pack for your DSA 1491. Sensing wires to the battery pack are critical in battery charging/discharging and safety. **ONLY** an exact replacement or a suitable replacement battery provided from Sencore should be used.

WARNINGS !!

For your safety never attempt to repair/replace individual cells in a Li Po battery pack or solder to terminals on the cells.

LiPo Battery Replacement: Replace the DSA 1491 LiPo battery pack with only an identical replacement or approved replacement obtained from Sencore.

Li Po Battery Disposal: Li Po battery packs that can no longer be used are hazardous waste and must be disposed of accordingly. Completely discharge the battery and take it to a designated collection point in your area. Never dispose in a household or business waste collection.

Section 2: Quick Start Guide

2.1 Navigation

The DSA 1491 features a touch sensitive screen but supplements operation with a mechanical control knob and mechanical front panel switches. In combination, they are used to navigate, make selections, and initiate tests. The ability to make selections directly from the screen with a finger touch greatly simplifies meter use. The following section provides a brief explanation and some navigational hints to get you started.

Control Knob: The Control Knob may be rotated to increment through selectable screen fields. It may also be pushed to lock to a field or to make selections within a field. Rotating the knob, either clockwise or counter clockwise directs field movement on the display or selections within a highlighted/selected field. Pushing the knob inward selects a field or enters a selected operation. Pushing the knob also releases a selected field.

Operating the DSA 1491 requires 3 essential actions. These may be performed in random order depending on the test screen. They are summarized below:

User Action Summary:

Touch Screen – Touch your finger tip or stylus to the screen at locations of a listing, heading field or an icon. This selects the test or field. The selected field is indicated by a colored box, typically red or dark orange. (The color depends on the meter's Graphics Color setting)

Control Knob – Turning the control clockwise or counter clockwise. Moves a highlighted area upward or downward through a list or icons on the screen. Increments through values within a field when there is no list.

Control Knob - ENTER – push in the Control Knob. Selects a field so that changes may be made within the field. Releases a field so that the wheel can be used to move to other locations.

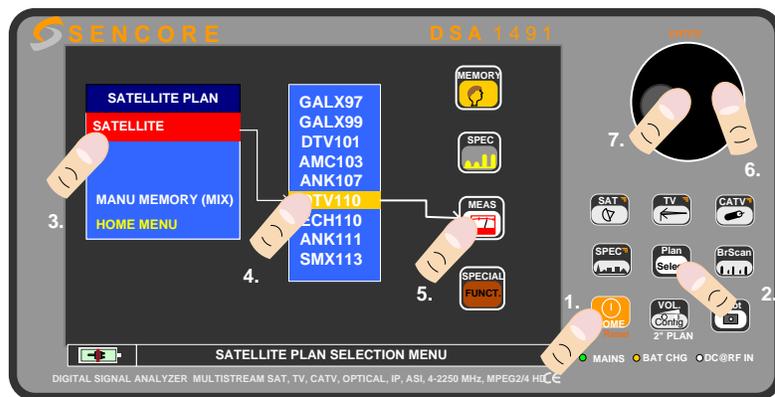
Navigation Hints:

Select a function – Home Menu: Touch your finger to an icon location on the screen. Alternative: Rotate the control knob to move highlight (an orange ring surrounding the icon) to the desired function. Push inward the control knob to ENTER area of the control knob – selecting that function.

Select/Release Field: Touch your finger to the selectable field heading. Alternative: Rotate the control knob to move highlight to different or desired heading. Push inward the control knob to select/enter the field.

Choose item within a list: Touch finger to the desired choice. Repeat finger touch to increment through field selection. Alternative: Push inward the control knob to ENTER the field or release/exit the field.

2.2. Navigation – Exercise



To become familiar with the DSA 1491's navigation follow the steps below: (#s reference fingers in the diagram above.) (Display Graphics Color Setting = BLUE)

1. Power the meter on: Briefly press and release the HOME pushbutton (Finger #1). (This is not a touch button - firmly press and release).
Control Knob Familiarization: Rotate the control knob (#6). Note how the orange highlight moves to different display icons. (Reference page 13) Move the highlight to the SAT icon.
2. Select a Test - touch the display at the location of the SAT icon (#2). Press the PLAN pushbutton (#2). The SATELLITE PLAN SELECTION MENU is shown with a left section, center section, and available test icons at the right. The blue sections contain listings which may be selected. A red box or yellow box highlights or indicates the selected listing in these groups.
3. Select a Satellite Plan (left blue area) with the Control Knob – rotate the control knob (#6) and observe how the red highlight box moves through the selectable listings. Highlight the “SATELLITE” listing. Press the control knob to ENTER the field (#7). Notice how the red highlight disappears. The center colored area is now active and the yellow box indicates the selected listing.
4. Select a satellite (center colored area) - touch your finger to the screen listing several listings above the one selected in the yellow box (#4). Your selection is moved to the center of the list and is highlighted. *To scroll farther down in the list, touch your finger along the screen near the bottom of the list. To scroll upward repeat the action near the top of the list box.* With the desired satellite highlighted, select a satellite test icon (right side of screen) – touch the MEAS icon. The meter advances to the Satellite Measurement Menu.

Hint: Using the touch screen is the most efficient. Most selections are available on the touch screen. Only occasionally there are too many selections in a field to list requiring Control Knob use. Examples include the REF selection field in the Spectrum Analyzer and FREQ selection in the MEAS menu. These require use of the Control Knob to increment through selections.

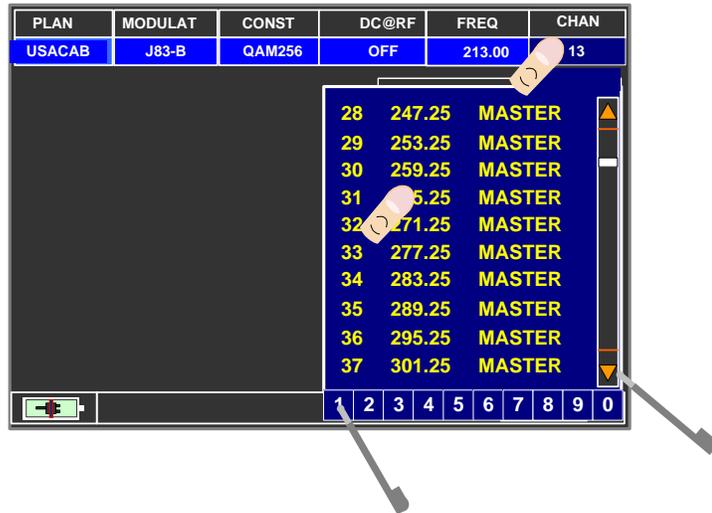
2.3 Dropdown Menu Selections

Several fields within the DSA 1491 screen have dropdown menus in which selections or entries are made. This section briefly explains how to select or enter values within a dropdown menu.

Channel Selection Dropdown Menu

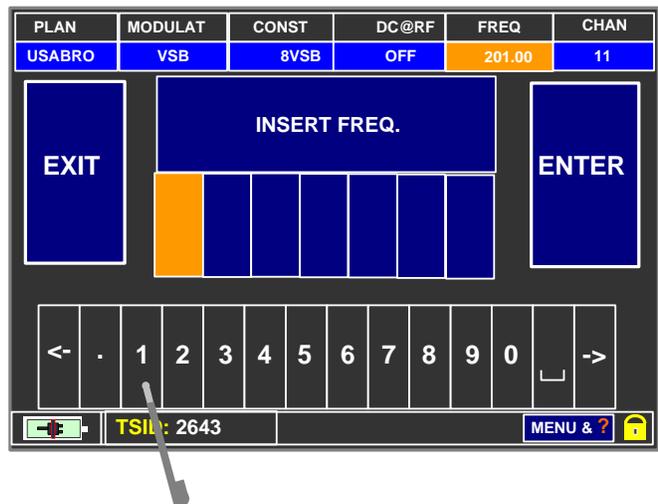
When many channels exist in the channel plan, a list is provided with a dropdown box by touching the on screen channel listing field with your finger tip or the stylus. The scroll up/down box with arrows on the right side of the dropdown list indicates that more channels are in the list than are currently visible. To scroll up in the list touch the up arrow with the stylus or your finger tip. To scroll downward touch the down arrow with the stylus or your finger tip.

You may jump to a channel listing by entering the desired channel number. With the stylus touch the channel numbers corresponding to the desired channel at the bottom of the list. The list immediately updates with the entered channel number centered in the list. To select the desired channel, touch the listing with your finger tip or stylus.



Frequency Selection Entry

The FREQ field provides a drop down menu which provides direct entry of a desired frequency. Touch the frequency value below the FREQ heading to produce the frequency entry menu. Touch the stylus to the numbers at the bottom to enter the frequency value. Use the back arrow to increment fields to the left. Use the clear entry, 2nd from the right, to clear a field entry. Touch the ENTER box when you have entered the desired value. Press the EXIT box to exit without frequency selection.



2.4 Measurement Signal Selection

This section introduces you to the general operational layout of the DSA 1491 to improve your understanding and operational ease. The instrument is fundamentally divided into 3 major categories by signal type. The signal types are Satellite (SAT), Broadcast Television (TV) and Cable Television (CATV). The first operational step is to select one of these 3 signal types for measurement. The signal type is selected by touching one of the Home Menu screen icons.

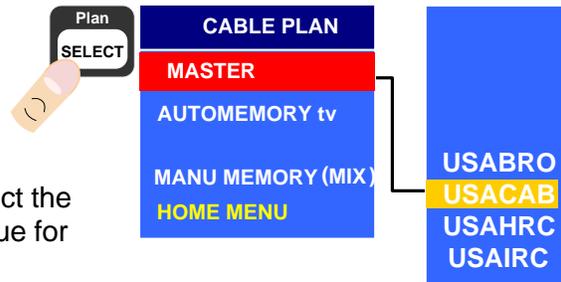


The DSA 1491 always retains the last selected signal type as its selected operational base until you return to the HOME Menu and select a different type. On the HOME Menu screen either the SAT, TV or CATV icon will always be highlighted or outlined. As you navigate through other test menus, this operational mode is retained.

The selected SAT, TV, or CATV operational mode, determines the available testing features, measurements, screen configurations, spectrum analyzer screen configurations and features, special test selections, signal/channel plans, and individual screen popup menus. Therefore, when operating the DSA 1491, always be conscious of the main signal type selected on the HOME Menu. Always select the signal type that is proper for the TV-RF signal you are measuring.

2.5 Meter Tuning

The DSA 1491 is both a satellite and a TV or Cable receiver. As a receiver it needs satellite or channel tuning information. The PLAN SELECTION MENU(s) provides the needed satellite/channel selections. Press the PLAN SELECT pushbutton on the front panel to select the PLAN SELECTION MENU. This menu is unique for the satellite, cable and TV tuning.



The DSA 1491 contains factory satellite, TV, and cable channel plans that provide tuning and measurement without further setup. Factory tuning plans vary depending on DSA 1491 model variations for different world applications/locations. For quick occasional measurements simply select the standard plans as summarized below.

SAT (Satellite): Select “SATELLITE”, Select a satellite by name reference/orbit position

BROADCAST TV TESTING: Select “TvMASTER PLAN”, Select “USABRO”

CABLE TESTING: Select “MASTER,” Select “USACAB”

After selecting a plan, touch the corresponding TV, CATV or SAT measurement pushbutton. Individual satellite transponder or channels in the satellite/channel plan are selectable in the main measurement page(s).

2.6 Quick Start Measurements

This section of the manual provides only enough information to get you making basic satellite, broadcast TV or cable measurements. It is not intended to completely summarize all the information contained in this manual. Please reference other portions of the manual as needed to answer questions and become familiar with the DSA 1491 and its features.

Follow these steps to start making basic measurements:

1. Connect the signal cable to the F-Type connector on the top side of the meter identified as the RF-IF Input.
2. Select the type of TV-RF signal to measure. When in the HOME icon menu screen touch the icon that matches the signal type to be measured. Or, simply press the SAT, TV or CATV front panel pushbutton.
SAT (Satellite): Touch to test satellite dish TV-RF (L-Band) signals.
TV (Broadcast): Touch to test terrestrial broadcast 8VSB signals.
CATV (Cable TV): Touch to test RF-RF signals on a cable television system.

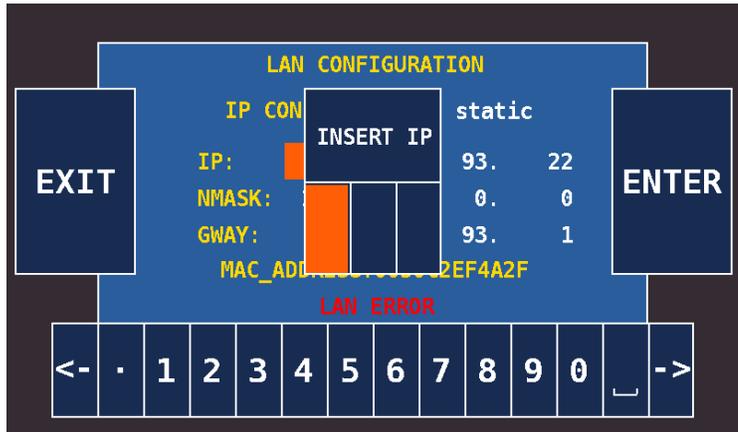
Instructions Continued: a = SATELLITE, b = BROADCAST TV, c = CABLE
(Follow a, b, c, instructions below relative to the signal type selected above.)

3. Select a tuning channel plan and plan variation in the PLAN SELECTION MENU. Press the PLAN SELECT front panel pushbutton.
 - a. SATELLITE: Highlight “SATELLITE” at left, typically the default. Select satellite by name/orbit position in the center section. Touch the screen’s MEAS icon at the right of the screen.
 - b. BROADCAST TV: Highlight “TvMASTER PLAN” - typically the default. Select/highlight “USABRO” in center section of display. Touch the screen’s MEAS icon at right.
 - c. CABLE: Select “MASTER” at left. Select “USACAB” in center section of the display. Touch the screen’s MEAS icon at the right of the screen.
4. Modify or select the channel/transponder or frequency to be measured.
 - a. SATELLITE: Touch listing below TRANSP heading. Dropdown selections appear. Touch finger near the up arrow or downward near the down arrow to move through the channel list. Touch a listing to select. Press control knob to ENTER. Touch another selectable field on the screen to exit.
 - b. TV: Touch the number below CHAN heading (upper right on screen). Touch finger near the up arrow or downward near the down arrow to move through the channel list. Press control knob to ENTER or select the channel.
 - c. CABLE: Touch the number below the CHAN heading (upper right on screen). Touch finger upward near the up arrow or downward near the down arrow to move through the channel list. Press the Control Knob to select.

NOTE: Press the SAT or TV or CATV push button to increment through available measurement pages. Touch the display section below the Vpid and Apid labels for MPEG program information. Touch the video portion of the display to view it full screen.

2.7 Entering Field Values

Some field values in the DSA 1491 are entered with a popup entry menu. This menu presents several entry boxes in the center of the display screen area. The number of fields or boxes represent the number of digits available for entry. The characters and/or numbers along the bottom are the appropriate entries. You may move to the left or right using the left arrow or right arrow entry. You may exit without making changes by selecting the EXIT field on the left. When the values are selected, select or touch the ENTER field to apply the value.

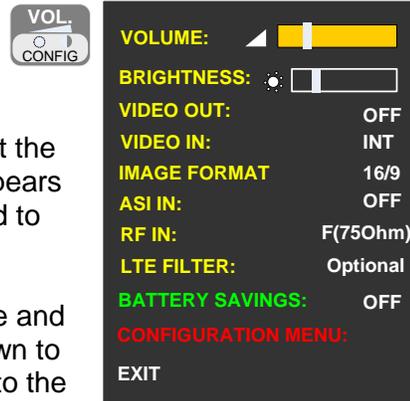


Section 3: Meter Configuration

The DSA1490 has two meter configuration menus. They include an initial CONFIG Pushbutton or “Quick View” menu and an extended CONFIGURATION MENU. The Quick View menu is accessed by briefly touching the CONFIG pushbutton at the bottom right corner of the meter. The extended CONFIGURATION MENU is accessed by touching the “CONFIGURATION MENU” listing in red at the bottom of the quick view menu. These menus and their listing are covered in the following section.

3.1 CONFIG Pushbutton (Quick View) Menu

The VOL/CONFIG pushbutton provides a quick view menu showing display settings and several in/out settings. This menu is intended to be easy to access providing commonly used selections or adjustments. To access this menu touch the VOL/CONFIG pushbutton at the bottom right of the meter front panel. The menu that appears automatically times off after a few seconds so is referred to as the “Quick View Menu” in this manual.



Each of the listings in the Quick View Menu is selectable and has an associated adjustment or selection which is shown to the right. Upon opening, the Quick View menu defaults to the VOLUME field which is highlighted. To select other listed fields, simply touch the screen with your finger over the listing. Alternatively, you may push the ENTER pushbutton and slide your finger over the arrow section of the Control Knob to navigate to other listings. The selection to the right of the listing is highlighted when selected for change. The following section briefly explains each of the selectable listings within this menu and explains the corresponding selections and use.

3.11 VOLUME

The VOLUME field contains an adjustment bar which may be selected and varied to increase or decrease the audio speaker level. This field is by default always selected or highlighted when the VOL/CONFIG pushbutton is pressed and the Quick View menu appears.

To change the volume, touch your finger or stylus to the left side of the adjustment bar to decrease the volume. Touch to the right side of the adjustment bar to increase volume. Or, once the bar is selected move your finger over the arrow of the Control Knob to increase or decrease the volume setting.

The volume adjustment only varies the volume of the built-in meter’s speaker and the volume of the Audio/Video Output jack. When using an external HDMI monitor connected through the HDMI connector, the HDMI audio level is not varied with this adjustment. However, you may adjust the volume with the controls on the HDMI monitor.

3.12 BRIGHTNESS

The BRIGHTNESS field adjusts the display backlight setting resulting in an increase or decrease in the display's brightness. Keep in mind, that the brighter the display setting the faster the internal battery pack discharges reducing the portable use time.

To change the brightness, touch your finger or stylus to the left side of the adjustment bar to decrease the brightness. Touch to the right side of the adjustment bar to increase the brightness. Or, once the brightness bar is selected by touching the BRIGHTNESS field listing, move your finger over the arrow section of the Control Knob to increase or decrease the brightness.

3.13 VIDEO OUT

The VIDEO OUT field provides a selection to transfer viewing from the meter's display to an external video display using the Audio/Video output or HDMI output connections. When you select the VIDEO OUT field and increment to "ON" or touch the field to change it to "ON," a warning box pops up informing you that you will lose video on the meter's display. It further prompts you for confirmation with a YES or NO box to select. Touch the YES box on the display if you want to continue. Touch NO on the display if you want to return to the Quick View menu.

NOTE: If you mistakenly press the YES selection and the meter's display goes black, press and hold down the POWER pushbutton for 3-5 sec. to power the unit off. Wait a few seconds and press the POWER pushbutton to power the unit back on. This restores viewing to the meter's display.

3.14 VIDEO IN

The VIDEO IN field selects the INT (internal) or EXT (external) video. The INT selection directs the meter to route video from the meter's internal demodulator to the meter's display for normal TV-RF signal analyzing and video viewing. This is the default setting. Selecting EXT directs the meter to switch to an external video input monitoring mode. In this mode the video input to the Audio/Video Input on the left side of the meter is routed to the display for viewing. The audio to the Audio/Video Input is routed to the audio circuits for monitoring. Selecting this mode defeats the normal RF measurement functions.

Note that the normal default of the VIDEO IN setting is INT which provides normal meter use and video viewing of the demodulated TV-RF signal. To setup the meter for external video viewing, touch the VIDEO IN field or listing. Touch the highlighted field to increment to EXT. To switch back to normal meter use, press the CONFIG pushbutton and change the VIDEO IN setting back to the INT. setting.

3.15 IMAGE FORMAT

The IMAGE FORMAT field provides an aspect ratio selection for the displayed video. The image format may be set to either 16:9 or 4:3. The selection changes the aspect ratio of the video viewed on the DSA1490's display and on an external monitor via the video output or HDMI output. To select the image format, touch the IMAGE FORMAT field, and touch the highlighted section to increment to the desired aspect ratio.

3.16 ASI IN

The DSA1490-ASI model includes the capability to provide MPEG monitoring and measurements of an ASI input signal. This capability is not included on the DSA1490.

The ASI IN field permits selection and measurement monitoring of an ASI input signal. The ASI Input jack is on the right side of the meter closest to the back of the meter. To select the ASI Input for viewing/monitoring on the DSA 1491-ASI, touch the ASI IN field and touch the highlighted portion to indicate "ON." When an ASI signal is being received the DSA1490-ASI automatically switches to the ASI input showing MPEG video/service information on the display screen. To disable the ASI IN feature, touch the ASI IN field and touch the highlighted portion to indicate "OFF."

3.17 RF IN

The RF IN field provides control to switch the input from the RF-IF IN connector to the OPTICAL IN connector/converter. The DSA 1491 includes the optional capability of transceiving and converting optical signals to RF channels for input to the DSA 1491's RF analyzing measurements. This capability complements measurements directly from the fiber cable in RFoG and fiber to the home delivery systems.

When making SAT, TV or CATV RF measurements with inputs to the conventional F connector RF-IF INPUT, be sure this setting is set to F(75 ohm). When using with a fiber delivery system and interfacing to the OPTICAL IN jack, select the OPTICAL selection.

Note: This input selection does not influence the OPTIC power level measurement function that is available from the HOME menu when the OPTIC icon is selected. This function always uses the OPTICAL IN jack.

3.18 LTE FILTER

The LTE FILTER is an optional feature that is not provided with the DSA 1491. The LTE FILTER field option when installed provides control to switch in an LTE band filter into the input RF measurement signal path. The filter provides attenuation to strong cellular LTE signals from 790-862 MHz which may exist when analyzing TV broadcast signals. Strong signals in this band may overdrive the meter measurement circuits. To turn on the LTE FILTER select this field and set the field to ON.

3.19 BATTERY SAVING

The BATTERY SAVING field provides control to either turn ON or turn OFF the battery saving features of the meter. The DSA 1491 provides two battery saving features. When the BATTERY SAVING setting is in the ON mode, if no user key press or touch command is received for a period of 30 seconds, the display brightness is reduced. If no user key press or touch command is received within 5 minutes, the meter automatically powers off. When the displayed is dimmed, pressing a key or a touch command returns normal display brightness and resets the timer.

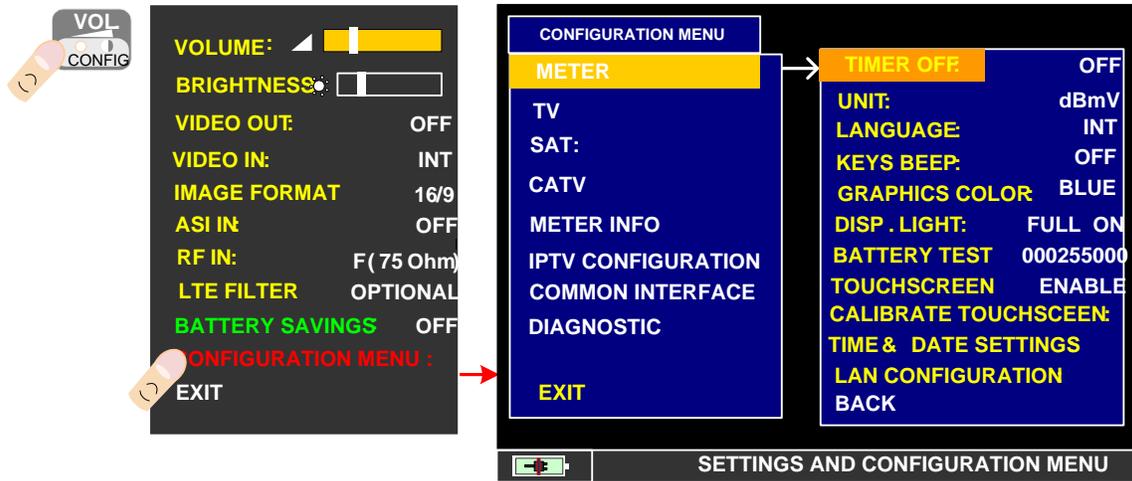
To use the BATTERY SAVING features, touch the BATTERY SAVING field and touch the highlighted selection field until it reads “ON.” To disable the BATTERY SAVING features, touch the BATTERY SAVING field and touch the highlighted selection field to read “OFF.”

3.20 CONFIGURATION MENU

The CONFIGURATION MENU field provides access to the Configuration Menu which provides further meter and measurement setup. The next section (3.2) provides details of the CONFIGURATION MENU.

3.2 Configuration Menu

The CONFIGURATION MENU provides setup options for the meter and measurement functions. The CONFIGURATION MENU is accessed by first pressing the CONFIG pushbutton at the bottom right of the meter's front panel. Secondly, touch the CONFIGURATION MENU listing near the bottom of the Quick View Config. Menu as illustrated below.



The CONFIGURATION MENU has several listings or categories in which setup selections are available. The selections are listed at the right of the category. The Configuration Menu includes METER, TV, SAT, CATV, METER INFO, IPTV CONFIGURATION, COMMON INTERFACE, and DIAGNOSTIC listings. Each listing has an associated configuration menu. Touch the screen listing to select the desired configuration menu. This section of the manual covers each of the CONFIGURATION MENU listings and explains the associated settings included within each.

3.21 METER CONFIGURATION

The METER listing provides display and measurement settings. To access the METER field navigate to the CONFIGURATION MENU screen and touch the METER listing. The METER menu appears to the right and includes the selectable fields TIMER, UNIT, LANGUAGE, KEYS BEEP, GRAPHICS COLOR, DISP. LIGHT, BATTERY TEST, CALIBRATE TOUCHSCREEN, TIME & DATE SETTINGS, and LAN CONFIGURATION. The follow section describes the purpose and selections of each of these menu selections.

3.21.1 TIMER OFF

The TIMER OFF field provides selections to specify the time delay before the meter powers off from user inactivity. If no touch command is sensed by the meter within the TIMER OFF setting time, the meter automatically turns itself off in order to save battery

life. To set, navigate to the CONFIGURATION MENU and touch the METER field. Then touch the TIMER OFF listing followed by touches to the highlighted field at the right to select the desired time delay. The settings include: OFF (meter always on), 5 min (meter turns off in 5 minutes), 10 min (meter turns off in 10 minutes), 15 min (meter turns off in 15 minutes), 30 min (meter turns off in 30 minutes)..

3.21.2 UNIT

The UNIT field provides selection for the unit of measurement for the channel level tests. The unit of measurements available include dBm, dBuV (dB microVolt), and dBmV (dB milliVolt). To select, navigate to the CONFIGURATION MENU and touch the METER field. Touch the UNIT field followed by touches to the highlighted selection field at the right to increment to the desired unit of measurement.

NOTE: dBmV is the most popular reference for a TV and CATV measurements. dBm is commonly used for satellite power references.

3.21.3 LANGUAGE

The LANGUAGE field provides selection for the language used by the meter's display menus. The language selections include English, Spanish, Dutch, French, Italian, and Portuguese, and Polish. To select a language, navigate to the CONFIGURATION MENU and touch the METER field. Touch the LANGUAGE field followed by touches to the highlighted field at the right to increment through available language selections.

3.21.4 KEYS BEEP

The KEYS BEEP field provides selections to enable a beep sound from the meter's speakers when touch commands are received by the meter. The settings include OFF, LOW, MEDIUM, and HIGH selections. The OFF selection disables the touch beeps. The LOW, MEDIUM and HIGH selections enable the touch beeps and vary the sound level. To turn on the key beep feature and select a volume navigate to the CONFIGURATION MENU and touch the METER field. Touch the KEYS BEEP field followed by touches to the highlighted field at the right to increment through available beep levels.

3.21.5 GRAPHICS COLOR

The GRAPHICS COLOR field provides selections for the color scheme used by the various displays and menus of the DSA1490. The color schemes include BLUE, GREEN, GREY, and BROWN to match personal preferences. The color scheme selected does not influence the battery use time. To select a color scheme, navigate to the CONFIGURATION MENU and touch the METER field. Touch the GRAPHICS COLOR field followed by touches to the highlighted field at the right to increment through the available color schemes.

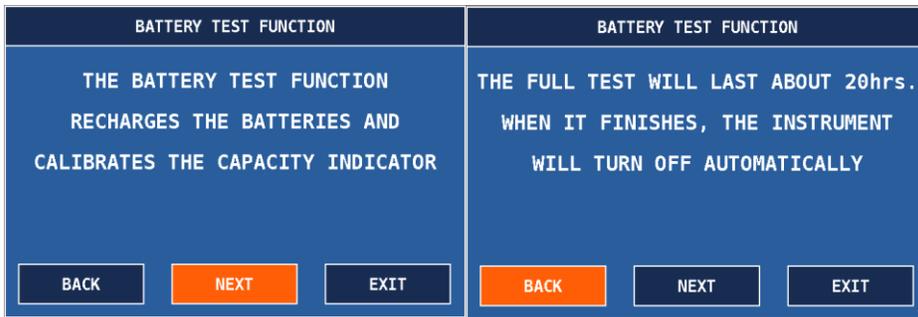
3.21.6 DISPLAY LIGHT

The DISPLAY LIGHT field provides several time selections to choose from for delaying the time in which the POWER SAVINGS feature dims the display lights when there is no user selection activity. To select a display light dimming time delay, navigate to the CONFIGURATION MENU and touch the METER field. Touch the DISPLAY LIGHT field

followed by touches to the highlighted field at the right to increment through the available time delays. Delay times may be FULL ON (display lights do not dim), 15 sec (display lights dim in 15 sec), 30 sec (display lights dim in 30 seconds).

3.21.7 BATTERY TEST

The BATTERY TEST field provides an automated battery test and reconditioning routine performed by the DSA 1491. The feature performs an internal battery test. The BATTERYTEST checks/recovers the battery capacity and recalculates the meter's battery charge indicator to get precise Indications on the charge battery status. For example, if the battery test indicates "000255000," the battery capacity is approximately 255 minutes. If letters are indicated, such as a "000275BGEY" readout, the battery capacity is 275 minutes. If sufficient time and/or a "Y" (YES) shows as the last letter, then the batteries are considered good.



3.21.8 TOUCHSCREEN

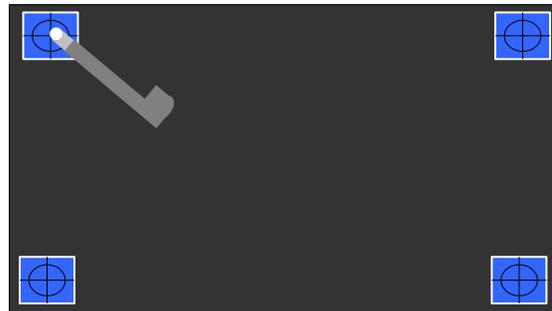
The TOUCHSCREEN field provides the ability to enable or disable the touchscreen. Setting this field to DISABLE will cause the touchscreen to be unresponsive to any touch selection. Setting this field to ENABLE permits touchscreen sensitive display selection. *Note: Full user control is possible using the large rotating and push control knob along with the front panel pushbuttons.*

3.21.10 CALIBRATE TOUCHSCREEN

The touch sensitive screen can be calibrated to improve position or touch location accuracy. If the touch point on the screen is shifted from the desired command or selection field's highlighted location or if you notice nearby values or commands are selected, a touch screen alignment with the included stylus is recommended.

To calibrate the touch screen navigate to the CONFIGURATION MENU and touch the METER field. Touch the CALIBRATE TOUCHSCREEN field to begin the calibration. The meter presents target circles one at a time in each corner of the meter starting at the upper left and progressing clockwise.

Touch the stylus to the center of each circle that alternately appears in the corners of the



display screen. Repeat this operation 4 times for each position or square that appears. Be sure to use the special stylus pointer and touch the screen exactly in the center of the target circle.

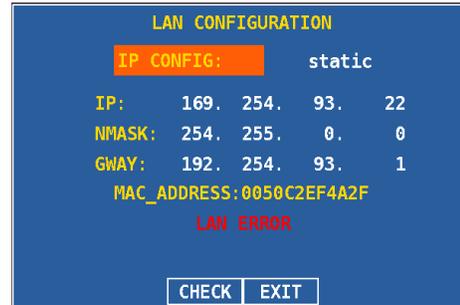
3.21.11 TIME & DATE SETTINGS

The TIME & DATE SETTINGS field provides entry of the time in hours (1-24), minutes, and seconds. It further provides entry of date information including the month, day, and year. The time and date settings are used for logging functions.



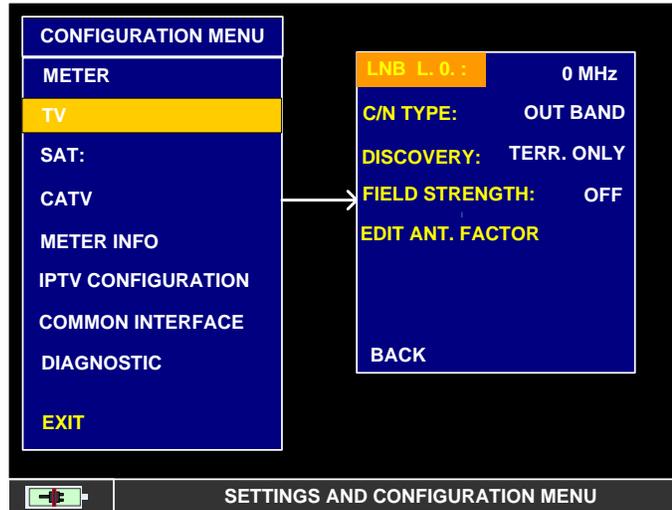
3.21.12 LAN CONFIGURATION

The LAN CONFIGURATION field provides selections to configure the RJ45 or LAN connection port of the DSA 1491 for connection to a network. The menu provides selection for a DHCP (Dynamic Host Connection Protocol) IP connection/configuration or static connection/configuration. The static configuration provides entry of IP, Network Mask and Gateway address entries. To configure a LAN connection, navigate to the CONFIGURATION MENU and touch the METER field.



3.22 TV Configuration

The TV listing provides settings relative to the terrestrial TV measurements provided by the DSA 1491. To access the TV field navigate to the CONFIGURATION MENU screen and touch the TV listing. The TV menu appears to the right and includes the selectable fields LNB L.O., C/N TYPE, and DISCOVERY. The follow section describes the purpose and selections of each of these menu selections.



3.22.1 LNB L.O.

The meter LNB L.O. (Low Noise Block Converter - local oscillator) frequency is typically used for settings associated with the Satellite receiver and dish settings. However, the LNB L.O. feature is made available in the TV and CATV reception settings in the rare case that an LNB L.O. input is required for a frequency conversion of the received signal. The default setting is 0 MHz which results in no frequency conversion. If the LNB L.O frequency is set or selected, the meter performs the frequency conversion subtracting the lower frequency from the larger frequency.

Note: If the LNB L.O. frequency is not the default 0 MHz, the frequency readout in the meter's measurement screen will indicate improperly for the known broadcast or cable channel frequency. The frequency indication is higher or lower by the entered L.O. frequency value.

3.22.2 C/N TYPE

The C/N TYPE field sets the method used by the meter to measure noise for TV analog channels when measuring the C/.N ratio. The noise may be measured using an in channel method "IN BAND" or outside the channel band "OUT BAND" measurement method.

With a C/N measurement mode "IN BAND," the signal/noise ratio is measured between the signal level of the video carrier (signal/carrier, red marker) and the noise level, estimated in the band between the colored subcarrier and the audio carrier (white marker) With a C/N measurement mode "OUT BAND," The signal/noise ratio is measured between the signal level of the video carrier (signal/carrier, red marker) and the noise level estimated in the guard band (-1.250 MHz from the video carrier, white marker)

To select the C/N TYPE, navigate to the CONFIGURATION MENU and touch the METER field. Touch the C/N TYPE field followed by touches to the highlighted field at the right to select the desired method.

3.22.3 DISCOVERY

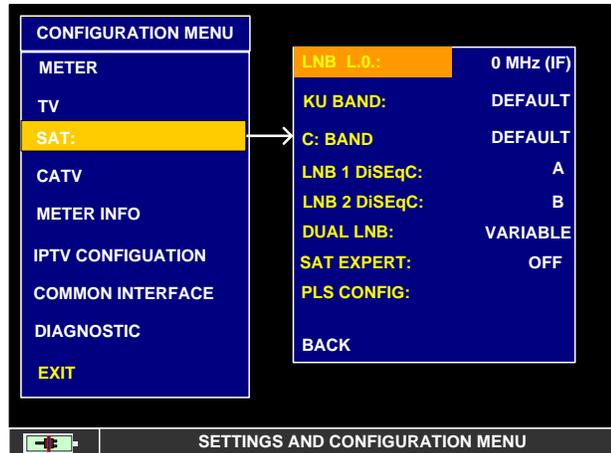
The DISCOVERY field provides an indication of the signal type(s) the meter searches for when performing a channel scan when creating automatic channel plans for broadcast TV. The DISCOVERY field in the TV Configuration is fixed at TERR. ONLY as there is no need to search for cable channel modulation types

3.22.4 FIELD STRENGTH & EDIT ANT. FACTOR

The FIELD STRENGTH field provides several selections of antenna types designed for use with the DSA 1491 for making TV transmission field strength measurements. Or, you may use an alternate antenna and select the CUSTOM antenna selection. When the CUSTOM selection is chosen the EDIT ANT. FACTOR field becomes active and may be selected to provide antenna factor calibration offsets and offsets for cable loss.

3.23 SAT Configuration

The SAT listing provides settings relative to the satellite measurements provided by the DSA 1491 and the SAT selection. To access the SAT field navigate to the CONFIGURATION MENU screen and touch the SAT listing. The SAT menu appears to the right and includes the selectable fields LNB L.O., KU BAND, C BAND, LNB 1 DiSEqC, LNB 2 DiSEqC, and DUAL LNB. The following section describes the purpose and selections of each of these menu selections.



3.23.1 LNB L.O.

The LNB L.O. field provides a selection to configure the DSA1491 for satellite L-band signal measurements. The selections include 0 MHz (IF) and STANDARD modes. With the STANDARD selection the meter performs a satellite input signal down conversion using the KU BAND or C BAND local oscillator setting entered into the meter. See the next two sections. If the 0 MHz (IF) selection, the meter performs no conversion and

assumes you are inputting an L-BAND IF signal for measurement. For common satellite dish installations and signal analyzing use the STANDARD setting. Use the STANDARD mode when the satellite transponder frequency and LNB L.O. frequency are known. The meter tunes to the satellite transponder frequency. Use the O MHz (IF) when the L-band IF frequency is known and the satellite transponder frequency and LNB L.O. are not known. To select the LNB L.O. mode navigate to the CONFIGURATION MENU and touch the METER field. Touch the SAT field followed by touches to the highlighted field at the right to select the desired LNB L.O. mode.

3.23.2 KU BAND

The KU BAND field provides selection of the LNB local oscillator frequency used by the meter when in the STANDARD mode of the LNB L.O. setting and a KU band frequency is selected for measurement. The KU BAND field contains a default setting along with common local oscillator frequencies including 10700, 10750, 11150, 11300, and UNIVERSAL. The DEFAULT setting uses the programmed transponder satellite plan's entered local oscillator frequency listing. This provides proper meter operation under most satellite testing applications. If the dish's LNB local oscillator is suspected of being different than in the satellite channel plan, you may select for the available KU BAND frequencies for testing. To select a KU band local oscillator frequency, navigate to the CONFIGURATION MENU and touch the SAT field. Touch the KU BAND field followed by touches to the highlighted field at the right to select the desired KU BAND local oscillator frequency.

3.23.3 C BAND

The C BAND field provides selection of the LNB local oscillator frequency used by the meter when in the STANDARD mode of the LNB L.O. setting and a C band frequency is selected for measurement. The C BAND field contains a DEFAULT field and common local oscillator frequencies including 5950, 5750, and 5150. The DEFAULT setting uses the programmed transponder satellite plan's entered local oscillator frequency listing. This provides proper meter operation under most satellite testing applications. If the dish's LNB local oscillator is suspected of being different than in the satellite transponder plan, you may select for the available C BAND frequencies for testing. To select a C band local oscillator frequency, navigate to the CONFIGURATION MENU and touch the SAT field. Touch the C BAND field followed by touches to the highlighted field at the right to select the desired C BAND local oscillator frequency.

3.23.4 LNB 1 DISEQC

The LNB 1 DiSEqC field provides configuration for selecting the DiSEqC switch port for LNB 1 for the DUAL LNB test. The selections include A, B, C, and D. To select the port for LNB 1, navigate to the CONFIGURATION MENU and touch the SAT field. Touch the LNB 1 DiSEqC field followed by touches to the highlighted field at the right to select the desired port (A,B,C or,D). Note: The Sencore provided DiSEqC switch is a two port switch with A and B port selections.

3.23.5 LNB 2 DISEQC

The LNB 2 DiSEqC field provides configuration for selecting the DiSEqC switch port for LNB 2 for the DUAL LNB special test. The selections include A, B, C, and D. To select the port for LNB 1, navigate to the CONFIGURATION MENU and touch the SAT field. Touch the LNB 1 DiSEqC field followed by touches to the highlighted field at the right to select the desired port (A, B,C, or D). Note: The Sencore provided DiSEqC switch is a two port switch with A and B port selections.

3.23.6 DUAL LNB

The DUAL LNB field provides selections including combinations of two satellites at different orbital positions for measurement. To select from the DUAL LNB menu navigate to the CONFIGURATION MENU and touch the SAT field. Touch the DUAL LNB field followed by touches to the highlighted field at the right to select the desired dual orbital positions.

3.23.7 SAT EXPERT

The Satellite Expert feature is not available for use with the Sencore DSA 1491. The Satellite Expert feature, when available, can be enabled or disabled in the configuration menu. The DSA 1491 must include the optional SAT EXPERT feature for this selection to be meaningful. When this option is not included or licensed, enabling or disabling this listing does not impact the features or functions of the DSA 1491.

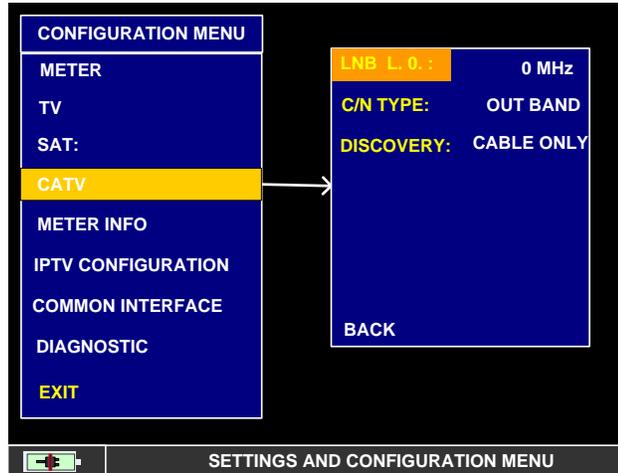
3.23.8 PLS CONFIGURATION

The PLS Configuration menu provides 10 pre-selections for PLS (Physical Layer Signaling) values. PLS settings 1-10 provide settings for PLS receiver reference values. The selected receive PLS code value must match the satellite modulator's applied PLS code value for proper reception/decoding.

Description: PL scramble coding is used in DVB-S/S2 single modes. PLS specifies a randomized scrambling sequence applied to each PL frame and initiated at the end of each PL header. The complex code relates to an “n” value defined by an entry of 0 to 262141.

3.24 CATV Configuration

The CATV listing provides settings relative to using the CATV measurements provided by the DSA 1491. To access the CATV field navigate to the CONFIGURATION MENU screen and touch the CATV listing. The CATV menu appears to the right and includes the selectable fields LNB L.O., C/N TYPE, and DISCOVERY. The follow section describes the purpose and selections of each of these menu selections.



3.24.1 LNB L.O.

The meter LNB L.O. (Low Noise Block Converter - local oscillator) frequency is typically used for settings associated with the Satellite receiver and dish settings. However, the LNB L.O. feature is made available in the CATV reception settings in the rare case that an LNB L.O. input is required for a frequency conversion of the received signal. The default setting is 0 MHz which results in no frequency conversion. If the LNB L.O. frequency is set or selected, the meter performs the frequency conversion subtracting the lower frequency from the larger frequency.

Note: If the LNB L.O. frequency is not the default 0 MHz, the frequency readout in the meter’s measurement screen will indicate improperly for the known broadcast or cable channel frequency. The frequency indication is higher or lower by the entered L.O. frequency value.

3.24.2 C/N TYPE

The C/N TYPE field sets the method used by the meter to measure noise for CATV analog channels when measuring the C/.N ratio. The noise may be measured using an in channel method “IN BAND” or outside the channel band “OUT BAND” measurement method.

With a C/N measurement mode “IN BAND,” the signal/noise ratio is measured between the signal level of the video carrier and the noise level, estimated in the band between the colored subcarrier and the audio carrier. With a C/N measurement mode “OUT BAND,” The signal/noise ratio is measured between the signal level of the video carrier and the noise level estimated in the guard band (-1.250 MHz from the video carrier).

To select the C/N TYPE, navigate to the CONFIGURATION MENU and touch the METER field. Touch the C/N TYPE field followed by touches to the highlighted field at the right to select the desired method.

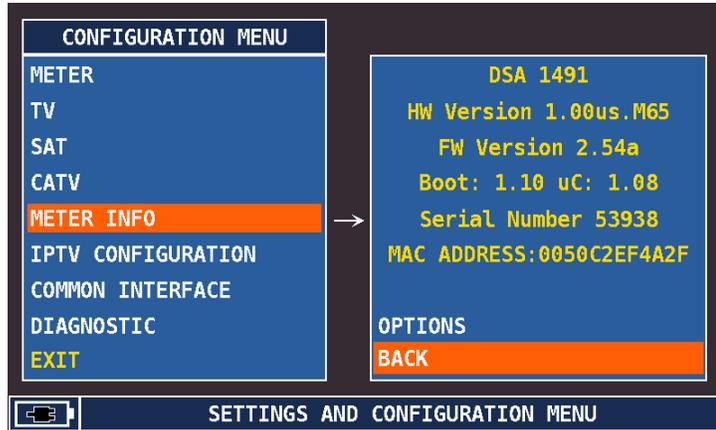
3.24.3 DISCOVERY

The DISCOVERY field provides an indication of the signal type(s) the meter searches for when performing a “HELP” channel function. A HELP discovery analysis is performed when in the Spectrum mode and selecting the MENU & ? menu and touching the HELP icon. A discovery analysis automatically tries to determine a channel band’s modulation type, symbol rate and bandwidth resulting in an automatic configuration of the meter and signal tuning/reception.

The DISCOVERY field in the CATV Configuration menu identifies CABLE ONLY. No selections or changes are available.

3.25 METER INFO MENU

The METER INFO menu provides information regarding the internal hardware, firmware, boot-up version, microprocessor program version, and serial number. The menu further indicates the inclusion of optional hardware and firmware features. The MAC address of the meter is also indicated.



The Meter Info Menu contains an “OPTIONS” selection at the bottom right. Touch this selection or rotate the large Control Knob to highlight the OPTIONS row and push the knob in to select.

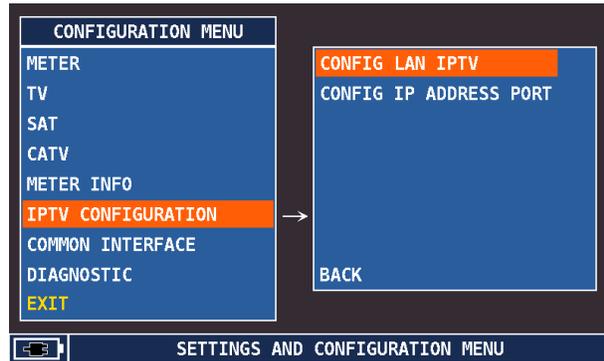
The OPTION LIST menu shows possible options for the DSA 1491. It further indicates a YES or NO indicating if that option is included or licensed in the meter. Not all of the options listed are available with the DSA 1491. The LTE FILTER, COAX CABLE REFLECTOMETER, 2700 MHZ SAT. EXT, VIDEO WAVE F. MONITOR, and NETWORK DELAY MEASUREMENT are not currently available. Some options on the list are provided courtesy of Sencore and are not additional purchased options. Examples include the TV MINISPECTRUM, ASI IN/OUT and HD AUDIO DOLBY +. These options are included with every DSA 1491.

OPTION LIST			
HD AUDIO DOLBY+	YES	HD ATSC USA	YES
HD SAT EXPERT FUNCTION	YES		
HD ASI IN/OUT	YES		
HD NETWORK DELAY MEAS.	NO		
HD TV MINISPECTRUM	YES		
HD GPS RECEIVER	YES		
HD OPTIC INPUT	YES		
HD LTE FILTER	NO		
HD LAN IPTV/ASI	YES		
HD PRODRIVE TEST SW	NO		
HD ETR 101-290 T.S.	YES		
HD COAX CABLE REFLECT.	NO		
HD REMOTE CONTROL	YES		
HD 2700 MHZ SAT EXT	NO		
HD VIDEO WAVE F. MONIT.	NO		

3.26 IPTV CONFIGURATION

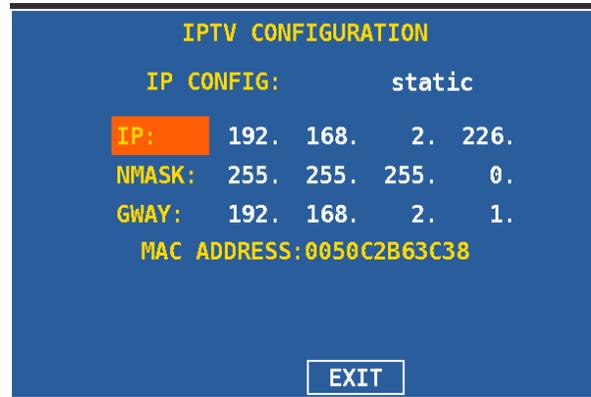
The IPTV CONFIGURATION field provides two selections which are used to configure the TS Over IP LAN jack located on the right side of the meter. This LAN connector is used as the input and output port for the IP-TV analysis and streaming features provided by the DSA 1491.

To access the IPTV CONFIGURATION field navigate to the CONFIGURATION MENU screen and touch the IPTV CONFIGURATION listing. The IPTV CONFIGURATION menu appears to the right and includes the selectable fields CONFIG LAN IPTV, and CONFIG IP ADDRESS PORT. The following sections describes the purpose and selections of each of these menu selections



3.26.1 CONFIG LAN IPTV

The CONFIG LAN IPTV selection provides a menu used to configure the TS Over IP LAN RJ45 jack or connection port of the DSA 1491 for connection to a network. The static configuration provides entry of IP, Network Mask and Gateway address entries. To configure the TS Over IP LAN connection, navigate to the CONFIGURATION MENU, touch the IPTV CONFIGURATION listing and then touch the CONFIG LAN IPTV listing. Touch the field for entry. A popup menu provides numeric entry for the individual fields.

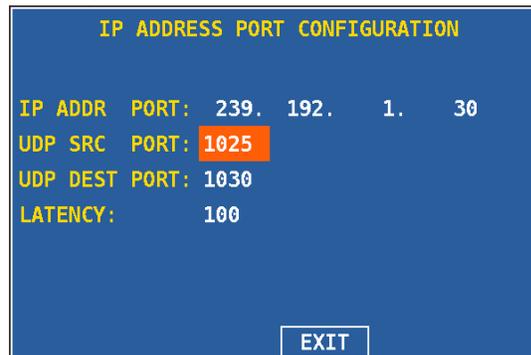


3.26.2 CONFIG IP ADDRESS PORT

The CONFIG IP ADDRESS PORT provides configuration of the IPTV multicast IP and UDP source (SRC) and destination (DEST) port entry.

To configure the TS Over IP LAN connection, navigate to the CONFIGURATION MENU, touch the IPTV CONFIGURATION listing and then touch the CONFIG IP ADDRESS PORT listing. Touch the field for entry. A popup menu provides numeric entry for the individual fields.

IP ADDR PORT: Enters the IP multicast address of the IPTV LAN port in which a source is sending to.



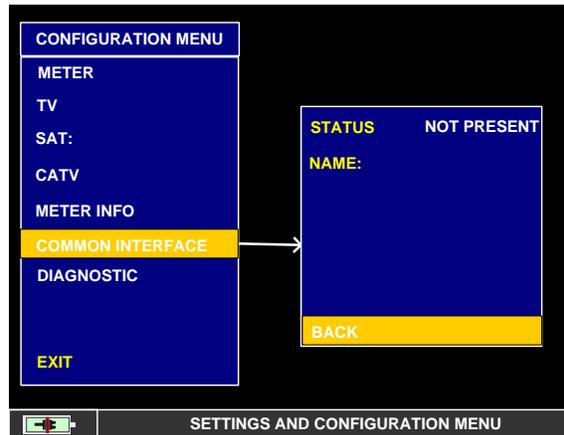
UDP SRC PORT: Enters the UDP source port in which a source is sending to.

UDP DEST PORT: Enters a UDP destination port.

LATENCY: Enters a latency or delay value to the input buffering.

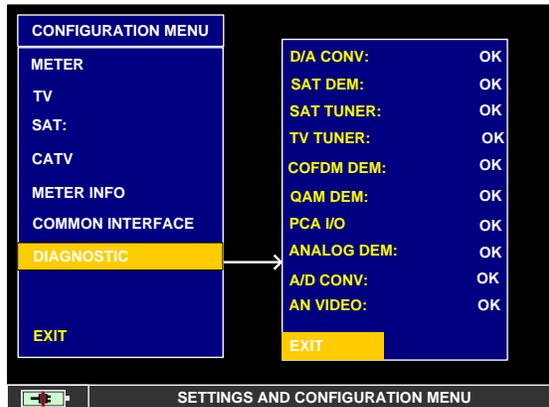
3.27 COMMON INTERFACE CONFIGURATION

The COMMON INTERFACE field provides a selection to provide information regarding the Conditional Access Smart Card Reader. The DSA 1491 contains a CI or Common Interface Slot on the right side of the meter. This slot is used for the insertion of a CAM (Conditional Access Module) and accompanied subscription service card. When an authorized subscription service card is inserted into the CAM and the CAM is properly seated into the DSA1490's CI socket, the meter is permitted to decrypt the video service for viewing. The CONFIGURATION INTERFACE menu indicates the status or presence of a CAM/Subscription Card and naming.



3.27 DIAGNOSTIC TEST

The DIAGNOSTIC listing in the CONFIGURATION MENU provides a self-test of the meters internal circuits. The circuits should all indicate "OK" if they are working and responding to the microcontroller. If a listing does not indicate OK, a likely problem exists. Please contact the Sencore Service Dept. for assistance. Please see Appendix B of this manual for service information and procedures.



Section 4: Satellite Measurements

The satellite signal analysis provided by the DSA 1491 indicates the performance of satellite signals, provides satellite dish alignment, and may be used to test satellite distribution paths and satellite equipment. This section provides information on the satellite measurements.

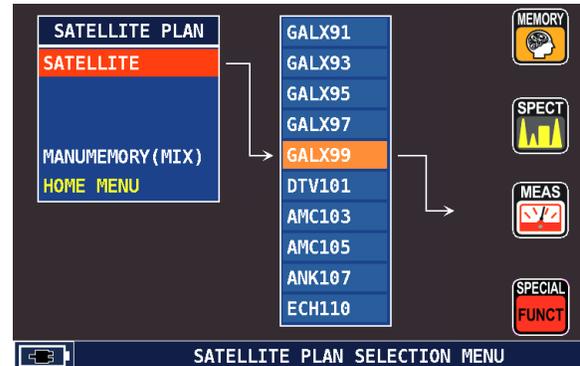


4.1 Satellite Plan Selection

The DSA 1491 is a satellite receiver which may be tuned to the individual satellite transponders. A comprehensive list of satellites with tuning information is contained in the satellite plan of the instrument. When the SAT icon is highlighted on the Home Menu, press the PLAN SELECT pushbutton on the unit's front panel. A SATELLITE PLAN SELECTION MENU appears providing either the SATELLITE plan or a MANU MEMORY (MIX) plan. Touch the desired plan with a finger or the supplied stylus to begin satellite signal measurements.

SATELLITE PLAN

The SATELLITE listing in the SATELLITE PLAN menu provides a satellite tuning plan which includes a list of satellites. The satellites are identified for selection by abbreviated names and orbit positions. The list of satellites is shown in the center of the SATELLITE PLAN SELECTION MENU when the SATELLITE plan is selected. Touch the desired satellite listing in the center of the screen to highlight it. There are more satellites above and or below the shown listings. Touch a listing towards the top to scroll upward in the list. Touch a listing near the bottom to scroll downward in the satellite list. The list is arranged by orbit position.



MANU MEMORY (MIX) Plan

The MANU MEMORY (MIX) listing in the SATELLITE PLAN menu contains manually created channel plans. A manual plan may include either satellites transponders, cable channels or TV broadcast channels. It may also include a combination or a mix of satellite transponders, TV or CATV channels. Manual channel plans may be created in the MEMORY function of the DSA 1491 or with a PC using the included SMART software.

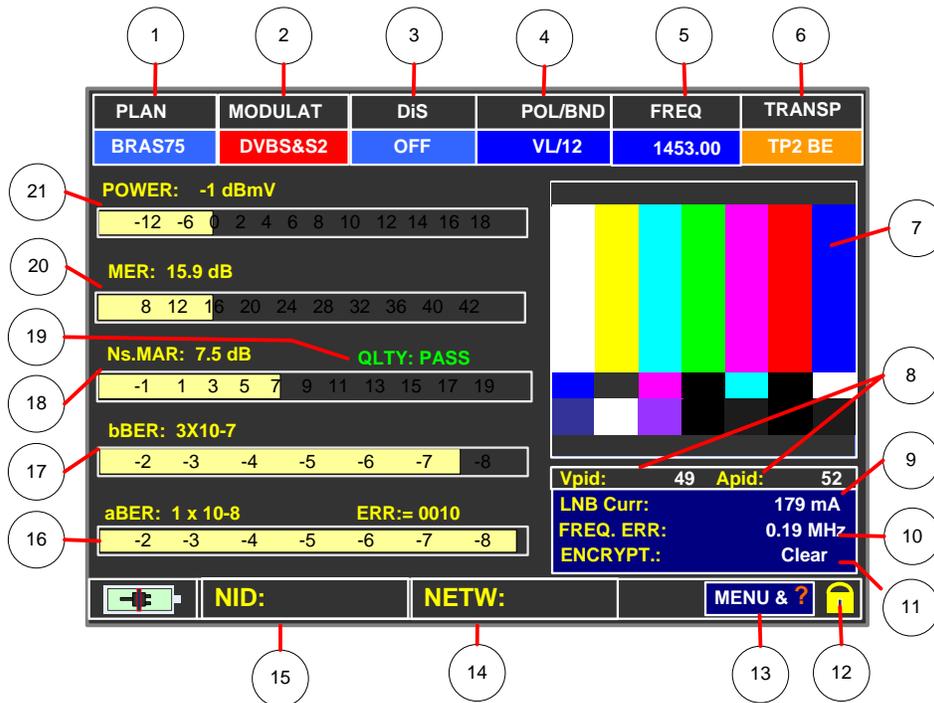
4.2 Satellite Measurements

The DSA 1491 provides a comprehensive analysis of a satellite's transponder signal, either digital or analog. Digital signal analysis includes standard DVB, DVBS, DVBS2, DVBS2 Multistream, and DSS signals with modulation types including QPSK – 8PSK – 16 APSK, 32 APSK, QAM. Measurements are provided on two measurement pages. To access the satellite measurements push the SAT pushbutton, touch the MEAS icon from the HOME Menu with the SAT icon highlighted, or touch the MEAS icon in the Satellite Plan Selection Menu.



There are two satellite measurement pages for digital satellite signals including a main measurement page and a constellation measurement page. The remainder of this section describes the DSA 1491's satellite measurements and measurement pages.

4.21 Main Measurement Page

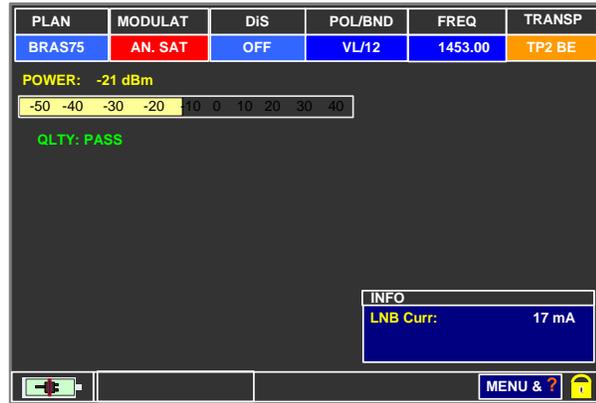


- 1. Plan:** The satellite selected in the Satellite Plan Selection Menu or in a Manual plan
- 2. Modulation:** The modulation type of the digital signal. Defaults to the type in the satellite plan for the selected transponder (6). Selectable field permit selection of modulation type.
- 3. DiSEqC:** The current setting for DiSEqC to provide switching signals for satellite equipment

- 4. Polarity/Band:** Vert./Horiz (Left/Right) polarization, high/low band switching and 12V or 18V indicator. Selectable field permits polarity/band selection.
- 5. Frequency:** The center frequency of the satellite transponder (6). Selectable field permits frequency tuning.
- 6. Transponder:** The selected satellite transponder being analyzed. Selectable field permits transponder selection.
- 7. Video:** The active video on the selected video service within the transponder
- 8. VPID/APID:** Video and Audio Program Identifier values for the selected video service contained in MPEG
- 9. LNB Current:** The current flowing to the LNB supplied by the meter
- 10. Freq. Error:** The frequency error of the LNB’s oscillator as calculated by the meter
- 11. Encryption:** Indicates if the selected video service is encrypted
- 12. Locked Symbol:** Indicates if the meter’s receiver is locked to a digital RF signal
- 13. MENU & ?:** Provides a popup menu with related selections and a HELP icon for DISCOVERY of the satellite transponder signal modulation, symbol rate etc.
- 14. Network Name (NETW):** Indicates the network name or identification
- 15. TSID or NID:** Transport Stream or network Identification numbers
- 16. aBER:** Bit Error Ratio measurement after Viterbi error correction measurement
- 17. bBER:** Bit Error Ratio measurement – before Viterbi error correction
- 18. Noise Margin (Ns.MAR):** Provided margin signal vs. noise power measurement
- 19. Quality (QLTY) Rating:** Quality rating based upon MER and noise margin values
- 20. MER:** Modulation Error Ratio measurement of selected transponder
- 21. POWER:** Strength or power level of satellite signal

4.22 Satellite Analog Main Measurement Page

Satellite transponders with analog signals can be metered for signal level. The analog signal may also be viewed on the satellite spectrum analyzer. The satellite’s analog video modulation cannot be detected for viewing. To measure the level on an analog satellite requires that the modulation type be selected or indicate “AN.SAT.” Touch the MODULAT header field to highlight the modulation type. Touch the AN.SAT listing near the bottom of the list.



4.23 Constellation & Info Measurement Page

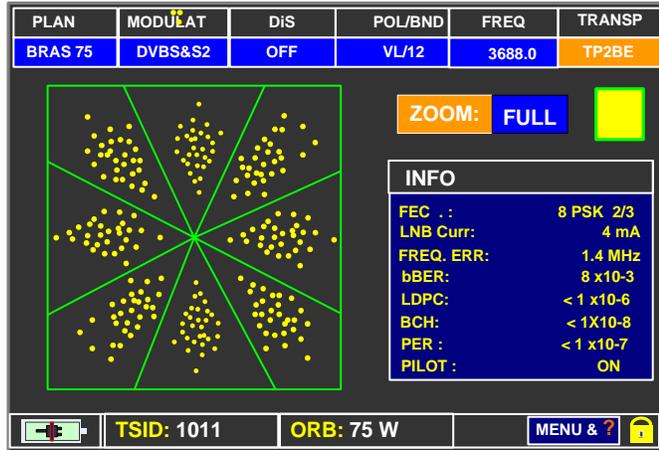
The constellation measurement page provides a second page of analysis of a digital satellite transponder signal. The top and bottom fields of the page are the same as the main measurement page. The left center of the Constellation & Info page provides a constellation analysis. The right center of the Constellation & Info page provides an INFO box with information regarding the satellite transponder signal and satellite dish/system being measured.

There are two ways to access the Constellation & Info measurement page from the Main Measurement page. Either press the SAT pushbutton on the front of the meter or touch the display screen anywhere on the left center measurements area from the POWER measurement bar down to the aBER measurement bar.

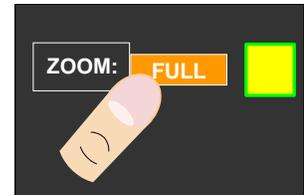
CONSTELLATION

The constellation analysis provides a visual indication of the detected RF symbol accuracy. The constellation diagram changes its appearance to match the type of modulation contained in the digital satellite signal. For example, the constellation of an 8 QPSK signal contains 8 sections around a center point as shown in a nearby illustration.

The constellation diagram may show a full or all the symbol sections or ¼



sections of the constellation using the ZOOM feature. To zoom into a smaller ¼ section of the full constellation diagram, touch the selection box to the side or right of the ZOOM box. Multiple touches increment the ¼ section view through all the quarter sections of the constellation diagram. The box to the right of the selection box indicates the selected section being shown by the constellation diagram.



INFO

The INFO box in the Constellation & Info measurement page provides additional satellite analysis and satellite dish LNB status. A brief overview of the tests is provided below.

FEC: Modulation Type and FEC measurement of the selected transponder signal

LNB Curr: Metered current flowing from the meter to the satellite dish LNB

FREQ. ERR: Frequency error of the LNB’s local oscillator frequency

bBER: Bit error ratio analysis before Viterbi error correction

LDPC: Bit error ratio analysis of low density parity check codes (LDPC) which may be contained in the DVB-S2 signal.

BCH: Bit error ratio analysis of BCH codes which may be contained in the satellite signal

PER: Packet Error Rate analysis

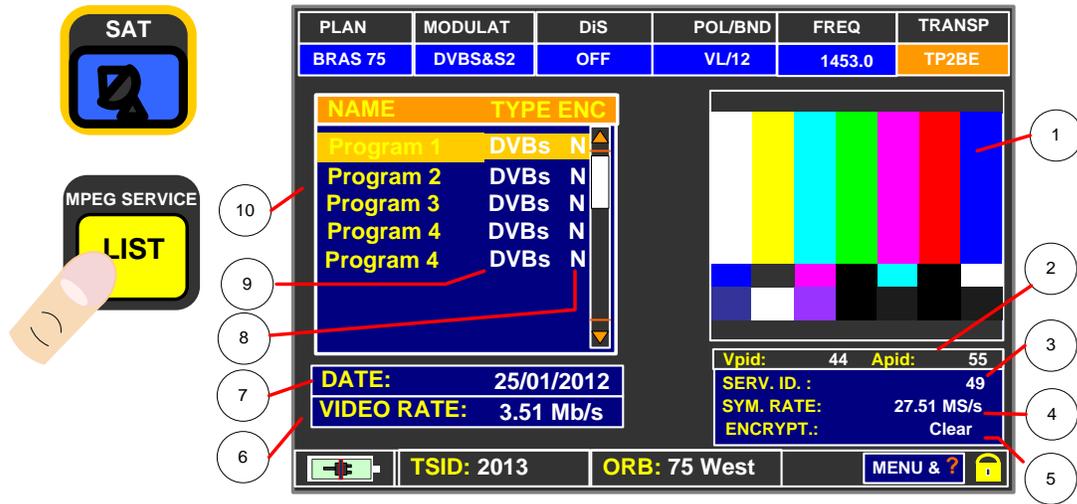
PILOT: Pilot on/off indicator

** NOTE: Measurements provided depend on the satellite signal type and inclusion of the test codes required for the tests.*

4.3 Satellite MPEG SERVICE LIST

The MPEG SERVICE LIST measurement page of the DSA 1491 provides information regarding the MPEG stream and video service/program of the selected satellite transponder. The MPEG SERVICE LIST page may be accessed in two ways. From the HOME Menu with the SAT icon highlighted, touch the MPEG SERVICE LIST icon. Secondly for convenience from the Satellite Main Measurement Page, touch the box below the displayed video. Touch the same box to return to the Main Measurement Page from the MPEG SERVICE LIST page.

4.31 MPEG Service Page Description

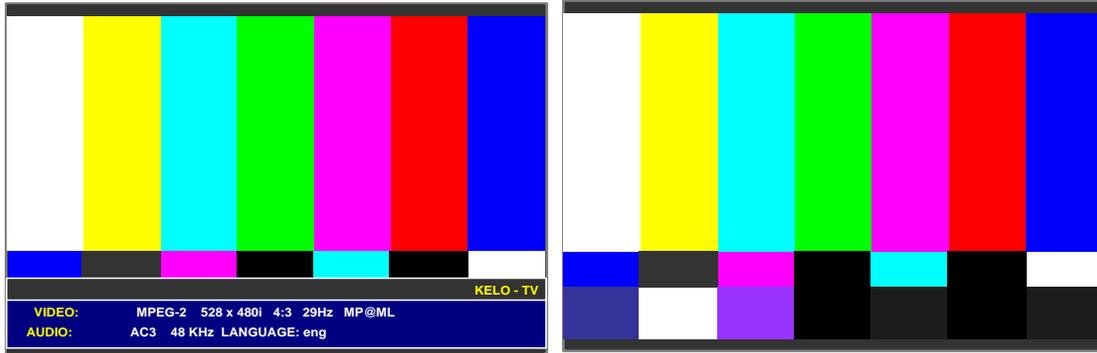


The MPEG SERVICE LIST measurement page provides information regarding the MPEG transport stream and the selected video service/program contained in the stream. The top and bottom fields are the same as listed and described in the Main Measurement page in section 4.2 of this manual. The unique fields are numbered in the nearby figure and a brief description follows.

- 1. Demodulated Video Display:** Shows the demodulated video of the selected service from the selected satellite transponder.
- 2. VPID/APID:** Indicates the VPID (Video Packet Identifier Number) and APID (Audio Packet Identifier Number) of the selected video service/program.
- 3. Service ID:** The video service/program identification number
- 4. Symbol Rate:** The RF symbol rate of the satellite transponder
- 5. Encryption Status:** The V
- 6. Video Rate:** The MPEG data rate of the selected video service/program
- 7. Date:** The current date as listed in the MPEG stream
- 8. Encryption Status:** Indicates if the individual services are encrypted (YES) or in the clear non-encrypted (NO).
- 10. Service List:** List the video services/programs in the MPEG transport stream

4.32 MPEG Video Service Monitoring

The video displayed in the Main Measurement Page or in the MPEG SERVICE LIST page may be expanded to fill the display screen. For a full screen view of the demodulated video of a selected video service touch the displayed video section of the screen.



The displayed video initially indicates the video service name along with associated MPEG header video and audio information. This information is located along the bottom of the display and includes the video resolution, aspect ratio, and MPEG compression level. The audio information includes the format, and data rate. After a few seconds for review, the bottom section is pushed to the bottom of the display. When viewing a full video display you may return to the previous measurement screen by touching the center of the screen.

4.4 Satellite Measurement Popup Menu

The satellite measurement pages include a popup menu that provides easy changes to the meters local oscillator and symbol rate settings. It further provides changes to the buzzer functions and includes quick access to the HELP DISCOVERY function. The Popup Menu listings are explained below.

LNBLocOsc: Provides user changes to the local oscillator setting of the meter.

SYM RATE: May be selected to change the symbol rate setting of the meter to match a transponder’s digital signal’s rate enabling meter lock.

BUZZER FUNC: Provides a switch selection to turn the alignment buzzer on or off.

BUZZ. TYPE: Provides a selection to produce a tone based upon the received satellite signal level or on the satellite noise margin measurement.

TS_STREAMING: Provides a selection to setup streaming of selected services from the RF demodulated transport stream to the LAN port or to a USB drive file.



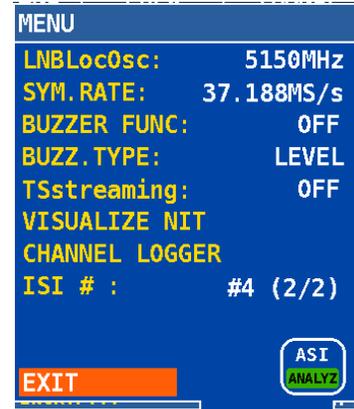
VISUALIZE NIT: Provides a measurement screen with the information contained in the DVB Network Information Table.

CHANNEL LOGGER: Monitors and charts the digital RF measurements of a satellite transponder or channel.

ASI icon: Provides a shortcut to the ASI-IP analyzer function providing an TS stream bitrate and services information.

4.41 DVB-S2 Multi stream Selection Popup Menu

When a DVB-S2 multi-stream satellite signal is detected by the DSA-1491 an addition is made to the selections within the MENU & ? popup menu. An ISI # (Input Stream Identifier #) selection field is added to accommodate selection of the multiple programs contained in the VCM or ACM multi stream satellite transmission. To select different streams/services touch the ISI # field or rotate the large Control Knob to highlight the ISI # row and press to Enter. Rotate the Control Knob to see what services are available in the multi-stream.



In the Constellation Measurement page some measurements of the selected ISI are made available on a second measurement page. The following is a summary of the indications.

FEC: Forward Error Correction detected for the selected ISI #.

LNB Curr: Current flow to LNB from meter

TS/GS: Generic Stream or Transport stream formatted DVB-S2 transmission

CCM/ACM: Modulation type constant coding & modulation or adaptive coding & modulation used for multi stream

ISSY: Input Stream Synchronization indicator – active or inactive

NPD: Null Packet Deletion – active or inactive

Rolloff: Spectral rolloff of the DVB-S2 satellite signal as indicated in the BBHEADER

PktLen: Packet Length of transport stream packets

PLAN	MODULAT	DiS	POL/BND	FREQ	TRANSP
GALX99	DVB-S2	OFF	HL/18	3699.4	---

ZOOM: FULL

ISI #2 (1/2)

FEC: 3/4

LNB Curr: 0mA

TS/GS : Transport

CCM/ACM: ACM

ISSY : Not Active

NPD : Not Active

Rolloff: 0.25

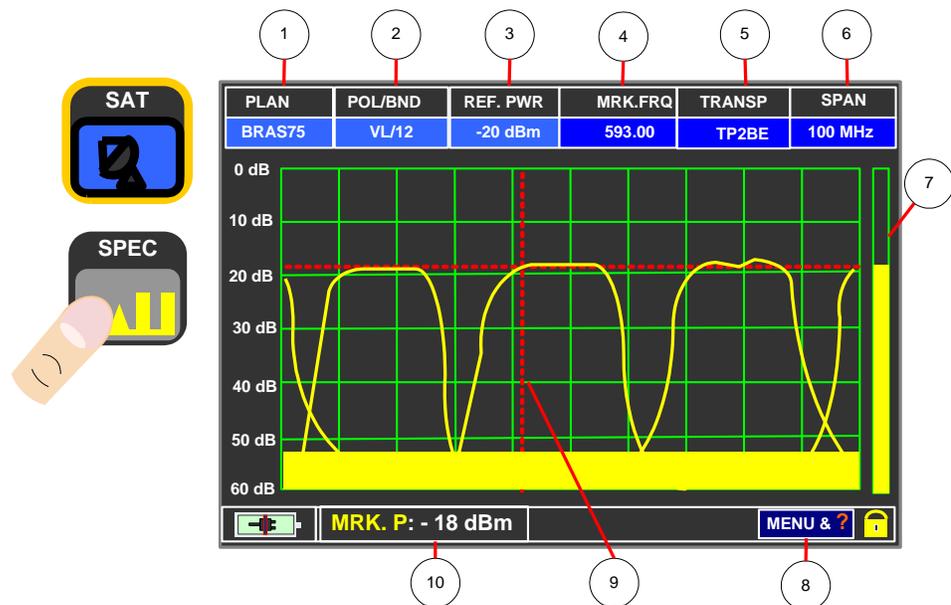
PktLen : 188

TSID: 1122
ORB. :
MENU & ?

4.5 Satellite Spectrum Analyzer

The satellite spectrum analyzer provides detailed spectral analysis of both analog and digital satellite signals. To select the spectrum analyzer function from the HOME menu with the SAT icon highlighted, touch the SPEC icon. You may also access the spectrum analyzer from any of the other satellite measurement pages by pushing the SPEC pushbutton at the right of the display.

The Satellite Spectrum Analyzer page contains header fields with many of the same sections as the measurement page. However, some of the headings are different. Below is a summary of all the header fields and an indication if the field may be highlighted for change.



- 1. Plan:** The satellite selected in the Satellite Plan Selection Menu or in a Manual plan
- 2. Polarity/Band:** Vert./Horiz (Left/Right) polarization, high/low band switching and 12V or 18V indicator. Selectable field permits polarity/band selections.
- 3. Reference Power:** Indicates the level of the top line of the spectrum analyzer commonly called the reference power level.
- 4. Marker Frequency:** The frequency represented by the location of the vertical red marker line on the spectrum analyzer display. A selectable field permits moving the marker line. The marker may be moved automatically by touching points in the display or by highlighting the MRK FRQ field and rotating the touch control knob.
- 5. Transponder:** The selected satellite transponder being analyzed. Selectable field permits transponder selection.
- 6. Span:** The frequency span of the spectrum analyzer. A selectable field with 50, 100, 200, 500 MHz and FULL selections.
- 7. Avg. Level:** Bar graph indicating the average transponder level. Not selectable.
- 8. Menu &?:** Popup Menu with selections to configure the meter's satellite receiver and spectrum analyzer features. See the next section (4.5) for details.
- 9. Marker Line:** The marker frequency cursor line. May be moved by touching the display location you wish the marker to relocate.
- 10. Marker Power:** The power indicated at the frequency location of the marker line. The field is not selectable.

4.6 Satellite Spectrum Analyzer Popup Menu

The satellite Spectrum Analyzer page includes a popup menu that provides settings for the spectrum analyzer and provides handy changes to the meter’s local oscillator and DiSEqC. It further provides a convenient access to the HELP DISCOVERY function. Touch the MENU & ? section of the display at the bottom right of the display to access the Popup Menu. The Popup Menu listings are shown in the nearby figure and explained below.



SPECTRUM: Provides a selection of the sweep or update rate of the spectrum analyzer. Selections include FAST and SUPERFAST.

BUZZER: Provides a switch selection to turn the alignment buzzer on or off.

MRK. BW (Marker Bandwidth): Selections include OFF, ON, and BW.PWR. The ON selection provides a variable BW with two vertical markers on the display which may be varied by rotating the touch control knob. The MRK BW selection adds a power measurement to the selected band at the bottom center of the spectrum analyzer display.

DELTA MARKER: Turns on or off a white marker which along with the existing red marker provide two adjustable frequency locations. At the center bottom of the spectrum analyzer display is added a Delta Marker Power (Delta MRK.P) measurement which indicates the level difference between the red and white frequency locations.

PICTURE: Changes how the spectral energy is displayed within the spectrum analyzer graph from a FULL to a CONTOUR view. The FULL selection fills in the displayed spectral energy with color. The CONTOUR selection outlines the top of the spectral energy with a colored line.

LOC. OSC: Provides user changes to the local oscillator setting of the meter.

dB DIV: Provides 1,2,5,10 dB selections to change the resolution of the spectrum analyzer’s vertical increments or dB level.

RBW FILTER: Provides a selection (1, 5 MHz) of the spectrum analyzer resolution bandwidth.

MODE: Provides a selection for ANALOG or DIGITAL mode for the spectrum analyzer.

DiSEqC: Provides selections to send switching commands to a DiSEqC device.

SAVE/RECALL: Provides memory for 20 captured spectrum analyzer screens which may be recalled and viewed on the screen.

HELP ICON: Provides signal DISCOVERY to automatically determine a digital satellite transponders signal type, modulation type, and symbol rate for automatic tuning.

4.7 Satellite Special Functions

The DSA 1491 provides many special functions for satellite dish control and alignment. The satellite special functions menu is selected by pressing the SPECIAL FUNCT icon on the HOME Menu with the SAT icon highlighted. This section provides an overview of the special functions available for satellite signal and satellite equipment testing.



SAT SCR: Provides tests of satellite cable routers (SCR) and related satellite equipment. Provides selection of up to 8 users and frequency selections by LNB/SCR types or with an automatic test. Touch “SCR CABLE TEST” to perform in the spectrum mode the SCR LNB/MULTISWITCH 8 frequency check (USER 1-8).

DUAL LNB: Provides simultaneous metering of the Noise Margin of 2 satellites when combined with control of a DiSEqC switch (provided).

DiSEqC MOTOR: Provides control commands including GO TO, MOVE, SAVE to a DiSEqC satellite actuator motor dish. Emulates a satellite dish receiver with DiSEqC actuator control.

SAT FINDER: Automatically looks and finds 3 designated transponders of the target selected satellite to confirm that the dish is correctly aimed and the desired satellite is found. When a transponders is identified the buzzer starts. The test indicates the satellite is FOUND when all 3 transponders are confirmed.

BUZZ & NOIS MAR. GR: (Buzzer with Noise Margin Graph): Provides a buzzer to indicate the relative improvement or degradation of a satellite transponders noise margin measurement. Provides an active Noise Margin performance graph showing increases or decreases in signal performance during a moving 7 second segment.

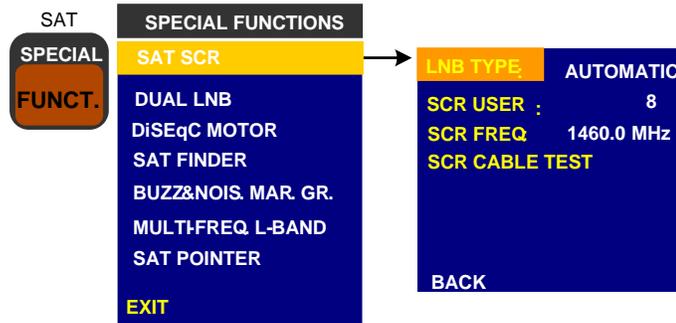
MULTI-FREQ. L-BAND: Provides the simultaneous level dBm measurement of 3 L-band signals and shows relative attenuation compared to a referenced calibration or captured test point in a satellite system.

SAT POINTER: Provides a spectrum analyzer view with fast screen updates to facilitate finding and noting the peak of the transponder signal marking the best dish alignment position.

EXIT: Touch EXIT to go back to the previous menu from the SPECIAL FUNCTIONS Menu.

4.71: AT SCR – Single Cable Router Test Function

The SAT SCR special test function provides tests of satellite cable routers (SCR) and related satellite equipment. It provides selection of up to 8 users with corresponding frequency selections. It provides an AUTOMATC test by cycling through and testing the satellite signal switched paths for each user. It further provides tests setup to match the routing characteristics of several LNB types. To access the SAT SCR test function from the HOME Menu, with the SAT icon highlighted, touch the SPECIAL FUNCT icon. Or from the SATELLITE PLAN SELECTION MENU touch the SPECIAL FUNCT icon followed by a touch of the SAT SCR listing in the SPECIAL FUNCTIONS Menu. The SAT SCR fields are listed below along with a brief description.



LNB TYPE: Automatic mode or LNB types listed by model are available for selection. The AUTOMATIC listing provides an automated test and is recommended

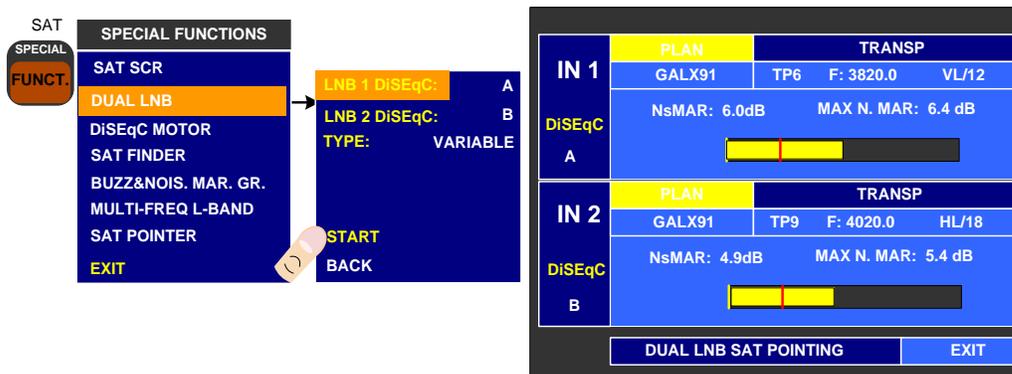
SCR USER: Select User 1 to User 8

SCR FREQ: SCR L-Band router frequency assigned or selected for each user

SCR CABLE TEST: Sequences through each user selecting the path and monitoring the user’s assigned frequency. The test uses the spectrum analyzer display to show the satellite transponder signal received as the automatic test cycles through reception for each user.

4.72: DUAL LNB – Dual Satellite Metering Function

The DUAL LNB test is a special function capable of metering two satellite signals simultaneously. The test works in conjunction with the dual DiSEqC switch that is provided with the DSA 1491. To select the DUAL LNB test from the HOME Menu, with the SAT icon highlighted, touch the SPECIAL FUNCT icon. From the SATELLITE PLAN SELECTION MENU, touch the SPECIAL FUNCT icon. Touch the DUAL LNB field and a setup box appears with selections applicable to configuring the test.



LNB 1 DiSEqC: Selects the DiSEqC command and port of the DiSEqC switch to select and meter in the LNB 1 or IN 1 section of the DUAL LNB test.

LNB 2 DiSEqC: Selects the DiSEqC command and port of the DiSEqC switch to select and meter in the LNB 2 or IN 2 section of the DUAL LNB test.

TYPE: Selects from several available types. Use the VARIABLE selection to independently select two transponders from different satellites or within a satellite plan.

The DUAL LNB test screen actively monitors the Noise Margin measurements of both satellite signals IN/LNB 1 and IN/LNB2. It further indicates the peak or maximum noise margin as an indication of the best possible dish position or peak.

DUAL LNB Test Setup:

Navigate to the DUAL LNB test as described and shown in this section. Connect the DiSEqC switch and satellite signal feeds to the input of the switch and the output to the meter's RF input. Set the LNB 1 DiSEqC setting (A, B, C, D): IN 1 = DiSEqC "A" on the Sencore Switch). Set to correspond to the switch input you want to meter for IN/LNB 1. Set the LNB 2 DiSEqC setting (ABCD: IN 2 = DiSEqC "B" on the Sencore provided switch). St to correspond to the switch input you want to meter for IN/LNB2. Set the TYPE to "VARIABLE" to permit individual satellite transponder selection for LNB 1 and LNB 2. Press START to advance to the DUAL LNB test screen.

Touch the PLAN field to highlight the satellite selection plans available. Rotate the touch control knob to increment through the plans. Touch the TRANSP field to exit and highlight the transponder information field for value selections. Select the desired transponder by rotating the touch control knob. Touch the PLAN and TRANSP fields for the IN 2 bottom section and repeat these steps to select a satellite and transponder.

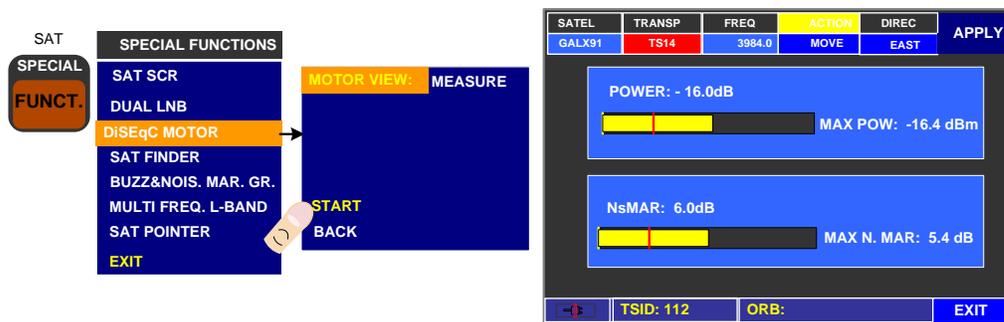
DUAL LNB Tests

The DUAL LNB test results show the signal Noise Margin and Noise Margin Peak for both satellite signals, LNB 1 and LNB2. The bar indications include a peak indicator and a live indication of the Noise Margin. A digital value for each is shown above the bar.

When aligning a dual feed dish, it is likely that you will not be able to get the maximum Noise Margin for both LNB signals. The goal is to compromise the dish settings to achieve the highest Noise Margin values for both LNBS.

4.73: DiSEqC – Dish Motor Control Function

The DiSEqC MOTOR is a special function which permits measurement of a satellite signal while also providing DiSEqC motor actuator commands to move the dish. To select the DiSEqC MOTOR special test from the HOME Menu, with the SAT icon highlighted, touch the SPECIAL FUNCT icon. From the SATELLITE PLAN SELECTION MENU, touch the SPECIAL FUNCT icon. Touch the DiSEqC field and a setup box appears with selections applicable to configuring the test feature.



The DiSEqC MOTOR feature provides commands while metering or showing the satellite signal on a measurement screen or a spectrum analyzer display screen. The MOTOR VIEW selection provides these two selections.

- MEASURE:** Provides DiSEqC motor control command fields and a POWER and NOISE MARGIN test bar and measurement values for metering the satellite signal.
- SPECTRUM:** Provides DiSEqC motor control commands fields along with a spectrum analyzer view of the satellite signal in which to visual see reception.
- START:** Touch the START field on the test configuration section to begin the special test.

The ACTION field at the upper right of the measurement or spectrum analyzer screen provides the DiSEqC motor control commands. The DIREC field selects a direction for the movement, east or west. The APPLY field provides or implements the output command as selected to the actuator. The following provides a quick reference.

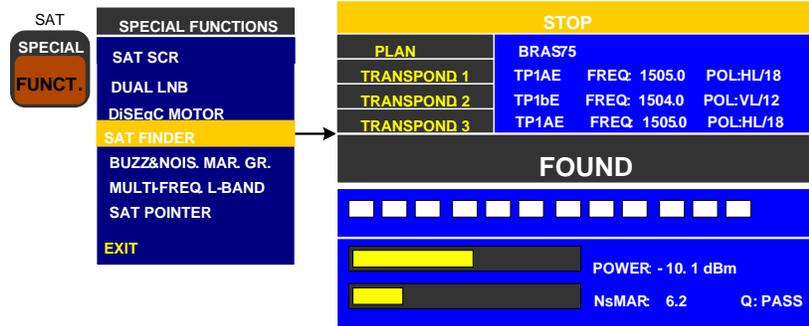
ACTIONS

- MOVE:** Moves the dish to the direction listed, east or west. Ignore measurements until the dish is moving.
- GO TO:** Selects one of the 99 pre-stored dish positions. (See STORE listing) Touch the heading to select the GO TO field and rotate the touch knob to select a position. Touch the APPLY field, upper right in display, directs the meter to go to the position selected.
- STORE:** Stores the current motor position, up to 99 positions may be stored.
- RESET:** Removes no-go zones or banded sectors which were previously setup on the motor dish system. This command removes any previously set limitations. Touch the APPLY field to reset.
- DIREC (Direction):** Determines if movement is to be west or east
- APPLY:** Initiates the actions selected in the ACTIONS field.

4.74 SAT FINDER Function

The SAT FINDER is a special function which is used to find and verify if you have a satellite dish aimed at the proper satellite. The SAT FINDER looks for three user-defined reference transponders on the selected satellite. The satellite is selected in the SATELLITE PLAN SELECTION MENU. Once all three of the transponders can be found and locked is achieved by the meter, the satellite is considered found. Upon finding one of the listed satellite transponders, the power level and Noise Margin are measured enabling dish pointing. When the meter verifies that it can lock and receiver all three transponders properly, the FOUND indicators is presented and the alignment buzzer is turned ON to assist with further peak alignment of the satellite dish.

From the Home Menu with the SAT icon highlighted touch the SPECIAL FUNCT icon. If in the SATELLITE PLAN SELECTION MENU, touch the SPECIAL FUNCT icon at the right of the display. Then touch the SAT FINDER field which takes you directly to the SAT FINDER page.



The top and center fields of the SAT FINDER test are unique compared to other tests. The following provides a brief description of the selections and readouts in these fields.

Top Field Indications:

STOP: The search is in progress, touch this field to stop the search to exit or change transponder listings.

TRANSPONDER SELECTION: The search is stopped permitting changes to the transponders listed on the SAT FINDER test screen. The stop features also facilitates changes to connection cables and the satellite dish equipment.

Center Field Indications:

START SEARCH: Touch to start searching for the three listed transponders. Once selected the center field indicates “SEARCH IN PROGRESS.”

SEARCH IN PROGRESS: An active search for the listed transponders is in progress.

FOUND: The search is complete and successful and all listed transponders were received.

Entering or Changing SAT FINDER Transponders

You may change the transponders used for satellite identification in the SAT FINDER function. Changes can only be made when the transponder search is stopped. Touch the top field of the SAT FINDER function screen to stop transponder searching. The top field reads “TRANSPONDER SELECTION” when stopped. Touch the transponder listing you wish to change. Rotate the big touch Control Knob to increment through available

transponders on the selected satellite. Touch the center START SEARCH field to begin a new search.

You may only select from the list of transponders in the satellite plan for the selected satellite. *Note: Transponder listings are transponders in the plan for that satellite. Changing satellites is done in the SATELLITE PLAN SELECTION MENU.* Adding transponders to a particular satellite plan can be done using the supplied SMART software. Check with industry sources, such as LyngSat, for information on satellite transponders.

If less than 3 transponders are desired, simply repeat the entry of one of the transponders listed in one or two of the other transponder listing fields.

Identifying a Satellite

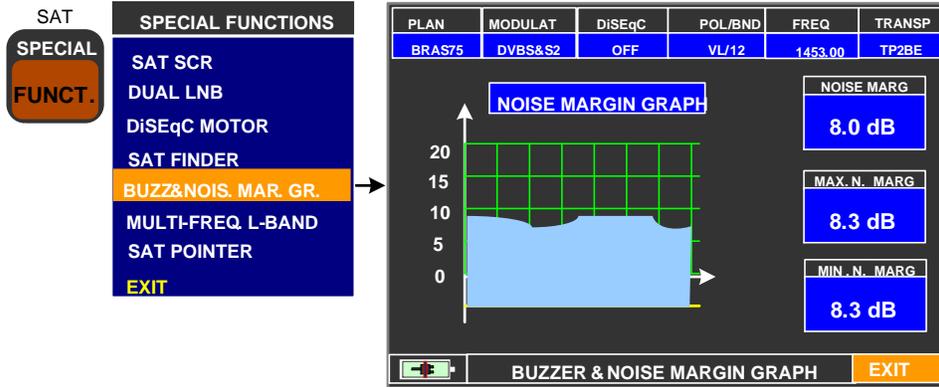
The SAT FINDER function tells you if the satellite you are currently aimed at is the correct satellite. It does this by tuning and locking to up to three listed transponders in the satellite plan for the selected satellite. Follow these steps to aim a dish and identify if you are properly aimed and receiving the desired satellite.

1. Connect the meter to the satellite LNB, or connection cable leading to the dish. You may optionally use the SAT POINTER feature of the meter to find a satellite using a spectrum analyzer view, a preferred method by some installers.
2. Touch the SAT icon on the HOME or start Menu of the DSA 1491. In the next menu, (SATELLITE PLAN SELECTION MENU) touch the desired satellite to select it. *Note: touch at the top or bottom of the list to scroll up or down.*
2. Touch the SPECIAL FUNCT icon at the meters lower right corner. Touch the SAT FINDER listing from the next screen. The meter enters the SAT FINDER function and begins searching for the listed transponders.
3. The meter searches and locks quickly to the first listed transponders providing an indication of an existing satellite signal on the measurement bars. Use the indicators to improve the satellite dish aiming and wait for verification of the other transponders. If they are all found, the meter begins to beep and a “FOUND” indicator appears in the center of the screen. The bottom bar graphs continue to show level and Noise Margin readings to peak align the dish. If the SAT FINDER function continues to search you are likely aimed at the wrong satellite. You may move the dish to adjacent satellites to find the correct one. It may be helpful to return to the SATELLITE PLAN SELECTION MENU, select an adjacent satellite and repeat the SAT FINDER test to identify which satellite you are currently receiving.

Note: Be aware that satellites and their transponders may undergo changes. Check with published sources or references to determine if transponder listings are currently active and technical settings are correct. If one of the SAT FINDER transponder listings has changed, the satellite will not be found.

4.75 BUZZER & NOISE. MARGIN GRAPH Function

The BUZZER & NOISE MARGIN GRAPH test, abbreviated BUZZ&NOIS. MAR. GR. is a special function which provides a time charted graph of the Noise Margin measurement of a selected satellite transponder. It further is accompanied by the alignment buzzer. The test may be used for satellite dish alignment or to monitor the received signal performance of a satellite dish or LNB.



To select the BUZZ&NOIS MAR.GR. function from the Home Menu, touch the SPECIAL FUNCT. icon with the SAT icon highlighted. If the SAT icon is not highlighted, touch the SAT icon and from the SATELLITE PLAN SELECTION MENU after selecting the desired satellite, touch the SPECIAL FUNCT. icon at the right. Then touch the BUZZ&NOIS MAR.GR. listing which takes you directly to the function page.

Measurements in the BUZZ&NOISE MAR.GR function include the following:

NOISE MARG: The current Noise Margin measurement value in dB

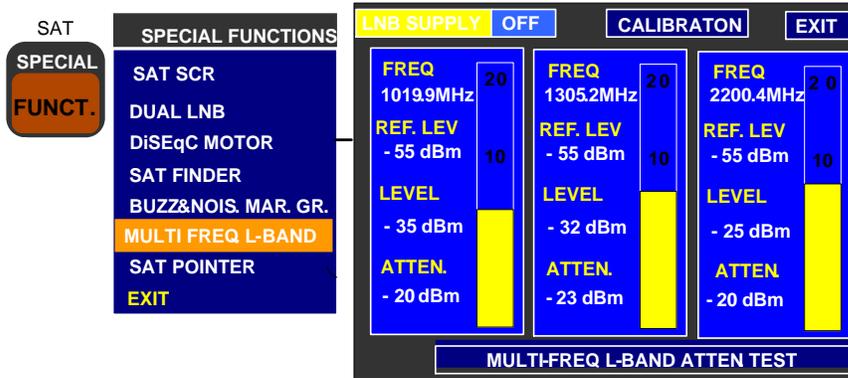
MAX N. MARG: Maximum or best Noise Margin measurement since the test began – signal lock

MIN N. MARG: Minimum or worst noise margin measurement since test began – signal lock.

The received signal performance (noise margin) is graphed from left to right scrolling a 7 second window of performance. Each horizontal increment represents a 1 second time interval. Interruptions are marked as a yellow line falling to the bottom of the chart moving to the left. Variations in noise margin are clearly seen as rising or falling levels in the chart. Levels on the right of the graph clearly indicate the maximum and minimum variations since the onset of the test began.

4.76 MULTI-FREQ L-BAND FUNCTION

The MULTI-FREQ L-BAND test is a test that simultaneously measures the signal power of three L-Band frequencies and meters the attenuation of the signals compared to a reference or “calibrated” level. The test may be used to determine L-Band losses between two signal points. It further may be used to determine the differences in losses between three test frequencies between two signal points. The test is useful in determining attenuation losses and frequency response differences from the satellite location to points in the satellite distribution system or at the receiver.



To select the MULTI-FREQ L-BAND function, touch the SPECIAL FUNCT icon on the Home Menu when the SAT icon is highlighted. If in the SATELLITE PLAN SELECTION MENU, touch the SPECIAL FUNCT icon at the right of the display. Then touch the MULTI-FREQ L-BAND field which takes you directly to the test function.

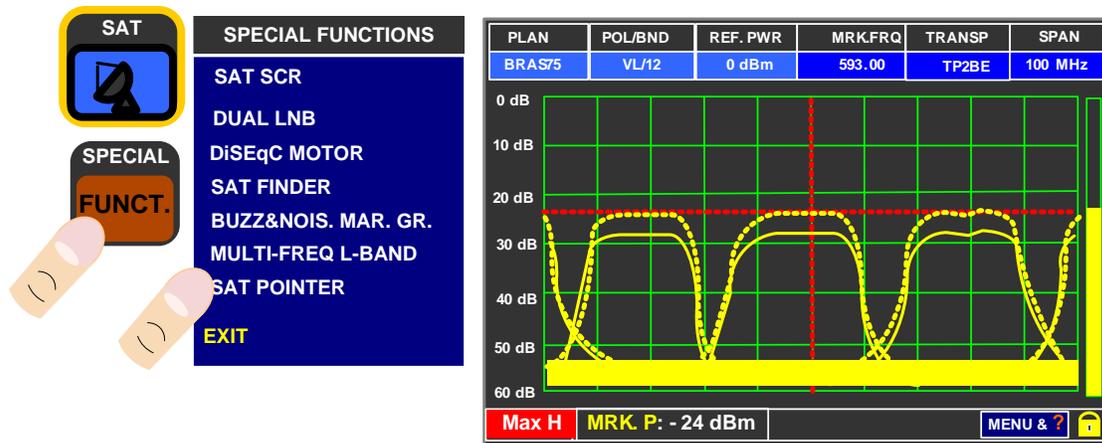
The test function is highly automated with three preselected test frequencies. Connect the cable from the meter to the reference test point. Touch the CALIBRATION field at the top center of the test screen. The meter tests and captures the reference levels at the listed test frequencies. Proceed to move to other test points in which the same source signal(s) used to capture the reference levels are present. The meter indicates the current measured level and computes the attenuation for the three test frequencies compared to the captured reference level. The bar graphs indicate the attenuation levels for all three frequencies for easy comparison.

- FREQUENCY:** L-BAND Frequency used for the level measurement
- REF LEV:** Power level at the reference point which was captured with the “CALIBRATION” activity. Calibration is initialized by touching the CALIBRATION field.
- LEVEL:** Indicates the active or current test power level for each of the three L-band test frequencies
- ATTEN:** Indicates the attenuation or difference in power level between the reference level, captured during the “Calibration” step, and the current input measured power for the three test frequencies. Attenuation is also graphed by the vertical bar meters.
- LNB SUPPLY:** This field provides polarity and band selections if needed to provide for the satellite dish or equipment.

4.77 SAT POINTER Function

The SAT POINTER special function provides a satellite spectrum analyzer view of the selected satellite transponder. The SAT POINTER adds a Max HOLD feature so the spectrum display captures and retains a reference line indicating the max signal level available from the satellite transponder as the dish is moved. The reference level provides a visual target for the best dish positioning point. The SAT POINTER is setup to include seven transponder frequency locations for ease in recognizing a satellite signal when aiming a dish.

To select the SAT POINTER function, touch the SPECIAL FUNCT icon on the Home Menu when the SAT icon is highlighted. If in the SATELLITE PLAN SELECTION MENU, touch the SPECIAL FUNCT icon at the right of the display. Then touch the SAT POINTER field which takes you directly to the SAT POINTER function.



Menu & ?: The popup menu, the same as found in the spectrum analyzer, provides convenient selection of features useful when in the SAT POINTER function. The menu provides access to the BUZZER which may be turned on and used to indicate maximum level. This is helpful if you cannot see the meter and move the dish simultaneously. It further provides access to the DiSEqC switch selections.

The HELP feature, shown as a HELP icon in the menu, may be selected to automatically analyze the selected transponder. The selected transponder is marked with the red cursor in the middle of the transponder band. For additional information on the satellite HELP feature see Section 4.8 of this manual.

4.78 Azimuth & Elevation

The Azimuth & Elevation special function is a satellite calculator for eastern hemisphere satellite dish azimuth, elevation, polarization, and polar dish settings. Enter in the satellite dish installation location including the orbit position of the satellite dish you are pointing the dish at, the installation site latitude entered as degree north as a positive value or degree south as a negative value, and the installation site longitude east.

To select the Azimuth & Elevation calculator function, touch the SPECIAL FUNCT icon on the Home Menu when the SAT icon is highlighted. If in the SATELLITE PLAN SELECTION MENU, touch the SPECIAL FUNCT icon at the right of the display. Then touch the Azimuth & Elevation field which takes you directly to the calculator. Touch the Sat Orbit field, press the knob to select the field, rotate the Control Knob to increment values in the field and set the orbit position of the satellite you are aiming for. Push the Control Knob to release the field. Use the same process to set the Site Latitude and Site Longitude. When you have entered the correct values at the top of the screen, touch the COMPUTE field at the center. The computed values are indicated at the bottom of the screen.



Sat Orbit (deg E): Satellite position in degrees east

Site Latitude (deg N+, S-): installation site location latitude

Site Longitude (deg E): Installation site location longitude

COMPUTE: Initiate computation of satellite dish settings. Select the COMPUTE field (highlighted) and press the large Control Knob to Enter (Compute).



Dish Azimuth (True North): Satellite dish azimuth setting in degrees referencing true north

Dish Azimuth (Magnetic North): Satellite dish azimuth setting in degrees referencing magnetic north

Dish Elevation: Satellite dish elevation setting in degrees

Slant Range: Distance in kilometers

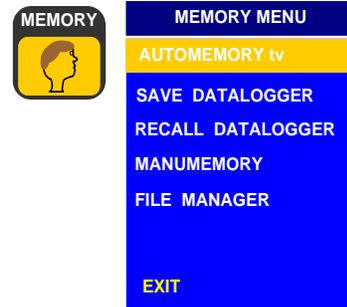
Polarization Tilt: Polarization tilt setting in degrees

Polar Axis Angle: Polar axis angle setting in degrees

Polar Offset Tilt: Polar offset tilt angle in degrees

4.8 Satellite Memory Management

The MEMORY MENU provides test logging features and transponder/channel management functions. The MEMORY MENU is accessed by pressing the MEMORY icon with the head/brain picture on it. On the Home Menu or in the SATELLITE PLAN SELECTION Menu touch the MEMORY icon. The MEMORY MENU functions are summarized below: The following sections of this manual provide more details.



AUTOMEMORY tv: NOT AVAILABLE IN the SATELLITE MODE. In TV or CABLE mode scans a master TV or Cable channel plan and builds an AUTO named channel plan with channels identified by DISCOVERY and meeting minimum level settings.

SAVE DATALOGGER: Scans the transponders in the selected satellite plan and records performance measurements to a log file. The scanning progress and test summary is shown during the scanning.

RECALL DATALOGGER: Selects and recalls a previously scanned and stored log file by name for reviewing the test results

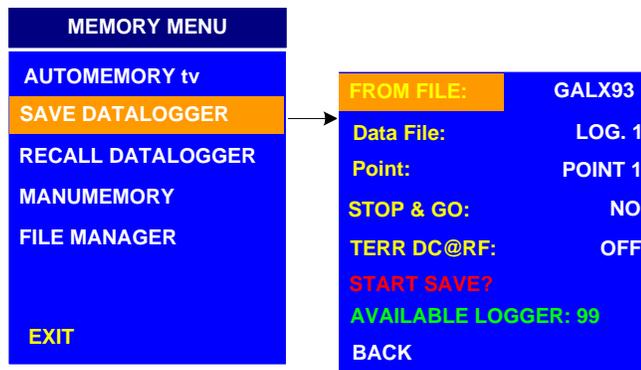
MANUMEMORY: Provides creation and editing of manually created transponder/channel plans.

FILE MANAGER: Provides selection of logger and satellite manual created channel plans for renaming or deleting.

Touch a listing in the MEMORY MENU to begin a function as listed above.

4.81 SAVE DATALOGGER – Satellite Auto Measure & Store

The SAVE DATALOGGER feature within the MEMORY MENU scans the transponders in a selected satellite plan and captures performance measurements for each transponder to a log file. The logged data file is stored in one of the 99 available memory locations and is named for latter recall and test result viewing. To begin a data logger capture, select the SAVE DATALOGGER by touching the MEMORY icon on the Home Menu with the SAT icon highlighted. Touch the SAVE DATALOGGER listing in the MEMORY MENU.



The SAVE DATALOGGER has a configuration menu with several fields which impact the function. Following is a brief description of these fields.

FROM FILE: This field indicates the selected satellite in a satellite or manual memory plan. This is the plan selected in the SATELLITE PLAN MENU. This field may be highlighted and a new satellite plan or manual memory plan selected.

Data File: This is the name of the file in which the scanned measurement data is to be stored.

Point: Provides a name for the test point or other identifier associated with the log file data.

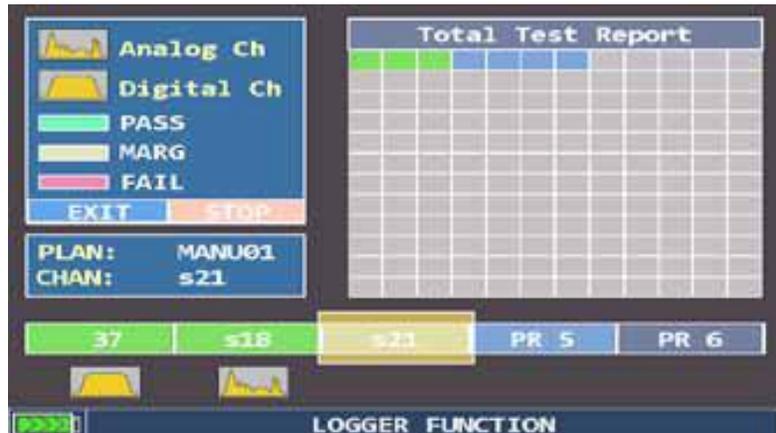
STOP&GO: Provides for stopping the log measurements when changing from a satellite transponder to a cable channel or broadcast channel when the manual memory channel plan contains a mix of signal types. This provides the user a time to change connections.

TERR DC@RF: Provides an on/off switch for enabling DC voltage to the RF jack when measuring broadcast TV. Not applicable in the Satellite mode.

START SAVE?: Starts the logging saving transponder performance testing data to the Data File name in the Date File field.

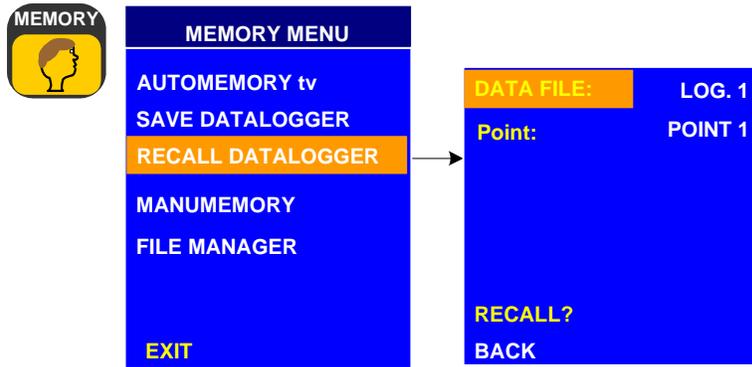
AVAILABLE LOGGER: 99: Indicates the available memory locations for storing logging data files.

When the DATA LOGGER begins scanning transponders, a LOGGER FUNCTION screen shows the scanning/logging progress. A Total Test Report section, on the right of the display screen, indicates the progress of the scan and summarizes the performance of each transponder tested. The transponder is color coded in the report indicating a pass, marginal or fail status. Near the bottom of the LOGGER FUNCTION screen the transponder currently being tested is highlighted. A picture indication shows if the transponder was digital or analog.



4.82 RECALL DATALOGGER - View Satellite Data Log File

The RECALL DATALOGGER within the MEMORY MENU provides a means to recall existing memory log files containing satellite transponder performance test data. The log files available for recall are files created with a SAVE DATALOGGER function covered in the previous section.



To recall a data logger file touch the MEMORY icon on the HOME Menu with the SAT icon highlighted. Touch the SAVE DATALOGGER listing in the MEMORY MENU. In the DATA FILE field of the selection box, touch the listing on the right and rotate the touch Control Knob to increment through the available log files. Press the RECALL field to view the file’s measurement contents.

The DATALOGGER viewer shows the file name and point number in the upper left to identify the logger file. The name of the channel or transponder is shown in the left column. The digital or analog signal type is listed and the associated performance measurements are shown horizontally for each transponder/channel.

LOG. 1 POINT 1		EXIT			
NAME	TYPE	PRW LVL	MER C/N	bBER A/V	aBER PER
E5	DVB-T	67.8	29.2	5x10 ⁻⁵	<E-8
37	DVB-H	63.2	23.3	<10 ⁻⁶	<E-8
s18	An TV	71.6	49.3	8.2	<E-8
s21	DVB-C	75.5	>36	<10 ⁻⁹	<E-6
PR 5	An Sat	65.7			
PR 6	DVB-S	58.1	12.7	1x10 ⁻⁴	<E-8
PR 7	DVB-S2	67.8	12.8	8x10 ⁻³	<E-7

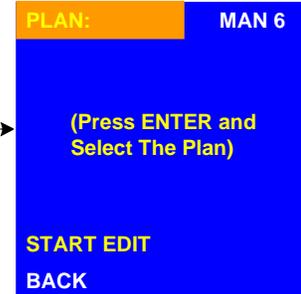
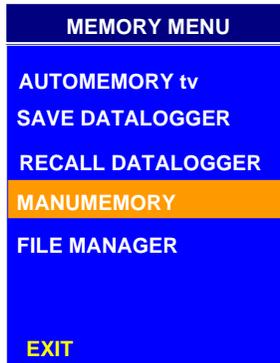
RECALL DATALOGGER

An indication of transponder signal performance is provided with a color coded box at the left of the transponder name. A green box indicates the transponder passed test performance criteria and is good. A red box indicates a performance issue.

4.83 MANUMEMORY – Creating or Editing Satellite Plans

The MANUMEMORY feature found in the MEMORY MENU provides the ability to manually create a tuning plan which may includes a list of satellite transponders. A manual plan provides convenience by listing only the transponders you want to test or that you use for your installations. The MANUMEMORY feature permits entry of the individual transponder listings. The MANUMEMORY feature also permits edits or changes to listed transponders within a previously created manual plan.

To Manually Create a Plan:



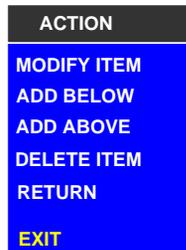
1. To create a transponder/channel plan navigate to the MANUMEMORY feature by touching the MEMORY icon and touching the MANUMEMORY listing in the MEMORY MENU.

2. In the PLAN field at the top of the configuration box touch the listing at the right to highlight the field. Move your finger over the arrow portion of the touch control knob to increment through available memory channels.

3. Select a manual channel plan number of choice. Press the START EDIT field to begin construction of a manual plan. *NOTE: The name of the selected manual file can be renamed. See the next section of this manual for instructions on how to rename an existing manual file.*

4. The ITEM EDITING menu appears to enable entry of transponder. Touch the SAVE? field to add a listing after changing the individual fields to the desired values.

ACTIVE PLAN: MANU 25			
N	TR/CHAN	FREQ	MODE
1	PR 1	1030.0	DigiSAT
2	PR 2	1070.0	DigiSAT
1	PR 3	1090.0	DigiSAT
2	PR 4	1741.0	DigiSAT
3	PR 5	1350.0	DigiSAT



MANUMEMORY ACTIONS

MODIFY ITEM: Produces the ITEM EDITING menu which permits changes to the settings for the transponder listing highlighted

ADD BELOW: Produces the ITEM EDITING menu in which you may select the parameters of a transponder signal and dish characteristic to add a listing below the currently highlighted field.

ADD ABOVE: Produces the ITEM EDITING menu in which you may select the parameters of a transponder signal and dish characteristic to add a listing above the currently highlighted field.

DELETE ITEM: Deletes the highlighted listing from the selected plan.

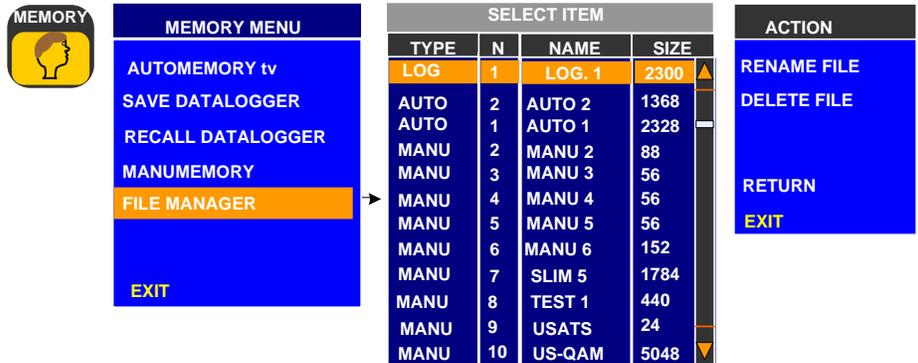
To Edit an Existing Plan:

1. To make changes or additions to an existing manual memory plan navigate to the MANUMEMORY feature by touching the MEMORY icon followed by touching the MANUMEMORY listing in the MEMORY MENU.
2. In the PLAN field at the top of the configuration box touch the listing at the right side to highlight the file name. Rotate the control knob to increment through the available memory plans.
3. Select the file name in which you want to edit or add listings. Press the START EDIT field to begin editing.
4. Touch MODIFY ITEM from the listings to produce the ITEM EDITING Menu. Modify the items in the Menu to match the transponder and satellite dish characteristics as needed. Press the SAVE? field to save the changes to the highlighted listing.

Press BACK to return to the previous menu without making changes.

4.84 FILE MANAGER – Renaming or Deleting Files

The FILE MANAGER, found in the MEMORY MENU, provides management of the logger and transponder/channel plan files. The FILE MANAGER provides the ability to rename or delete files from the meter’s memory. To access the FILE MANAGER from the Home Menu, touch the MEMORY icon followed by a touch of the FILE MANAGER listing in the MEMORY MENU.



You can rename or delete files that were created with the DATA LOGGER as in scanning satellite transponders and capturing performance measurement data to a test file. These test files are identified as LOG file types and are typically named as LOG 1, LOG2, etc. You can rename or delete files that were created by the AUTOMEMORY feature or with a MANUMEMORY feature of the meter. These channel or satellite transponder files are typically named “AUTO 1,” “AUTO 2”, etc. or “MANU 1,” “MAN 2, etc. by the meter. However, these file names can be changed to a more recognized or descriptive name as desired. The following section summarizes how to rename, or delete these files in the FILE MANAGER function.

To Rename a File:

1. Navigate to the MEMORY MENU. Touch the FILE MANAGER listing.
2. Scroll up or down in the listed files to find the file you want to rename. Touch the listing to select or highlight the listing and press the ENTER pushbutton in the center of the larger touch Control Knob.
3. Touch the RENAME FILE listing in the ACTION MENU which appears.
4. A naming overlay appears on the screen. Touch letters to enter into naming boxes. Press the “>” field to advance to the next box. Continue until the name is complete. Touch the EXIT box.

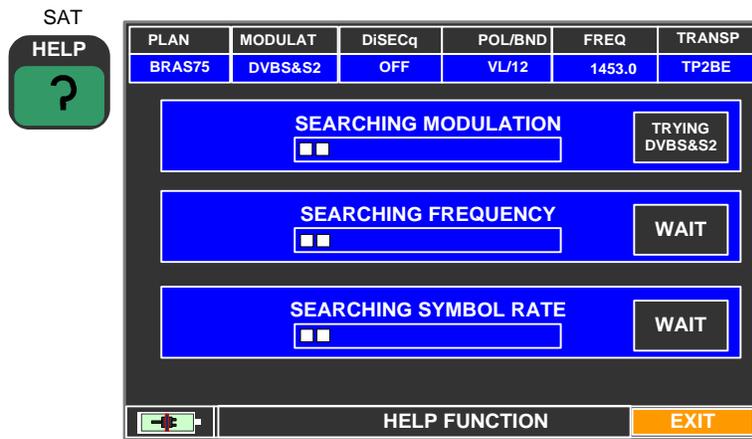
To Delete an Existing File:

1. Navigate to the MEMORY MENU. Touch the FILE MANAGER listing.
2. Scroll up or down in the listed files to find the file you want to delete. Touch the listing to select or highlight the listing and press the ENTER pushbutton in the center of the larger touch Control Knob.
3. Touch the DELETE FILE listing in the ACTION MENU which appears to delete the selected file: **NOTE: DELETION IS PERMANENT – THE FILE CANNOT BE RECOVERED.**

4.9 Satellite HELP

The HELP icon of the DSA 1491 within the Satellite Spectrum Analyzer popup menu offers automated help in tuning to a satellite transponder. The HELP icon on the DSA 1491 refers to help or assistance tuning in a digital channel. The HELP feature determines for a user the RF type of digital signal within a satellite transponder.

Initiating a HELP function on the DSA 1491 directs the meter to automatically analyze the satellite transponder and determine automatically the RF modulation type, bandwidth/center frequency, and RF symbol rate. The DSA 1491 methodically analyzes the digital satellite transponder signal to determine these parameters. If the parameters are within the receiver capabilities the meter finishes by advancing to the main satellite measurement page. If the transponder has no signal or is a proprietary modulation scheme, the DSA 1491 reports “NO SIGNAL.”



To initiate a HELP function use the spectrum analyzer and position or tune so as to center the marker frequency cursor in the center of a transponder signal. Press the MENU & ? field to bring up the popup menu. Touch the HELP icon to launch the help search.

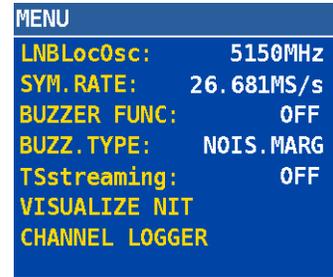
The HELP FUNCTION screen informs you of the meter’s progress in determining the type of digital signal within the satellite transponder. The boxes on the right in the center list the modulation, frequency, and symbol rates as discovered by the meter. When the search is completed, “found” will be displayed on all three measurement fields at the right. The top fields are the same as the satellite main measurement page. To return to the previous menu, press the EXIT field at the bottom right of the display.

For Satellite Digital Transponder Signal HELP:

1. Touch the SAT icon or pushbutton. Touch and select the satellite transponder or enter the transponder frequency.
2. Touch the SPEC pushbutton to enter the Spectrum function.
3. Touch the “MENU & ?” field - bottom right. Touch the HELP icon in the Popup Menu.
4. Wait while the meter analyzes and determines the transponder symbol rate, frequency and modulation type. FOUND is shown in all three boxes when successful. Touch EXIT to return to the MEAS page and begin transponder measurements.

4.10 Satellite TS Streaming LAN/USB

The TSstreaming feature permits streaming of the demodulated transport stream of the received satellite, cable or broadcast signal. The TS streaming feature can be used to stream the selected transport steam services to a destination IP address via the TS Over IP LAN port. The TSstreaming feature may be used to stream the selected transport stream services to a USB memory stick. The following settings are available in the TSstreaming field for selection.



OFF: TSstreaming is disabled

LAN: Enables TSstreaming to LAN – advances to TSstreaming LAN menu

USB: Selects TSstreaming to USB – advances to TSstreaming USB menu

To start TSstreaming touch the MENU & ? icon at the bottom right of the measurement screen, touch the TSstreaming field, rotate the control knob or repeatedly touch the OFF/LAN/USB field to increment to LAN or USB. Press the large control knob to advance to the TSstreaming function.

TSstreaming LAN

The individual services within the demodulated satellite signal transport stream can be selected and encapsulated to the LAN IP to steam to a destination IP.

IP DEST: Provides entry of the destination IP address in which to stream the selected services highlighted by the boxes in the center service selection area. Rotate the

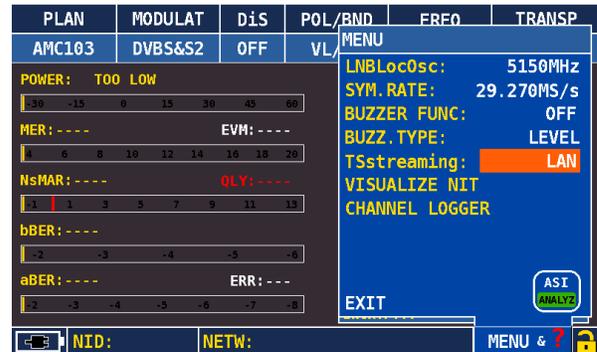
large knob to highlight the IP DEST field and push the large control knob to enter the field for entry of address.

PORT: Provides entry of the destination IP port in which to stream the selected services highlighted by the boxes in the center service selection area.

Services Selection (Center): Provides selection of the individual services of the transport stream in which to include in the stream to the defined IP Destination address and port.

Start/Stop/Exit: Starts and/or stops the streaming activity to the LAN address/port defined. To exit the menu press the EXIT field.

Data Rate: Indicates the data rate of the stream via LAN.



(Rate is limited to 20 Mbps)

Note: The streaming LAN feature does not provide professional TS stream muxing and PCR correction so use should be limited to signal confirmation and monitoring only.

TS Streaming USB

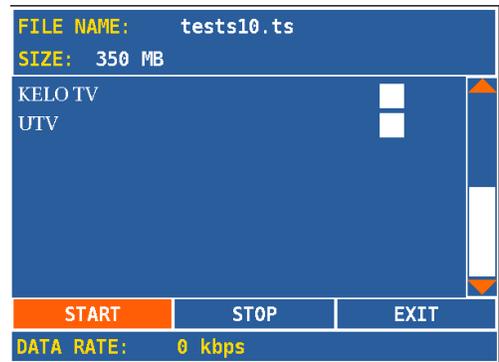
The TSstreaming feature may be used to stream the selected transport stream services to a USB memory stick. To start TSstreaming touch the MENU & ? icon at the bottom right of the measurement screen, touch the TSstreaming field, rotate the control knob or repeatedly touch the OFF/LAN/USB field to increment to USB. Press the large control knob to advance to the TSstreaming to USB function..



The following fields are included in the TSstreaming to USB menu.

File Name: Provides entry to define the file name of the TS stream capture to the USB memory stick. The file is a .ts file.

Size: Sets the size of the ts stream capture or record file on the USB memory stick. The size of the file determines the duration of the TSstream capture based upon the streams services selected and resulting total bit rate.



Services Selection (Center): Provides selection of the individual services of the transport stream in which to include in the stream to the defined USB memory stick file.

Start/Stop/Exit: Starts and/or stops the streaming activity to the USB stick file. To exit the menu press the EXIT field

Data Rate: Indicates the data rate of the stream

DSA 1491– User Manual

(yellow). Menu when in the The channel monitor provides a continuous graphing of the satellite transponder being received.

Bottom Chart: The bottom chart provides charted values of the satellite transponder's measured power (red), and PER (blue).

When in the Single Channel Monitoring function a control Menu provides selections applicable to the charting. The Menu includes the time interval setting elapsed from the left to right side of the chart.



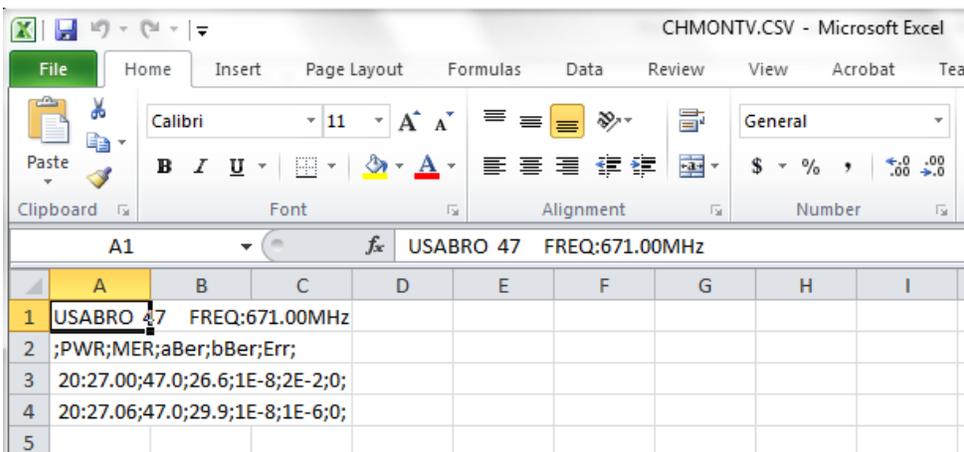
TIME INTVL: Time Interval of the graph shown on the display. The displayed time interval of the graph.

SEND TO USB: Turns on the capability of writing channel monitoring values to a USB memory stick file. When turned ON the graphed values of the channel measurements are suspended and values are written to the USB stick file.

FILE NAME: Produces an entry menu to define a fine name to store channel monitoring values on the USB memory stick.

RESET: Resets or clears the graph. Restarts the channel monitoring and graphing.

Channel monitoring values that are written to the USB stick file can be opened and viewed with a spreadsheet application. The values include a time reference from the date/time settings of the meter. The values include the Power, MER, aBER, bBER and packet errors.



	A	B	C	D	E	F	G	H	I
	USABRO 47 FREQ:671.00MHz								
1	USABRO 47	FREQ:671.00MHz							
2	;PWR;MER;aBer;bBer;Err;								
3	20:27.00;47.0;26.6;1E-8;2E-2;0;								
4	20:27.06;47.0;29.9;1E-8;1E-6;0;								
5									

Section 5: TV Broadcast Measurements

The broadcast TV signal analysis provided by the DSA 1491 indicates the performance of broadcast television digital 8VSB signals or ISDB-T or DVB-T/T2, depending on model. Measurements provide guidance for antenna installation/aiming and may be used to test TV-RF distribution systems. This section provides information on the broadcast TV measurements.

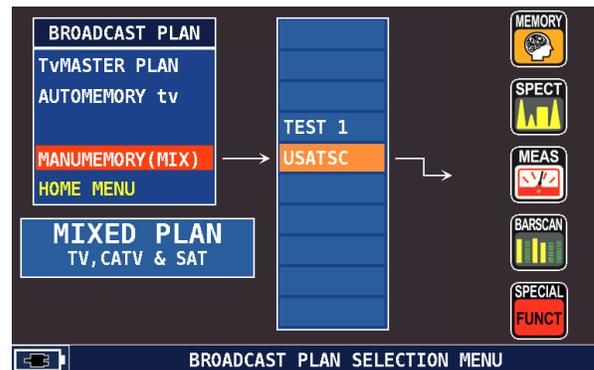
5.1 TV Plan Selection

When the TV icon in the HOME Menu is highlighted, pressing the PLAN SELECT front panel pushbutton presents a TV BROADCAST PLAN SELECTION MENU. This menu provides selections which define a tuning plan for selecting TV channels and respective frequency bands for measurements. The TV BROADCAST PLAN MENU contains several listings of which to choose from. The following is a brief description of these listings and their content.



TvMASTER PLAN: This selection provides a listing of standard or master TV channel plans in which to choose from. For testing applications in North America, the USABRO listing provides a suitable channel plan which includes all the off-air TV channels from 2 to 69. ISDB-T and DVB-T/T2 models present different but regional applicable channel plans.

AUTOMEMORYtv: This selection provides a list of channel plans to choose from that are “AUTO” plans. These plans are created with the AUTOMEMORYtv feature in the MEMORY MENU. Please see section 5.81 of this manual for information on creating an AUTO channel plan. If you have created an AUTO plan for broadcast signal analyzing or antenna work, it will be listed for selection.



MANU MEMORY (MIX) Plan: The MANU MEMORY (MIX) listing in the TV BROADCAST PLAN menu contains manually created channel plans. A manual plan may include either satellites transponders, cable channels or TV broadcast channels. It may also include a combination or a mix of satellite transponders, TV or CATV channels. Manual channel plans may be created in the MEMORY MENU function or using the supplied SMART software with a PC.

To Select a Broadcast TV Channel Plan:

1. Touch the TV icon. Touch the PLAN SELECT pushbutton to present the BROADCAST PLAN SELECTION MENU.

2. Touch the TVMASTER PLAN. Touch the USABRO field in the center list. Press the TV pushbutton or the MEAS icon at the right. The meter advances to the TV MEASUREMENT page.

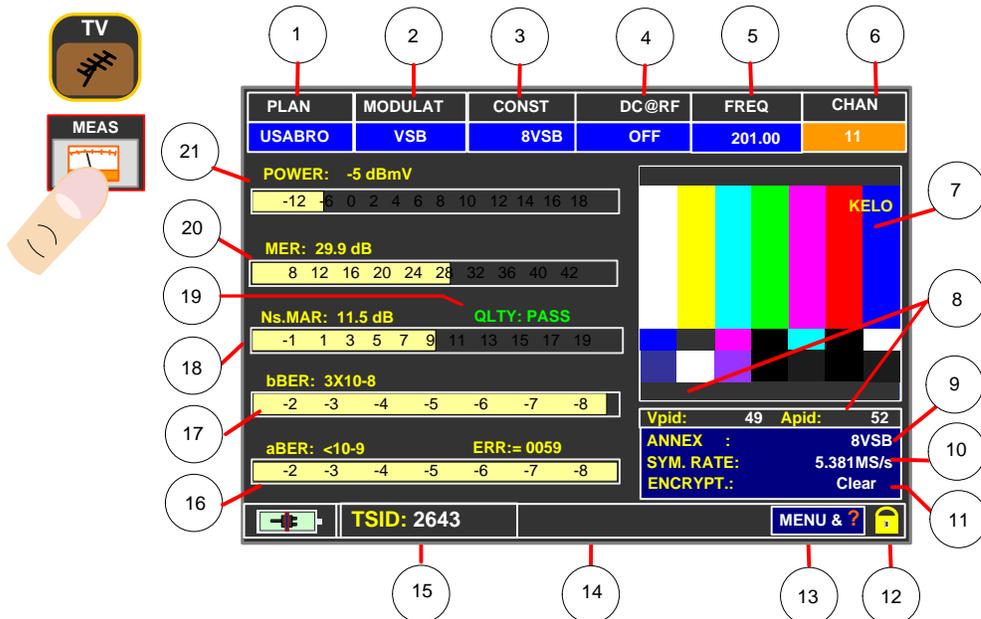
5.2 TV Digital & Analog Measurements

The DSA 1491 provides a comprehensive analysis of a TV broadcast signal, either digital or analog. Digital signal analysis includes standard 8VSB, ISDB-T, or DVB-T/T2 analysis depending on the model. To access the TV Broadcast measurements touch the TV icon on the HOME page or touch the TV front panel pushbutton. Press the PLAN SELECTION pushbutton to selecting a channel plan as desired.



5.21 Main Digital TV Measurement Page

The main measurement page includes many fields. The following section describes the fields of a digital channel measurement as numbered in the figure below.

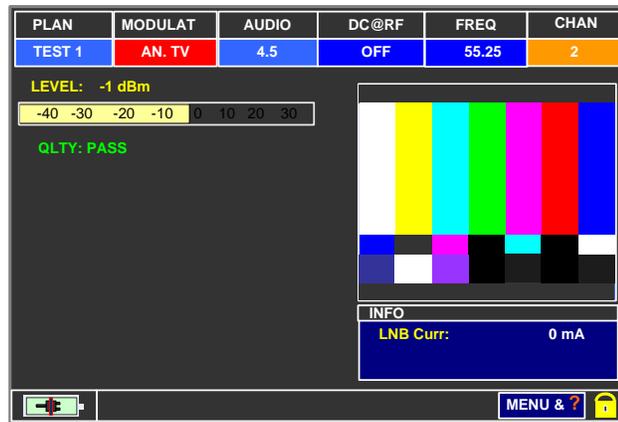


- 1. Plan:** The TV channel plan selected in the TV Broadcast Plan Selection Menu or in a Manual channel plan
- 2. Modulation:** The modulation type of the digital signal. Defaults to the type identified in the channel plan which should be VSB for broadcast TV in North America for the selected channel (6). This is a selectable field that permit selection of other modulation types and analog (AN.TV).
- 3. CONST:** The current setting for constellation based upon modulation.

- 4. **DC@RF:** Indicates if DC voltage is applied to the RF input jack of the meter. This field should be off for most testing applications. Selectable field permits voltage selection and output.
- 5. **FREQ:** The center frequency of the digital channel or video carrier of analog channel. (6). Selectable field permits frequency tuning.
- 6. **CHAN:** The selected channel being analyzed. Selectable field permits channel selection. The channel must be included in the selected channel plan (1).
- 7. **Video:** The active video on the selected video service within the channel
- 8. **VPID/APID:** Video and Audio Program Identifier values for the selected video service contained in MPEG
- 9. **ANNEX:** The standard signal type or reference – 8VSB for terrestrial digital signals.
- 10. **SYM RATE:** The symbol rate of the RF digital carrier in million (MEGA) symbols per second.
- 11. **Encryption:** Indicates if the selected video service is encrypted
- 12. **Locked Symbol:** Indicates if the meter’s receiver is locked to a digital RF signal
- 13. **MENU & ?:** Provides a popup menu with related selections and a HELP icon for determining the channel signal modulation, symbol rate, and frequency.
- 14. **Network Name (NETW):** Indicates the network name or identification
- 15. **TSID or NID:** Transport Stream or network Identification numbers
- 16. **aBER:** Bit Error Ratio measurement after error correction measurement
- 17. **bBER:** Bit Error Ratio measurement – before error correction
- 18. **Noise Margin (Ns.MAR):** Provided margin signal vs. noise power measurement
- 19. **Quality (QLTY) Rating:** Quality rating based upon MER and noise margin values
- 20. **MER:** Modulation Error Ratio measurement of selected channel
- 21. **POWER:** Average Power measurement for the digital channel and video carrier peak measurement for an analog channel, typically in dBmV.

5.22 Analog TV Measurements

The DSA 1491 may be used to analyze the level, A/V, and CN ratios of an analog TV channel. You may further view the demodulated video and listen to the audio. To measure a TV channel as an analog channel, the modulation type for the channel must be specified as an analog TV channel. The abbreviation for this on the meter is “AN. TV.” You may change the modulation type of a selected channel in the main measurement page by touching the MODULAT header. Select the AN.TV listing in the drop down selection box by touching the AN.TV listing. In most instances the meter detects when the channel is not a digital channel and defaults to the analog “AN. TV” type.



Analog measurements are provided on two measurement pages. Push the TV front panel push button to increment to each measurement page. The 1st page provides a

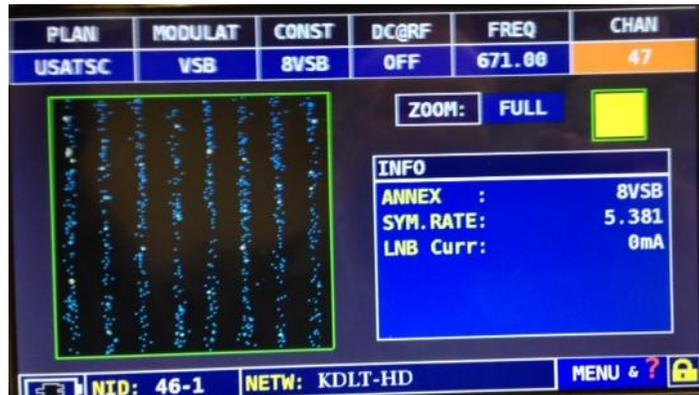
level measurement and provides video and audio monitoring. The 2nd page provides level, A/V ratio, and C/N ratio measurements.

5.23 FM Radio Tuning & Measurement

To measure the level of an FM radio signal, touch the MODULAT header field and select the “FM RADIO” listing. Touch the FREQ header and enter the FM radio frequency. The level of the FM radio signal is metered and you may listen to the detected audio.

5.32 TV Constellation & Monitoring

The constellation measurement page provides a second page of analysis of a broadcast digital channel. The top and bottom fields of the page are the same as the main measurement page. The left center of the Constellation & Info page provides a constellation analysis. The right center of the Constellation & Info page provides an INFO box with information regarding the CATV channel being measured.

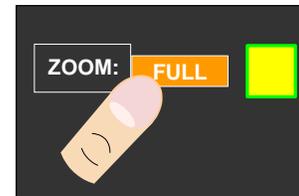


There are two ways to access the Constellation & Info measurement page from the Main Measurement page. Either press the TV pushbutton on the meter front panel or touch the display screen anywhere on the left center measurements area from the POWER measurement bar down to the aBER measurement bar. Touch this same area to return from the Constellation Measurement page to the Main Measurement Page.

CONSTELLATION

The constellation analysis provides a visual indication of the detected RF symbol accuracy. The constellation diagram changes its appearance to match the modulation type and the number of symbols in the RF transmission signal. For example, a QAM 64 signal has 64 squares while a QAM256 signal has 256 squares.

The constellation diagram may show a full or all the symbol squares or ¼ sections of the constellation using the ZOOM feature. To zoom into a smaller ¼ section of the full constellation diagram, touch the selection box to the side or right of the ZOOM box. Multiple touches increment the ¼ section view through all the quarter sections of the constellation diagram. The box to the right of the selection box indicates the selected section being shown by the constellation diagram. .



ANNEX: The digital signal standard annex it complies with such as J83-A which is the North American cable standard.

SYM. RATE: The detected symbol rate of digital channel

LNB Curr: The current flowing or sourced from the meter via the RF Input jack to an inline amplifier or block converter.

5.33 TV MPEG Video Service Monitoring

The video displayed in the Main Measurement Page or in the MPEG SERVICE LIST page may be expanded to fill the display screen. For a full screen view of the demodulated video of a selected video service touch the displayed video section of the screen.



The displayed video initially indicates the video service name along with associated MPEG header video and audio information. This information is located along the bottom of the display and includes the video resolution, aspect ratio, and MPEG compression level. The audio information includes the format, and data rate. After a few seconds for review, the bottom section is pushed to the bottom of the display. When viewing a full video display you may return to the previous measurement screen by touching the center of the screen.

5.4 TV Measurement Popup Menu

The TV measurement page includes a popup menu that provides easy changes to the meters local oscillator and to the buzzer functions. It further includes quick access to the HELP DISCOVERY function. The Popup Menu listings are explained below.

PRG. NAME: The current channel number

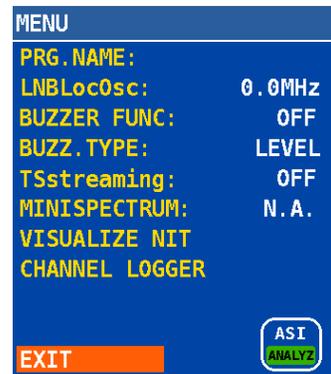
LNBLocOsc: Provides user changes to the local oscillator setting of the meter. This remains at 0 MHz for all typical TV-RF input signal testing.

BUZZER FUNC: Provides a switch selection to turn the alignment buzzer on or off.

BUZZ. TYPE: Provides a selection to produce a tone based upon the received signal level or on the signal noise margin measurement.

TS_STREAMING: Provides a selection to setup streaming of selected services from the RF demodulated transport stream to the LAN port or to a USB drive file.

MINISPECTRUM: Provides a spectrum overlay on the displayed video in the video window on the measurement page. The Minispectrum can be enabled or disabled for digital measurement channels.



VISUALIZE NIT: Provides a measurement screen with the information contained in the DVB Network Information Table.

CHANNEL LOGGER: Monitors and charts the digital RF measurements of a satellite transponder or channel.

ASI icon: Provides ASI signal analysis – shortcut to the ASI-IP analyzer. See Section 10 of this manual for details

5.41 TSstreaming

The individual services within the demodulated satellite signal transport stream can be selected and encapsulated to the LAN IP to stream to a destination IP.

IP DEST: Provides entry of the destination IP address in which to stream the selected services highlighted by the boxes in the center service selection area. Rotate the large knob to highlight the IP DEST field and push the large control knob to enter the field for entry of address.

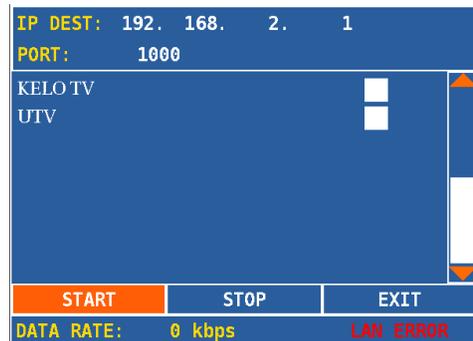
PORT: Provides entry of the destination IP port in which to stream the selected services highlighted by the boxes in the center service selection area.

Services Selection (Center): Provides selection of the individual services of the transport stream in which to include in the stream to the defined IP Destination address and port.

Start/Stop/Exit: Starts and/or stops the streaming activity to the LAN address/port defined. To exit the menu press the EXIT field.

Data Rate: Indicates the data rate of the stream via LAN. (Rate is limited to 20 Mbps)

Note: The streaming LAN feature does not provide professional TS stream muxing and PCR correction so use should be limited to signal confirmation and monitoring only.



TS Streaming USB

The TSstreaming feature may be used to stream the selected transport stream services to a USB memory stick. To start TSstreaming touch the MENU & ? icon at the bottom right of the measurement screen, touch the TSstreaming field, rotate the control knob or repeatedly touch the OFF/LAN/USB field to



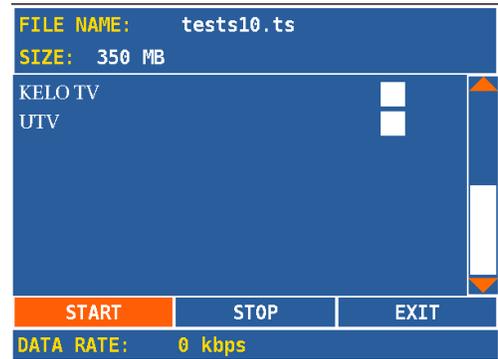
DSA 1491– User Manual

increment to USB. Press the large control knob to advance to the TSstreaming to USB function..

The following fields are included in the TSstreaming to USB menu.

File Name: Provides entry to define the file name of the TS stream capture to the USB memory stick. The file is a .ts file.

Size: Sets the size of the ts stream capture or record file on the USB memory stick. The size of the file determines the duration of the TSstream capture based upon the streams services selected and resulting total bit rate.



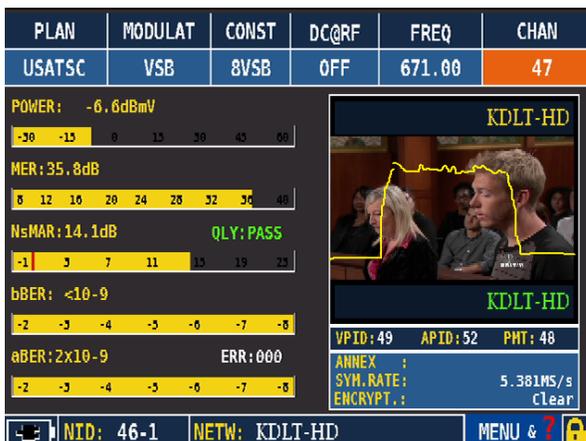
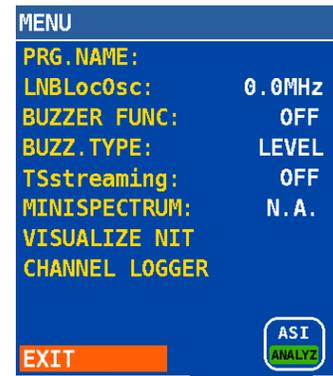
Services Selection (Center): Provides selection of the individual services of the transport stream in which to include in the stream to the defined USB memory stick file.

Start/Stop/Exit: Starts and/or stops the streaming activity to the USB stick file. To exit the menu press the EXIT field

Data Rate: Indicates the data rate of the stream

5.42 MINISPECTRUM

The MINISPECTRUM feature provides a channel spectrum analyzer overlay on the video display within the main measurement page. The overlay is enabled and disabled in the main channel measurement MENU. To enable/disable press the MENU & ? field at the bottom right of the measurement page. Touch the MINISPECTRUM field and increment the field to ON or OFF to enable or disable the spectrum overlay.



Bottom Chart: The bottom chart provides charted values of the satellite transponder’s measured power (red), and PER (blue).

When in the Single Channel Monitoring function a control Menu provides selections applicable to the charting. The Menu includes the time interval setting elapsed from the left to right side of the chart.



TIME INTVL: Time Interval of the graph shown on the display. The displayed time interval of the graph.

SEND TO USB: Turns on the capability of writing channel monitoring values to a USB memory stick file. When turned ON the graphed values of the channel measurements are suspended and values are written to the USB stick file.

FILE NAME: Produces an entry menu to define a file name to store channel monitoring values on the USB memory stick.

RESET: Resets or clears the graph. Restarts the channel monitoring and graphing.

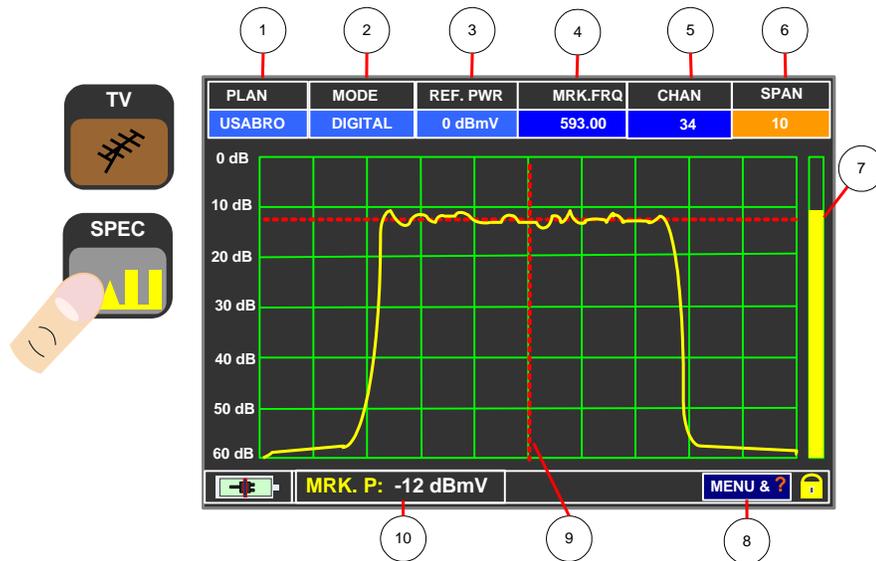
Channel monitoring values that are written to the USB stick file can be opened and viewed with a spreadsheet application. The values include a time reference from the date/time settings of the meter. The values include the Power, MER, aBER, bBER and packet errors.

	A	B	C	D	E	F	G	H	I
	USABRO 47 FREQ:671.00MHz								
1	USABRO 47	FREQ:671.00MHz							
2	;PWR;MER;aBer;bBer;Err;								
3	20:27.00;47.0;26.6;1E-8;2E-2;0;								
4	20:27.06;47.0;29.9;1E-8;1E-6;0;								
5									

5.5 TV Spectrum Analyzer

The TV spectrum analyzer provides detailed spectral analysis of both analog and digital analog TV signals. To select the spectrum analyzer function from the HOME menu with the TV icon highlighted, touch the SPEC icon. You may also access the spectrum analyzer from any of the other measurement pages by pushing the SPEC pushbutton at the right of the display.

The TV Spectrum Analyzer page contains header fields with many of the same sections as the measurement page. However, some of the headings are different. Below is a summary of all the header fields and an indication if the field may be highlighted for change.



- 1. Plan:** The channel plan selected in the TV Broadcast Plan Selection Menu. It may be the USABRO or a Manual or Auto plan. This field is not selectable.
- 2. MODE:** Indicates the spectrum analyzer's detector mode. Selectable field permits digital or analog selection.
- 3. Reference Power:** Indicates the level of the top line of the spectrum analyzer commonly called the reference power level.
- 4. Marker Frequency:** The frequency represented by the location of the vertical red marker line on the spectrum analyzer display. A selectable field permits moving the marker line. The marker may be moved automatically by touching points in the display or by highlighting the MRK FRQ field and rotating the touch control knob.
- 5. Channel:** The selected TV broadcast channel being analyzed. Selectable field permits channel selection. Note: A channel must be in the channel plan to be listed and selected.
- 6. Span:** The frequency span of the spectrum analyzer. A selectable field including 50 MHz, 100MHz, 200MHz, 500MHz and FULL selections.
- 7. Avg. Level:** Bar graph indicating the average transponder level. Not selectable.
- 8. Menu &?:** Popup Menu with selections to configure the meter's satellite receiver and spectrum analyzer features. See the next section (5.6) for details.
- 9. Marker Line:** The marker frequency cursor line. May be moved by touching the display location you wish the marker to relocate.
- 10. Marker Power:** The power indicated at the frequency location of the marker line. The field is not selectable

5.6 TV Spectrum Analyzer Popup Menu

The TV Spectrum Analyzer includes a popup menu that provides settings for the spectrum analyzer and provides handy features. It further provides a convenient access to the HELP function. Touch the MENU & ? section of the display to access the Popup Menu. The Popup Menu listings are explained below.

SPECTRUM: Provides a selection of the sweep or update rate of the spectrum analyzer. Selections include FAST and SUPERFAST.

BUZZER: Provides a switch selection to turn the alignment buzzer on or off.

MENU	
SPECTRUM:	FAST
BUZZER:	OFF
MRK. BW:	OFF
Δ MARKER:	OFF
PICTURE:	FULL
LOC. OSC:	0.0MHz
dB DIV:	10 dB
DC@RF:	OFF
RBW FILTER:	100KHz
SAVE/RECALL	HELP
EXIT	?

MRK. BW (Marker Bandwidth): Selections include OFF, ON, and BW.PWR. The ON selection provides a variable BW with two vertical markers on the display which may be varied by rotating the touch control knob. The MRK BW selection adds a power measurement to the selected band at the bottom center of the spectrum analyzer display.

DELTA MARKER: Turns on or off a white marker which along with the existing red marker provide two adjustable frequency locations. At the center bottom of the spectrum analyzer display is added a Delta Marker Power (Delta MRK.P) measurement which indicates the level difference between the red and white frequency locations.

PICTURE: Changes how the spectral energy is displayed within the spectrum analyzer graph from a FULL to a CONTOUR view. The FULL selection fills in the displayed spectral energy with color. The CONTOUR selection outlines the top of the spectral energy with a colored line.

LOC. OSC: Provides user changes to the local oscillator setting of the meter. This feature is rarely used with TV broadcast measurements and should remain at 0MHz.

dB DIV: Provides 1,2,5,10 dB selections to change the resolution of the spectrum analyzer's vertical increments or dB level.

MODE: Provides a selection for ANALOG or DIGITAL mode for the spectrum analyzer.

DC@RF: Provides a convenient selection output DC voltage to the RF input jack to power an inline amplifier, preamplifier or down converter.

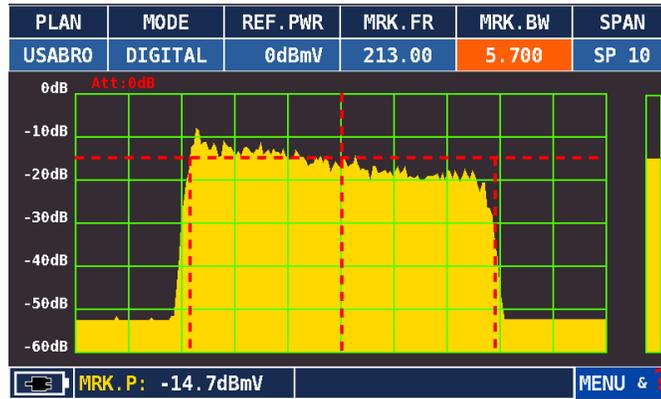
SAVE/RECALL: Provides memory for 20 captured spectrum analyzer screens which may be recalled and viewed on the screen.

RBW Filter: Indicates the spectrum analyzer's resolution bandwidth filter. No selections are provided to change the resolution bandwidth.

HELP ICON: Provides signal analysis to automatically determine a digital broadcast signal type, modulation type, and symbol rate for automatic tuning.

5.62 Spectrum Analyzer Marker Bandwidth Measurement

The Spectrum Analyzer includes a marker bandwidth (MRK.BW.) measurement. This measurement provides a means to select a bandwidth of interest for a level measurement. The bandwidth is adjustable from 0 to 8 MHz. When the MRK BW function is turned ON the spectrum analyzer marker frequency field (MRK.FR.) is not selectable.



This Marker Bandwidth (MRK.BW) measurement anchors the reference marker (MRK. FR) so it may not be selected or moved. The test produces two bandwidth markers, red horizontal lines, which begin at the reference MRK FR. and move apart as the control knob is rotated. The CHAN header is replaced by a MRK BW. header and the associated marker bandwidth value is shown. The field may be touched and selected to adjust the 2nd red line to widen the bandwidth markers with the control knob.

To select the MARKER BANDWIDTH feature from the Spectrum Analyzer screen, touch the MENU&? field. In the popup menu touch the MRK.BW field at the right so it indicates “BW.PWR.” Touch EXIT and then touch the MRK BW header and rotate the control knob to select the bandwidth. The bottom center field in the spectrum analyzer display indicates the power measurement in the selected bandwidth.

5.63 Spectrum Analyzer Delta Marker Measurement

The Spectrum Analyzer includes a Delta Marker measurement. The measurement provides an additional white horizontal and vertical marker or cursor on the spectrum analyzer display. The CHAN header is replaced by a MRK. FR. (Marker Frequency) header. This header field indicates the frequency position of the white marker. The header field may be touched and selected to move the white marker horizontally on the display screen. You may also touch locations on the screen moving the white marker to the touched point. The red marker is not moveable in the Delta Marker function.



To select the DELTA MARKER function

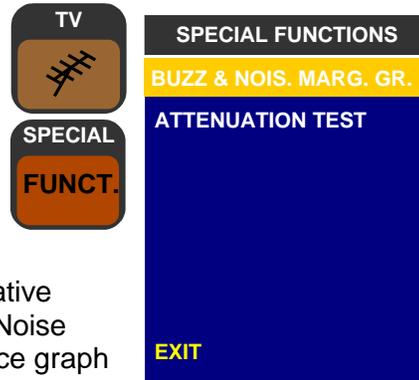
touch the MENU & ? field and in the popup menu touch the Delta (Triangle) Marker listing so it indicates “ON.”

The Delta Marker measurement provides a frequency difference measurement and a level difference measurement between the location of the red marker and the white marker. The Delta Frequency is indicated under the MRK FR. Header. The Delta Marker power or level is indicated in the bottom center measurement field.

The Delta (Triangle) Marker may be modified to provide a carrier to noise C/N ratio measurement. In the MENU & ? popup touch the Delta Marker field to increment to C/N. Press EXIT field to return to spectrum analyzer measurements. Select the Delta MRK .FR field and press the Control Knob to enter the field. Rotate the Control knob to position the white vertical line to the noise floor outside of the channel band. The red vertical cursor line should be in the middle of the digital channel. The C/N ratio measurement is indicated in the bottom field.

5.7 TV Special Functions

The TV Special Functions menu provides several listings. The TV special functions menu is selected by pressing the SPECIAL FUNCT icon on the HOME Menu when the TV icon is highlighted. This section provides an overview of the special functions available for TV signal testing.



BUZZ & NOISE MARG. GR.: (Buzzer with Noise Margin Graph): Provides a buzzer to indicate the relative improvement or degradation of a TV digital channel Noise Margin.. Provides an active Noise Margin performance graph showing increases or decreases in signal performance during a moving 7 second segment.

ATTENUATION TEST: Provides the simultaneous level dBmV measurement of three RF test frequencies showing relative attenuation compared to a referenced calibration point.

The following sections of this manual provide more information on these TV special functions.

5.71 TV BUZZER & NOISE MARGIN GRAPH TEST

The BUZZER & NOISE MARGIN GRAPH test, abbreviated BUZZ&NOIS. MAR. GR, is a special function which provides a time charted graph of the Noise Margin measurement of a selected satellite transponder. It further is accompanied by the alignment buzzer. The test may be used for satellite dish alignment or to monitor the received signal performance of a satellite dish or LNB

To select the BUZZ&NOIS MAR.GR. function from the Home Menu, touch the SPECIAL FUNCT icon with the TV icon highlighted. If the TV icon is not highlighted, touch the TV icon and from the TV BROADCAST PLAN SELECTION MENU after selecting the desired channel plan, touch the SPECIAL FUNCT icon at the right. Then touch the BUZZ&NOIS MAR.GR listing which takes you directly to the test function.

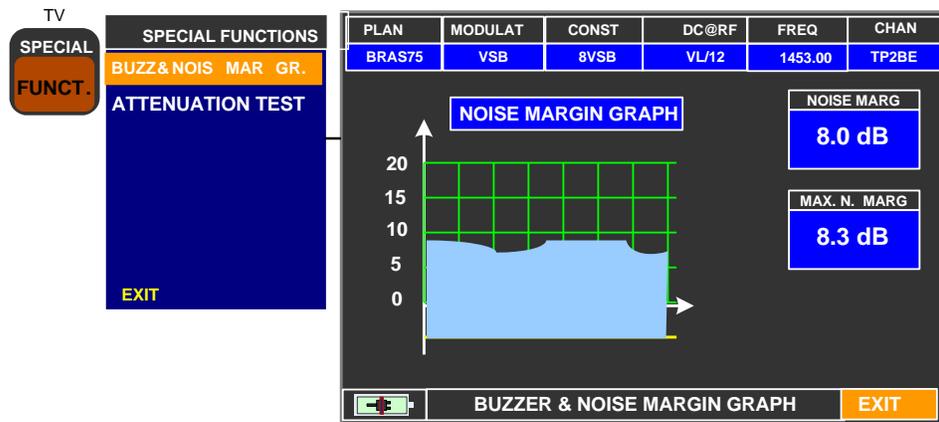
Measurements in the BUZZ&NOIS MAR.GR function include the following:

NOISE MARG: The Current Noise Margin measurement

MAX N. MARG: Maximum or best Noise Margin measurement since the test began – signal lock

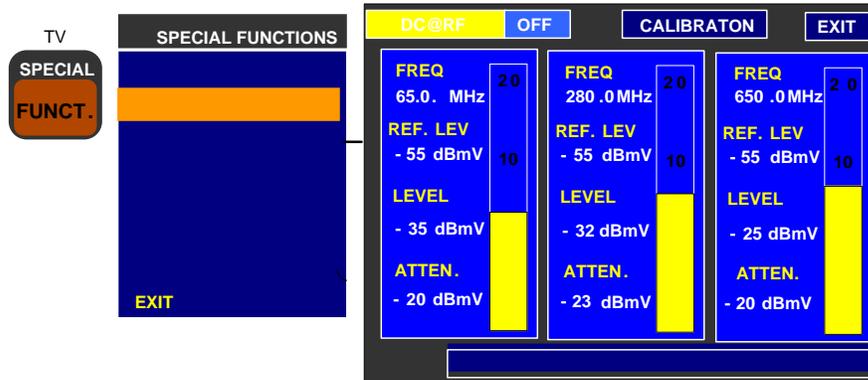
MIN N. MARG: Minimum or worst noise margin measurement since test began – signal lock.

The received signal performance (noise margin) is graphed from left to right scrolling a 7 second window of performance. Each horizontal increment represents a 1 second time interval. Interruptions are marked as a yellow line falling to the bottom of the chart moving to the left. Variations in noise margin are clearly seen as rising or falling levels along the top of the chart. Levels on the right of the graph clearly indicate the maximum and minimum variations since the onset of the test began.



5.72 TV ATTENUATION TEST

The TV ATTENUATION TEST is a special test that simultaneously measures the signal power of three TV frequencies and meters the attenuation of the signals compared to a reference or “calibrated” level. The test may be used to determine attenuation or losses between two signal points. It further may be used to determine the differences in losses between three test frequencies between the two signal points. The test is useful in determining attenuation losses and frequency response differences from an antenna or amplifier location to points in the TV-RF distribution system or to the receiver



To select the ATTENUATION TEST, touch the SPECIAL FUNCT icon on the Home Menu when the TV icon is highlighted. If in the TV BROADCAST PLAN SELECTION MENU, touch the SPECIAL FUNCT icon at the right of the display. Then touch the ATTENUATION TEST field which takes you directly to the test function.

The test function is highly automated with three preselected test frequencies. Connect the cable from the meter to the reference test point. Touch the CALIBRATION field at the top center of the test screen. The meter tests and captures the reference levels at the listed test frequencies. Proceed to move to other test points in which the same source signal(s) used to capture the reference levels are present. The meter indicates the current measured level and computes the attenuation for the three test frequencies compared to the captured reference level. The bar graphs indicate the attenuation levels for all three frequencies for easy comparison.

FREQUENCY: Frequency used for the level measurement

REF LEV: Power level at the reference point which was captured with the “CALIBRATION” activity. Calibration is initialized by touching the CALIBRATION field.

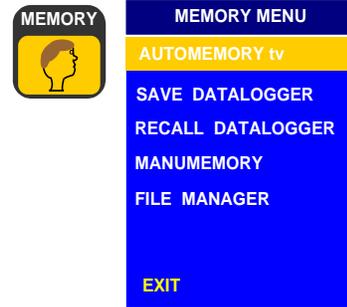
LEVEL: Indicates the active or current test power level for each of the three test frequencies

ATTEN: Indicates the attenuation or difference in power level between the reference level, captured during the “Calibration” step, and the current input measured power for the three test frequencies. Attenuation is also graphed by the vertical bar meters.

DC@RF – ON/OFF: This field provides DC voltage to the RF input if needed to power an in-line amplifier, preamplifier or down converter.

5.8 TV Memory Management

The MEMORY MENU provides channel plan creating, test logging features and channel plan management functions. The MEMORY MENU is accessed by pressing the MEMORY icon with the head/brain picture on it. On the Home Menu or in the TV BROADCAST PLAN SELECTION Menu touch the MEMORY icon. The MEMORY MENU functions are summarized below: The following sections of this manual provide more details.



AUTOMEMORY tv: Scans channels of a master TV or cable channel plan and automatically discovers active channels and builds an AUTO named channel plan with channels found meeting minimum level settings.

SAVE DATALOGGER: Scans the channels in a channel plan and records performance measurements to a log file. The scanning progress and test summary is shown during the scanning.

RECALL DATALOGGER: Selects and recalls a previously scanned and stored log file by name for reviewing the test results

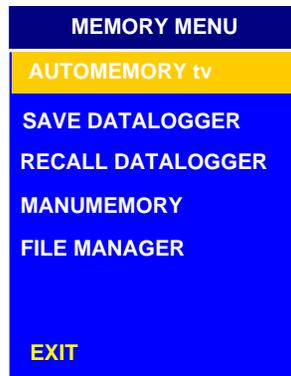
MANUMEMORY: Provides creation and editing of manually created transponder/channel plans.

FILE MANAGER: Provides selection of logger and satellite manual created channel plans for renaming or deleting.

Touch a listing in the MEMORY MENU to begin a function as listed above.

5.81 AUTOMEMORYtv – Scan TV Channels to Create a Channel Plan

The AUTOMEMORYtv feature found in the MEMORY MENU provides the ability to automatically scan TV channels in a standard tuning plan and discover the active digital and analog channels. The active channels are retained creating a channel tuning plan for the meter. The file containing the active channels is named as an AUTO plan with a numeric reference (Example: AUTO 1).



Auto scanning channels and creating a channel plan provides the convenience of only listing the channels available in your area for meter selection. All inactive channels are removed from the channel plan. Auto scanning channels to create a channel plan further configures each available channel as either analog or digital so the meter automatically applies the proper signal measurements.

To perform the AUTOMEMORYtv scan, with the TV icon highlighted on the HOME MENU touch the MEMORY icon. The meter advances to the MEMORY MENU. Touch the AUTOMEMORYtv listing which brings up a configuration box. The listing in the configuration box are listed and explained below.

FROM PLAN: Selects the master tuning plan to use for scanning for channels. Use USABRO for scanning broadcast TV channels in North America.

TO FILE N: Selects the AUTO x channel plan name for reference. This is the new channel plan name which may be selected after the channel scan is complete and the plan successfully created.

LEVEL: Defines the minimum signal level of an analog channel required to consider the analog signal a valid channel prior to adding it to the channel plan.

POWER: This defines the minimum signal level of a digital channel during the channel scan required to consider the digital signal a valid channel.

DISCOVERY: This defines the modulation signal types that the meter looks for during the channel scan. This field may offer TERRESTRIAL ONLY, CABLE ONLY, or TERR & CABLE selections. Select TERRESTRIAL ONLY when scanning for broadcast TV channels as this provides the fastest auto-scan time.

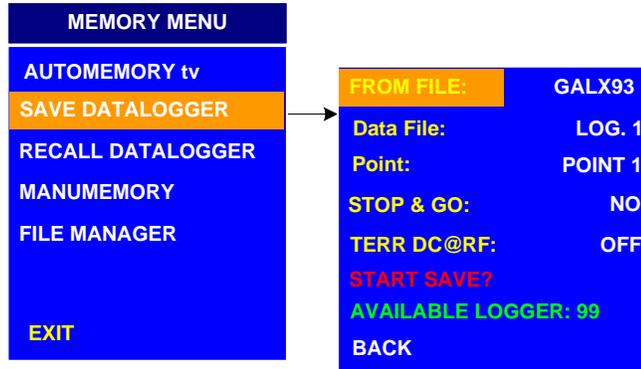
START SAVE?: Starts the AUTOMEMORY scan saving channel information to the AUTO x file specified.

To Create an AUTOMEMORY Channel Plan:

1. Navigate to the MEMORY MENU and touch the AUTOMEMORYtv field.
2. Set the FROM PLAN field to USABRO by touching the listing on the right.
3. Set the TO FILE N field to select an AUTO file name. Note: If the AUTO file selected already contains channel data, the bottom field changes from START SAVE? to START OVERWRITE? Touching the START OVERWRITE? field begins a scan replacing the data in the existing AUTO file.
4. Touch the LEVEL and/or POWER fields and set as desired.
5. Touch the START SAVE? field to begin the channel scan.
6. Wait a few minutes and watch the display screen which illustrates the scanning process and indicates the channels as discovered. The meter indicates complete when all the channels have been scanned.

5.82 SAVE DATALOGGER – TV Auto Measure & Store

The SAVE DATALOGGER feature within the MEMORY MENU scans the channels in a selected channel plan and captures performance measurements for each channel to a log file. The logged data file is stored in one of the 99 available memory locations and is named for latter recall and test result viewing. To begin a data logger capture, select the SAVE DATALOGGER by touching the MEMORY icon on the Home Menu with the TV icon highlighted. Touch the SAVE DATALOGGER listing in the MEMORY MENU.



The SAVE DATALOGGER has a configuration menu with several fields which impact the function. Following is a brief description of these fields.

FROM FILE: This field indicates the selected channel plan in which the individual channels will be scanned and tested. This field may be highlighted and a channel plan selected.

Data File: This is the file name where the scanned measurement data is to be stored.

Point: This is a name for the test point associated with the log file data.

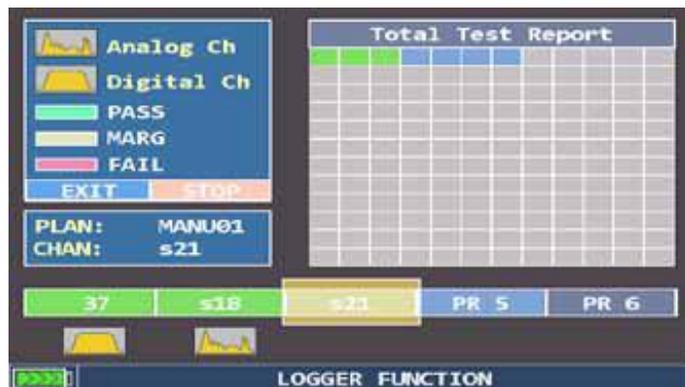
STOP&GO: Provides for stopping the log measurements when changing from a satellite transponder to a cable channel or broadcast channel when the manual memory channel plan contains a mix of signal types. This provides the user a time to change connections.

TERR DC@RF: Provides an on/off switch for enabling DC voltage to the RF jack when measuring broadcast TV. Not applicable in the Satellite mode.

START SAVE?: Starts the logging saving transponder performance testing data to the Data File name in the Date File field.

AVAILABLE LOGGER: 99: Indicates the available memory locations for storing logging data files.

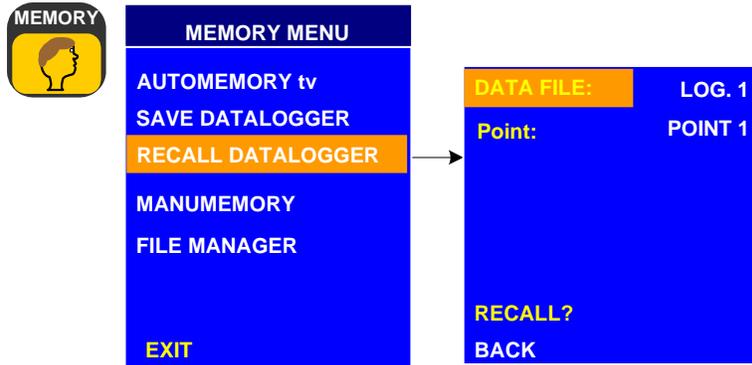
When the DATA LOGGER begins scanning transponders, a LOGGER FUNCTION screen shows the scanning/logging progress. A Total Test Report



section, on the right of the display screen, indicates the progress of the scan and summarizes the performance of each transponder tested. The transponder is color coded in the report indicating a pass, marginal or fail status. Near the bottom of the LOGGER FUNCTION screen the transponder currently being tested is highlighted. A picture indication shows if the transponder was digital or analog.

5.83 RECALL DATALOGGER - View TV Data Log File

The RECALL DATALOGGER within the MEMORY MENU provides a means to recall existing memory log files containing satellite transponder performance test data. The log files available for recall are files created with a SAVE DATALOGGER function covered in the previous section.



To recall a data logger file touch the MEMORY icon on the HOME Menu with the SAT icon highlighted. Touch the SAVE DATALOGGER listing in the MEMORY MENU. In the DATA FILE field of the selection box, touch the listing on the right and rotate the touch Control Knob to increment through the available log files. Press the RECALL field to view the file’s measurement contents.

The DATALOGGER viewer shows the file name and point number in the upper left to identify the logger file. The name of the channel or transponder is shown in the left column. The digital or analog signal type is listed and the associated performance measurements are shown horizontally for each transponder/channel.

LOG. 1 POINT 1		EXIT			
NAME	TYPE	PRW LVL	MER C/N	bBER A/V	aBER PER
E5	DVB-T	67.8	29.2	5x10 ⁻⁵	<E-8
37	DVB-H	63.2	23.3	<10 ⁻⁶	<E-8
s18	An TV	71.6	49.3	8.2	
s21	DVB-C	75.5	>36	<10 ⁻⁹	<E-6
PR 5	An Sat	65.7			
PR 6	DVB-S	58.1	12.7	1x10 ⁻⁴	<E-8
PR 7	DVB-S2	67.8	12.8	8x10 ⁻³	<E-7

RECALL DATALOGGER

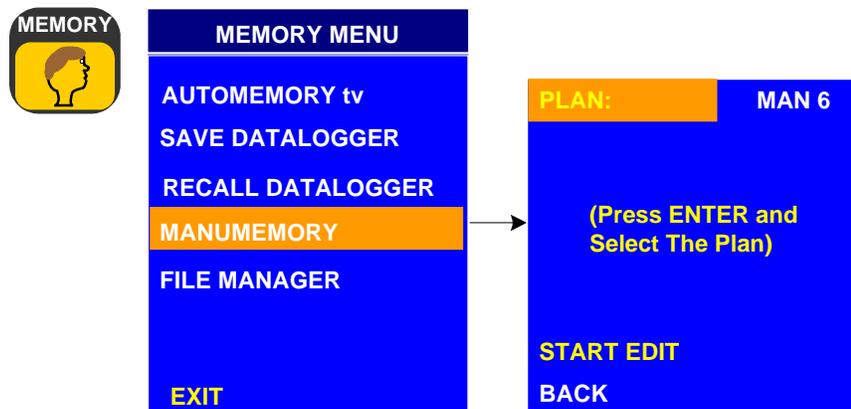
An indication of transponder signal performance is provided with a color coded box at the left of the transponder name. A green box indicates the transponder passed test performance criteria and is good. A red box indicates a performance issue.

5.84 MANUMEMORY – Creating or Editing TV Channel Plans

The MANUMEMORY feature found in the MEMORY MENU provides the ability to manually create a tuning plan which may include a list of broadcast channels. The file containing the active channels is named as a MANU plan with a numeric reference (Example: MANU 1). Manually creating a channel plan provides the convenience of only listing a few channels available in your area or desired for special testing application. Only the channels created and added to the list are available in the MANU channel plan for selection and measurement.

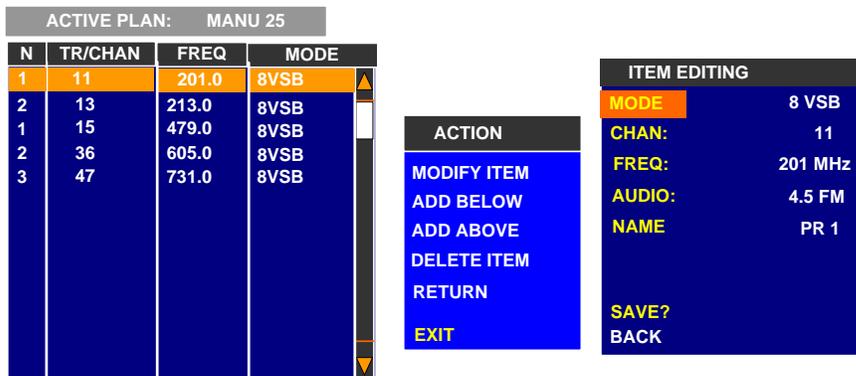
The MANUMEMORY feature permits entry of individual channels one at a time. For this reason it is ideal for creating a channel plan in which there is a small number of channels. When creating a channel plan with many channels the AUTOMEMORYtv or use of the SMART software is recommended.

The DSA 1491 provides management features for the MANU files. The MANUMEMORY feature permits edits or changes to listed channels within a previously created manual (MANU) channel plan. The following sections provide information on creating and editing a MANU channel plan.



To Manually Create a Plan:

1. To create a transponder/channel plan navigate to the MANUMEMORY feature by touching the MEMORY icon and touching the MANUMEMORY listing in the MEMORY MENU.
2. In the PLAN field at the top of the configuration box touch the listing at the right to highlight the field. Move your finger over the arrow portion of the touch control knob to increment through available memory channels.
3. Select a manual channel plan number of choice. Press the START EDIT field to begin construction of a manual plan. *NOTE: The name of the selected manual file can be renamed. See the next section of this manual for instructions on how to rename an existing manual file.*
4. The ITEM EDITING menu appears to enable entry of transponder. Touch the SAVE? field to add a listing after changing the individual fields to the desired values.



MANUMEMORY ACTIONS

MODIFY ITEM: Produces the ITEM EDITING menu which permits changes to the settings for the transponder listing highlighted

ADD BELOW: Produces the ITEM EDITING menu in which you may select the parameters of a transponder signal and dish characteristic to add a listing below the currently highlighted field.

ADD ABOVE: Produces the ITEM EDITING menu in which you may select the parameters of a transponder signal and dish characteristic to add a listing below the currently highlighted field.

DELETE ITEM: Deletes the highlighted listing from the selected plan.

RETURN: Returns to previous menu

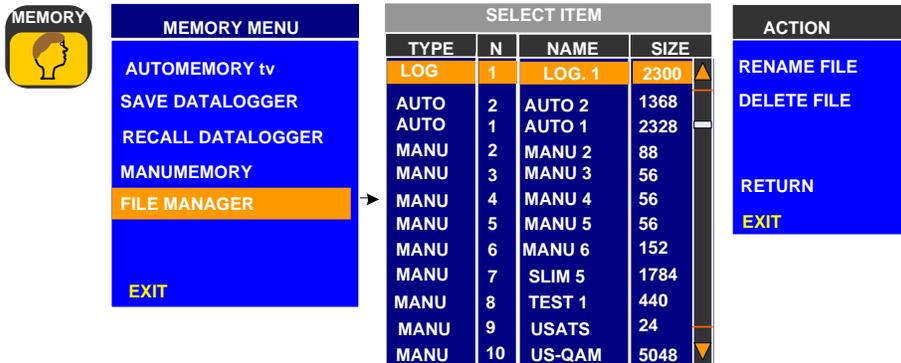
To Edit an Existing Plan:

1. To make changes or additions to an existing manual memory plan navigate to the MANUMEMORY feature by touching the MEMORY icon followed by touching the MANUMEMORY listing in the MEMORY MENU.
2. In the PLAN field at the top of the configuration box touch the listing at the right side to highlight the file name. Rotate the control knob to increment through the available memory plans.
3. Select the file name in which you want to edit or add listings. Press the START EDIT field to begin editing.
4. Touch MODIFY ITEM from the listings to produce the ITEM EDITING Menu. Modify the items in the Menu to match the transponder and satellite dish characteristics as needed. Press the SAVE? field to write the changes to the highlighted channel listing.

Press BACK to return to the previous menu without making changes.

5.85 TV FILE MANAGER – Renaming or Deleting Files

The FILE MANAGER, found in the MEMORY MENU, provides management of the logger and transponder/channel plan files. The FILE MANAGER provides the ability to rename or delete files from the meter’s memory. To access the FILE MANAGER from the Home Menu, touch the MEMORY icon followed by a touch of the FILE MANAGER listing in the MEMORY MENU.



You can rename or delete files that were created with the DATA LOGGER as in scanning a TV channel plan and capturing performance measurement data to a test file. These test files are identified as LOG file types and are typically named as LOG 1, LOG2, etc. You can rename or delete files that were created by the AUTOMEMORY feature or with a MANUMEMORY feature of the meter. These files are typically named “AUTO 1,” “AUTO 2”, etc. or “MANU 1,” “MAN 2, etc. by the meter. However, these file names can be changed to a more recognized or descriptive name as desired. The following section summarizes how to rename, or delete these files in the FILE MANAGER function.

To Rename a File:

1. Navigate to the MEMORY MENU. Touch the FILE MANAGER listing.
2. Scroll up or down in the listed files to find the file you want to rename. Touch the listing to select or highlight the listing and press the ENTER pushbutton in the center of the larger touch Control Knob.
3. Touch the RENAME FILE listing in the ACTION MENU which appears.
4. A naming overlay appears on the screen. Touch letters to enter into naming boxes. Press > to advance to the next box. Continue until the name is complete. Touch the EXIT box.

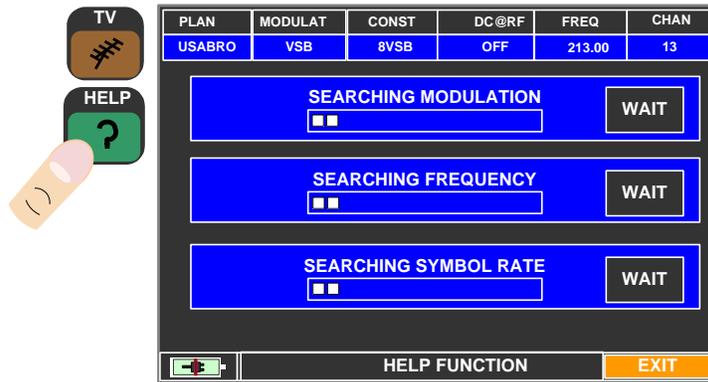
To Delete an Existing File:

1. Navigate to the MEMORY MENU. Touch the FILE MANAGER listing.
2. Scroll up or down in the listed files to find the file you want to delete. Touch the listing to select or highlight the listing and press the ENTER pushbutton in the center of the larger touch Control Knob.
3. Touch the DELETE FILE listing in the ACTION MENU which appears to delete the selected file: **NOTE: DELETION IS PERMANENT – THE FILE CANNOT BE RECOVERED.**

5.9 TV “Help” Signal Discovery

The HELP icon on the DSA 1491 refers to help or assistance tuning in a digital channel. The HELP function is used to help determine for a user the RF type of signal within a TV broadcast channel.

Initiating a HELP function on the DSA 1491 directs the meter to automatically analyze the TV channel and determine automatically the RF modulation type, bandwidth/center frequency, and RF symbol rate. The DSA 1491 methodically analyzes the digital signal to determine these parameters. If the parameters are within the receiver capabilities the meter finishes by advancing to the measurement page with the channel displayed. If the channel has no recognizable signal or is a proprietary modulation scheme, the DSA 1491 reports “NO SIGNAL.”



To initiate a HELP function simply locate a HELP icon and touch it. The HELP icon is located in the Spectrum Analyzer’s popup menu. When in the Spectrum Analyzer function touch the MENU & ? Field at the bottom right of the screen. Touch the HELP icon.

The HELP FUNCTION screen informs you of the meter’s progress in determining the type of digital signal or detecting an analog signal within the channel. The boxes on the right in the center list the modulation, frequency, and symbol rates as discovered by the meter. When the search is completed, “FOUND” is displayed on all three measurement status boxes at the right.

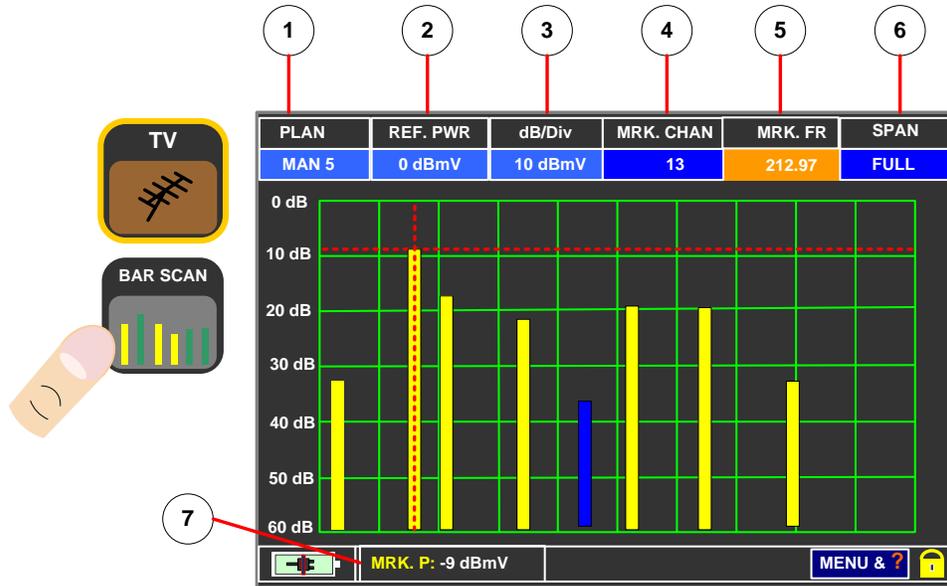
The HELP FUNCTION screen maintains the same header fields as in the TV measurement page. The fields indicate the plan, channel, channel frequency, constellation, and modulation for the selected channel. Press the EXIT field to exit at any time during the analysis.

For TV Channel Signal DISCOVERY or HELP:

1. Touch the TV icon to select TV. Select a channel plan by pressing the PLAN SELECT pushbutton and touching a selection in the center box. Touch the SPECTRUM icon.
2. Touch the CHAN field header and select a TV channel or position cursor at the center of an unknown channel or signal.
3. Touch the “MENU & ?” field at the bottom right. Touch the HELP icon in the Popup Menu.
4. Wait while the meter analyzes and determines the channel symbol rate, frequency and modulation type. FOUND is shown in all three boxes when successful. Touch EXIT to return to the MEAS page and begin transponder measurements.

5.10 TV BAR SCAN Test

The BAR SCAN measurement shows multiple bars forming a bar chart. Each bar of the chart represents the level of a TV-RF channel. The Bar Scan is essentially a simplified spectrum display in which multiple channel levels through a frequency span are indicated with bars on a level chart. The number of channels plotted in the bar chart is determined by the selected span (SPAN). For a TV Bar Scan measurement touch the BAR SCAN icon with the TV icon highlighted. The following sections provide more information on the Bar Scan measurement and fields on the Bar Scan display screen.



Bar Scan Basics

Each bar displays the signal level measured in a specific channel within the channel plan. The SPAN value determines the number of channels or bars displayed in the bar chart. A yellow bar represents a digital signal channel while a solid blue bar represents an analog signal channel. The marker, a vertical red dotted line, is initially positioned on the channel near the center of the display which is the center of the span of channels.

Bar Scan Measurement Initialization

When the Bar Scan measurement is selected the meter automatically defaults the center channel of the span to the last channel selected in the Channel Measurement function of the meter. To select the center channel for the Bar Scan test prior to a measurement, press the MEAS button and select the desired channel. Press the HOME button to return to the HOME menu and with the TV icon highlighted touch the BAR SCAN icon. The Bar Scan measurement further selects a level reference based upon the selected channel's signal level. Be sure to select an active channel so a proper reference (REF) level is automatically selected.

1. PLAN: Indicates the channel plan selected for measurement. The plan includes the channel list that will be measured and plotted into the BAR SCAN test results.

2. REF PWR Reference Power: The reference value establishes the level of the top horizontal bar of the bar graph. To change the reference value, touch the REF field header and touch the value field below to see selections. Touch the desired selection.

3. dB/DIV: The db/Div field displays the level change represented between adjacent horizontal lines or divisions in the bar graph. This field may be highlighted and changed to predetermined values (5 dB/DIV, 10 dB/DIV).

4. MRK CHN: The Bar Scan display or span is centered upon a selected channel shown in the field under the CHAN header. The CHAN field is selectable and the channel value may be changed. Changing the value moves the red cursor or marker on the display. Highlight the CHAN field and use the UP and DOWN arrow pushbuttons to move the marker to the desired channel or bar.

5. MRK FREQ. - Marker Frequency: The Bar Scan display or span is centered upon a selected channel shown in the field under the MRK CHAN header. The CHAN field is selectable and the channel value may be changed. Changing the value moves the red cursor or marker on the display. Touch the CHAN field to highlight it and show the selectable channel list. Touch a channel in the list to select.

6. SPAN: The SPAN field determines the number of channels and a relative frequency span included in the bar graph or scan. To change, highlight the field and use the UP or DOWN key to change the span between pre-defined values, from (10, 20, 32, 64, 128).

7. Marker Level Measurement: This field indicates the level of the channel marked by the red cursors on the display. The unit of measurement is set in the METER CONFIGURATION MENU. A horizontal dotted line shows the real time signal level value measured in the currently selected channel.

Section 6: CATV Measurements

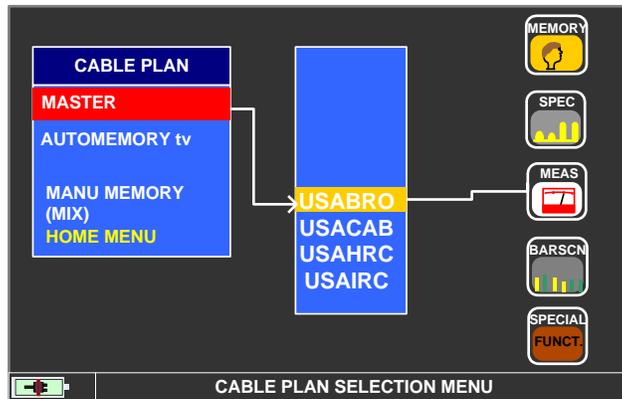
The DSA 1491 indicates the performance of cable television digital QAM signals providing guidance for installation and maintenance of cable TV-RF distribution systems. This section provides information on the cable TV measurements.



6.1 CATV Plan Selection

Upon selecting the CABLE icon in the HOME Menu and pressing the PLAN SELECT front panel pushbutton, the DSA1490 presents a CABLE PLAN SELECTION MENU. This menu provides selections which define a tuning plan for selecting CATV channels and respective frequency bands for measurements. The CATV PLAN SELECTION MENU contains several listings of which to choose from. The following is a brief description of these listings and their content. These cable plan listing depend on the DSA 1491 model and are appropriate for different locations.

MASTER PLAN: This selection provides a listing of standard CATV channel plans in which to choose from. For testing applications in North America, the USACAB listing provides a suitable channel plan which includes all the CATV channels from 2 to 158.



AUTOMEMORYtv: This selection provides a list of channel plans to choose from that are “AUTO” plans. These plans are created with the AUTOMEMORYtv feature in the MEMORY MENU. Please see Section 6.81 in this manual for information on creating an AUTO cable channel plan. If you have created an AUTO plan for CATV signal analyzing, it will be listed for selection.

MANU MEMORY (MIX) Plan

The MANU MEMORY (MIX) listing in the CATV PLAN SELECTION Menu contains manually created channel plans. A manual plan may include either satellites transponders, cable channels or TV broadcast channels. It may also include a combination or a mix of satellite transponders, TV or CATV channels. Manual channel plans may be created in the MEMORY MENU function or using the supplied SMART software with a PC. Please see Section 6.83 for MANUMEMORY channel creation.

To Select a CATV Channel Plan:

1. Touch the TV icon. Touch the MASTER field to select it.
2. Touch the USACAB field in the center list. The meter advances to the CATV MEASUREMENT page.

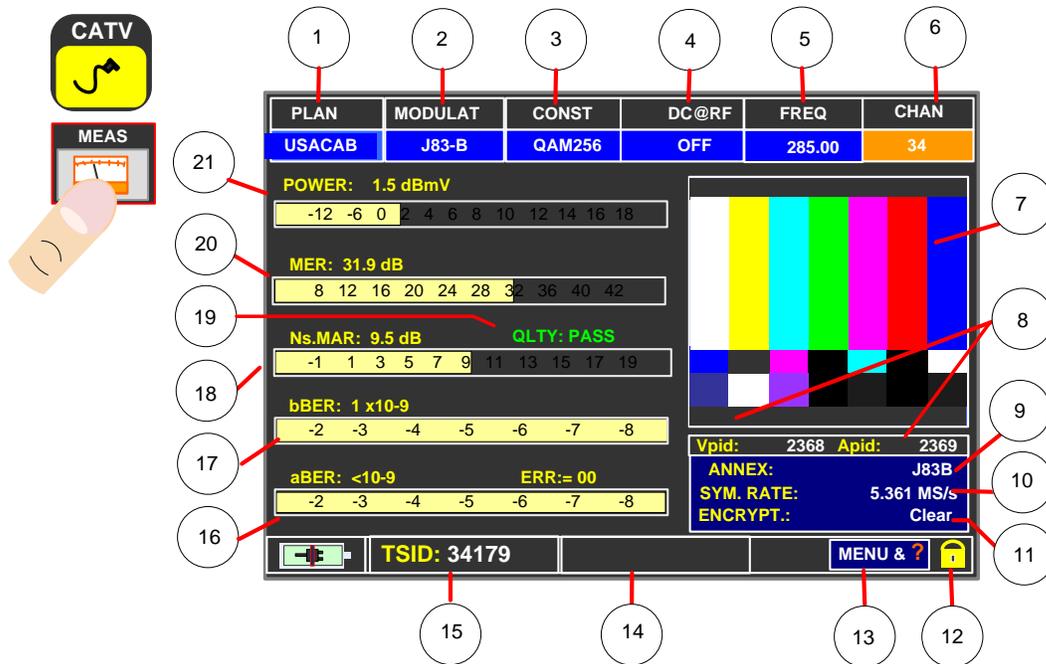
6.2 CATV Digital Measurements

The DSA 1491 provides a comprehensive analysis of a CATV signal, either digital or analog. Digital signal analysis includes standard QAM analysis also known as J83-B. To access the CATV measurements touch the MEAS icon from the HOME Menu with the CATV icon highlighted or touch the MEAS icon in the CATV Plan Selection Menu after selecting a cable channel plan.



There are two CATV measurement pages for digital cable signals including a main measurement page and a constellation measurement page. The remainder of this section describes the DSA 1491's CATV measurements and measurement pages. The following section describes the fields as numbered in the nearby figure.

6.2.1 Main Digital Measurement Page Description



1. Plan: The TV channel plan selected in the CATV Plan Selection Menu or in a Manual or Automemory channel plan.

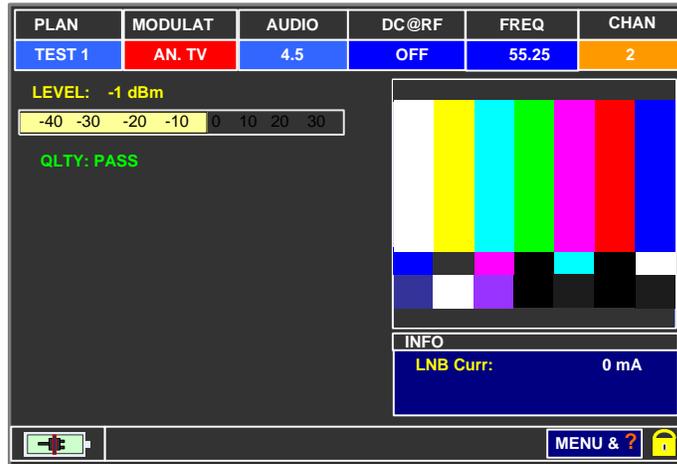
2. Modulation: The modulation type of the digital signal. Defaults to the type in the channel plan which should be J83-B (QAM B) for CATV in North America for the selected channel (6). Selectable field permits selection of other modulation types and analog (AN.TV).

3. CONST: The current setting for constellation based upon modulation. Typically reads QAM256 as most CATV systems use 256 symbols.

4. **DC@RF:** Indicates if DC voltage is applied to the RF input jack of the meter. This field should be off for most testing applications. Selectable field permits voltage selection and output.
5. **FREQ:** The center frequency of the digital channel or video carrier of an analog channel. (6). Selectable field permits frequency tuning. Changing the frequency causes dashed lines in the channel indicator as the frequency is no longer the channel's standard.
6. **CHAN:** The selected channel being analyzed. Selectable field permits channel selection. For inclusion in the selectable list the channel must be included in the selected channel plan (1).
7. **Video:** The active video on the selected video service within the channel.
8. **VPID/APID:** Video and Audio Program Identifier values for the selected video service contained in MPEG.
9. **ANNEX:** The standard signal type or reference – J83B for CATV digital signals.
10. **SYM RATE:** The symbol rate of the RF digital carrier in million (MEGA) symbols per second. QAM 256 uses a standard symbol rate of 5.361 MS/s.
11. **Encryption:** Indicates if the selected video service is encrypted or in the clear.
12. **Locked Symbol:** Indicates if the meter's receiver is locked to a digital RF signal.
13. **MENU & ?:** Provides a popup menu with related selections and a HELP icon for discovery of the channel signal modulation, symbol rate, and frequency.
14. **Network Name (NETW):** Indicates the network name or identification.
15. **TSID or NID:** Transport Stream or network Identification numbers.
16. **aBER:** Bit Error Ratio measurement after error correction measurement
17. **bBER:** Bit Error Ratio measurement – before error correction
18. **Noise Margin (Ns.MAR):** Provided margin signal vs. noise power measurement
19. **Quality (QLTY) Rating:** Quality rating based upon MER and noise margin values
20. **MER:** Modulation Error Ratio measurement of selected channel
21. **POWER:** Average Power measurement for the digital channel and video carrier peak measurement for an analog channel, typically in dBmV.

6.22 Analog CATV Measurement Page

An analog NTSC cable channel can be metered for signal level and the demodulated video may be viewed. To measure a TV channel as an analog channel, the modulation type for the channel must be specified as an analog TV channel. This may be done in the channel plan used for the CATV measurements, either in a Manual or Automatic plan.



The abbreviation for an analog channel on the meter is “AN. TV.” You may change the modulation type of a selected channel in the main measurement page by touching the MODULAT header. Select the AN.TV listing in the drop down selection box by touching the AN.TV listing.

Analog measurements are provided on two measurement pages. Push the MEAS button to increment to each measurement page. The 1st page provides a level measurement and provides video and audio monitoring. The 2nd page provides level, A/V ratio, and C/N ratio measurements. Video and audio monitoring is not provided on the 2nd page.

6.23 CATV Constellation & Info Measurement Page

The constellation measurement page provides a second page of analysis of a CATV digital channel. The top and bottom fields of the page are the same as the main measurement page. The left center of the Constellation & Info page provides a constellation analysis. The right center of the Constellation & Info page provides an INFO box with information regarding the CATV channel being measured.

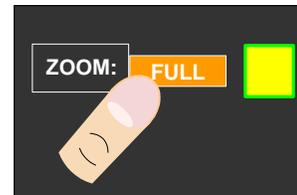


There are two ways to access the Constellation & Info measurement page from the Main Measurement page. Either press the front panel TV pushbutton or touch the display screen anywhere on the left center measurements area from the POWER measurement bar down to the aBER measurement bar. Touch this same area to return from the Constellation Measurement page to the Main Measurement Page.

CONSTELLATION

The constellation analysis provides a visual indication of the detected RF symbol accuracy. The constellation diagram changes its appearance to match the number of symbols in the QAM RF signal. For example, a QAM 64 signal has 64 squares while a QAM256 signal has 256 squares.

The constellation diagram may show a full or all the symbol squares or 1/4 sections of the constellation using the ZOOM feature. To zoom into a smaller 1/4 section of the full constellation diagram, touch the selection box to the side or right of the ZOOM box. Multiple touches increment the 1/4 section view through all the quarter sections of the constellation diagram. The box to the right of the selection box indicates the selected section being shown by the constellation diagram.



INFO: The INFO box in the Constellation & Info measurement page provides additional CATV channel information. A brief overview of the information shown is listed below.

ANNEX: The digital signal standard annex it complies with such as J83-A which is the North American cable standard.

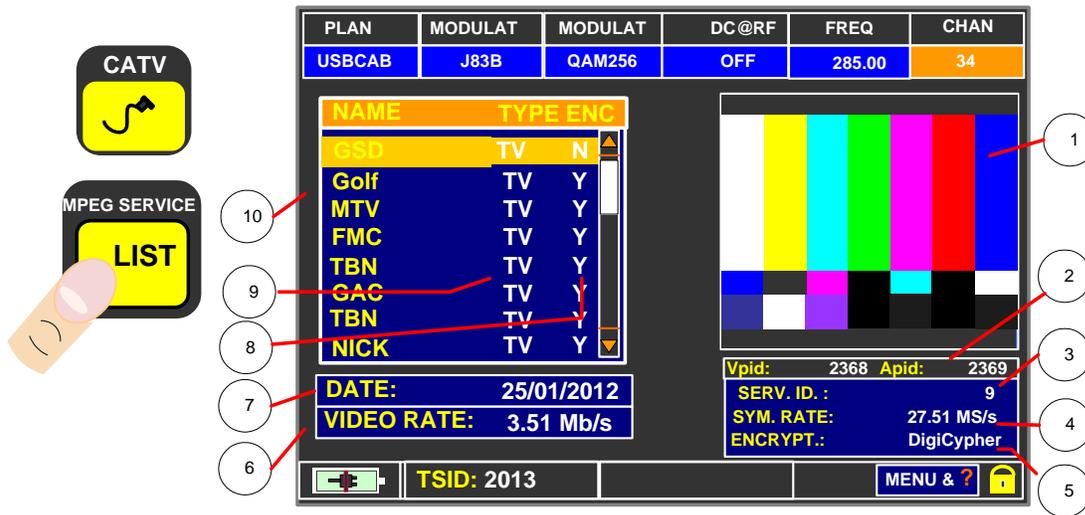
SYM RATE: The rate of the RF symbols as measured by the DSA 1491.

LNB Curr: Metered current flowing from the meter to the satellite dish LNB.

6.3 CATV MPEG SERVICE List

The MPEG SERVICE LIST measurement page of the DSA 1491 provides information regarding the MPEG stream and video service/programs of the selected CATV channel. The MPEG SERVICE LIST page may be accessed in two ways. From the HOME Menu with the TV icon highlighted, touch the MPEG SERVICE LIST icon. Secondly for convenience from the CATV Main Measurement Page, touch the box below the displayed video. Touch the same box to return to the Main Measurement Page from the MPEG SERVICE LIST page.

6.31 CATV MPEG Service Page Description

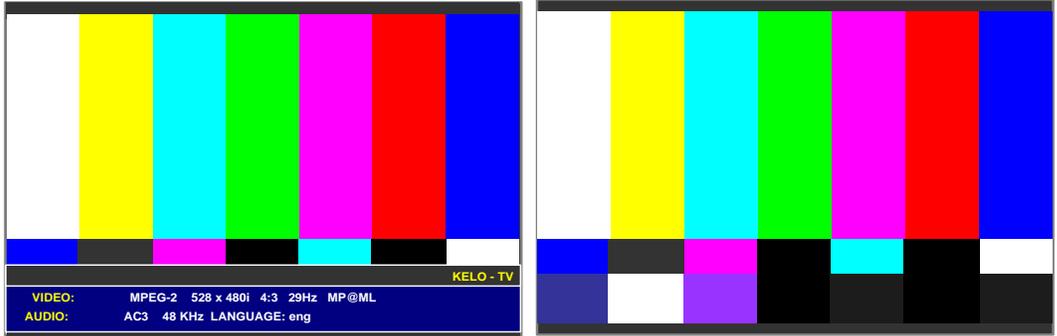


The MPEG SERVICE LIST measurement page provides information regarding the MPEG transport stream and the selected video service/program contained in the stream. The top and bottom fields are the same as listed and described in the Main Measurement page in section 6.2 of this manual. The unique fields are numbered in the nearby figure and a brief description of these fields is provided below.

- 1. Demodulated Video Display:** Shows the demodulated video of the selected service from the selected cable channel.
- 2. VPID/APID:** Indicates the VPID (Video Packet Identifier Number) and APID (Audio Packet Identifier Number) of the selected video service/program.
- 3. Service ID:** The video service/program identification number
- 4. Symbol Rate:** The RF symbol rate of the channel’s digital signal
- 5. Encryption Status:** Indicates if the video service selected is in the clear or encrypted.
- 6. Video Rate:** The MPEG data rate of the selected video service/program
- 7. Date:** The current date as listed in the MPEG stream
- 8. Encryption Status:** Indicates if the individual services are encrypted (YES) or in the clear non-encrypted (NO).
- 10. Service List:** List the video services/programs in the MPEG transport stream

6.32 CATV MPEG Video Service Monitoring

The video displayed in the Main Measurement Page or in the MPEG SERVICE LIST page may be expanded to fill the display screen. For a full screen view of the demodulated video of a selected video service touch the displayed video section of the screen.

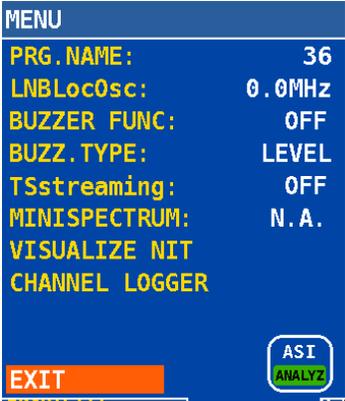


The displayed video initially indicates the video service name along with associated MPEG header video and audio information. This information is located along the bottom of the display and includes the video resolution, aspect ratio, and MPEG compression level. The audio information includes the format, and data rate. After a few seconds for review, the bottom section is pushed to the bottom of the display. When viewing a full video display you may return to the previous measurement screen by touching the center of the screen.

6.4 CATV Measurement Popup Menu

The CATV measurement page includes a popup menu that provides quick access to information and several available functions related to the CATV measurements. To The Popup Menu listings are explained below.

- PRG. NAME:** The current channel number
- LNBLocOsc:** Provides user changes to the local oscillator setting of the meter. This remains at 0 MHz for all typical TV-RF input signal testing.
- BUZZER FUNC:** Provides a switch selection to turn the alignment buzzer on or off.
- BUZZ. TYPE:** Provides a selection to produce a tone based upon the received signal level or on the signal noise margin measurement.
- TS_STREAMING:** Provides a selection to setup streaming of selected services from the RF demodulated transport stream to the LAN port or to a USB drive file.
- MINISPECTRUM:** Provides a spectrum overlay on the displayed video in the video window on the measurement page. The Minispectrum can be enabled or disabled for digital measurement channels.



VISUALIZE NIT: Provides a measurement screen with the information contained in the DVB Network Information Table.

CHANNEL LOGGER: Monitors and charts the digital RF measurements of a satellite transponder or channel.

ASI icon: Provides ASI signal analysis – shortcut to the ASI-IP analyzer. See Section 10 of this manual for details

HELP icon: Provides signal DISCOVERY to automatically determine a digital satellite transponders signal type, modulation type, and symbol rate for automatic tuning.

6.41 TSstreaming

The individual services within the demodulated satellite signal transport stream can be selected and encapsulated to the LAN IP to steam to a destination IP.

IP DEST: Provides entry of the destination IP address in which to stream the selected services highlighted by the boxes in the center service selection area. Rotate the large knob to highlight the IP DEST field and push the large control knob to enter the field for entry of address.

PORT: Provides entry of the destination IP port in which to stream the selected services highlighted by the boxes in the center service selection area.

Services Selection (Center): Provides selection of the individual services of the transport stream in which to include in the stream to the defined IP Destination address and port.

Start/Stop/Exit: Starts and/or stops the streaming activity to the LAN address/port defined. To exit the menu press the EXIT field.

Data Rate: Indicates the data rate of the stream via LAN. (Rate is limited to 20 Mbps)

Note: The streaming LAN feature does not provide professional TS stream muxing and PCR correction so use should be limited to signal confirmation and monitoring only.



TS Streaming USB

The TSstreaming feature may be used to stream the selected transport stream services to a USB memory stick. To start TSstreaming touch the MENU & ? icon at the bottom right of the measurement screen, touch the TSstreaming field,



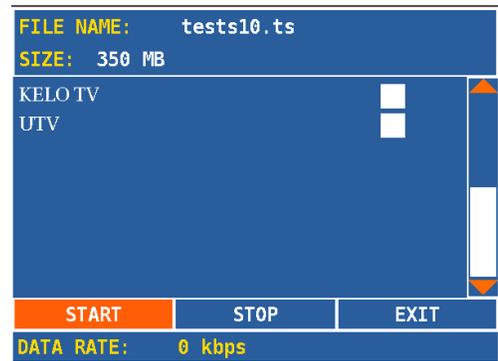
DSA 1491– User Manual

rotate the control knob or repeatedly touch the OFF/LAN/USB field to increment to USB. Press the large control knob to advance to the TSstreaming to USB function..

The following fields are included in the TSstreaming to USB menu.

File Name: Provides entry to define the file name of the TS stream capture to the USB memory stick. The file is a .ts file.

Size: Sets the size of the ts stream capture or record file on the USB memory stick. The size of the file determines the duration of the TSstream capture based upon the streams services selected and resulting total bit rate.



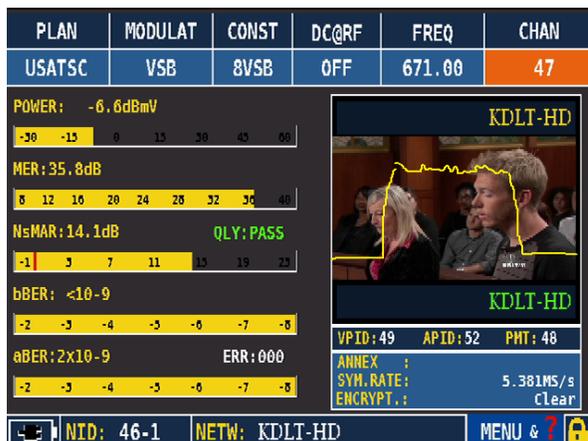
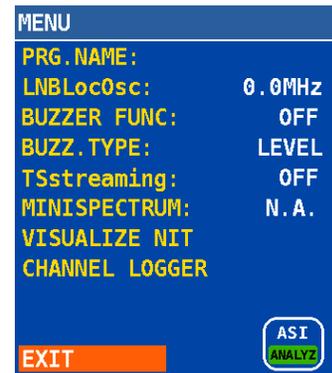
Services Selection (Center): Provides selection of the individual services of the transport stream in which to include in the stream to the defined USB memory stick file.

Start/Stop/Exit: Starts and/or stops the streaming activity to the USB stick file. To exit the menu press the EXIT field

Data Rate: Indicates the data rate of the stream

6.42 MINISPECTRUM

The MINISPECTRUM feature provides a channel spectrum analyzer overlay on the video display within the main measurement page. The overlay is enabled and disabled in the main channel measurement MENU. To enable/disable press the MENU & ? field at the bottom right of the measurement page. Touch the MINISPECTRUM field and increment the field to ON or OFF to enable or disable the spectrum overlay.



Bottom Chart: The bottom chart provides charted values of the satellite transponder’s measured power (red), and PER (blue).

When in the Single Channel Monitoring function a control Menu provides selections applicable to the charting. The Menu includes the time interval setting elapsed from the left to right side of the chart.



TIME INTVL: Time Interval of the graph shown on the display. The displayed time interval of the graph.

SEND TO USB: Turns on the capability of writing channel monitoring values to a USB memory stick file. When turned ON the graphed values of the channel measurements are suspended and values are written to the USB stick file.

FILE NAME: Produces an entry menu to define a file name to store channel monitoring values on the USB memory stick.

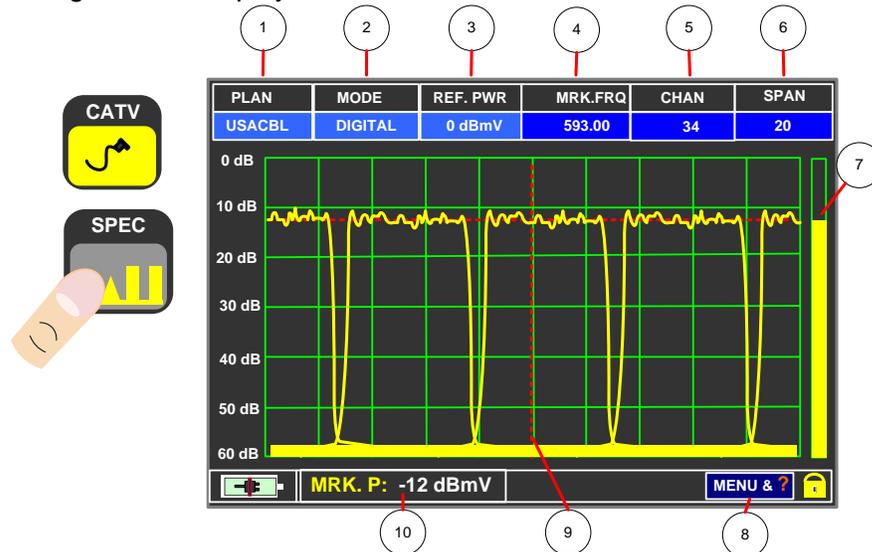
RESET: Resets or clears the graph. Restarts the channel monitoring and graphing.

Channel monitoring values that are written to the USB stick file can be opened and viewed with a spreadsheet application. The values include a time reference from the date/time settings of the meter. The values include the Power, MER, aBER, bBER and packet errors.

	A	B	C	D	E	F	G	H	I
	USABRO 47 FREQ:671.00MHz								
1	USABRO 47	FREQ:671.00MHz							
2	;PWR;MER;aBer;bBer;Err;								
3	20:27.00;47.0;26.6;1E-8;2E-2;0;								
4	20:27.06;47.0;29.9;1E-8;1E-6;0;								
5									

6.5 CATV Spectrum Analyzer

The CATV spectrum analyzer provides detailed spectral analysis of both analog and digital CATV signals. To select the spectrum analyzer function from the HOME menu with the TV icon highlighted, touch the SPEC icon. You may also access the spectrum analyzer from any of the other measurement pages by pushing the SPEC pushbutton at the right of the display.



The TV Spectrum Analyzer page contains header fields with many of the same sections as the measurement page. However, some of the headings are different. Below is a summary of all the header fields and an indication if the field may be highlighted for change.

- 1. Plan:** The channel plan selected in the CATV Broadcast Plan Selection Menu. It may be the USACAB or a Manual or Auto plan. This field is not selectable.
- 2. MODE:** Indicates the spectrum analyzer's detector mode. Selectable field permits digital or analog selection.
- 3. Reference Power:** Indicates the level of the top line of the spectrum analyzer commonly called the reference power level.
- 4. Marker Frequency:** The frequency represented by the location of the vertical red marker line on the spectrum analyzer display. A selectable field permits moving the marker line. The marker may be moved automatically by touching points in the display or by highlighting the MRK FRQ field and rotating the touch control knob.
- 5. Channel:** The selected CATV channel being analyzed. Selectable field permits channel selection. Note: A channel must be in the channel plan to be listed.
- 6. Span:** The frequency span of the spectrum analyzer. A selectable field with 50MHz, 100MHz, 200MHz, 500MHz and FULL selections.
- 7. Avg. Level:** Bar graph indicating the average channel digital level. Not selectable.
- 8. Menu &?:** Popup Menu with selections to configure the meter's cable TV receiver and spectrum analyzer features. See the next section (6.6) for details.
- 9. Marker Line:** The marker frequency cursor line. May be moved by touching the display location you wish the marker to relocate.
- 10. Marker Power:** The power indicated at the frequency location of the marker line. The field is not selectable

6.6 CATV Spectrum Analyzer Popup Menu

The CATV Spectrum Analyzer includes a popup menu that provides settings for the spectrum analyzer. It further provides a convenient access to the HELP DISCOVERY function. Touch the MENU & ? section of the display to access the Popup Menu. The Popup Menu listings are explained below.

SPECTRUM: Provides a selection of the sweep or update rate of the spectrum analyzer. Selections include FAST and SUPERFAST.

BUZZER: Provides a switch selection to turn the alignment buzzer on or off.

MENU	
SPECTRUM:	FAST
BUZZER:	OFF
MRK. BW:	OFF
Δ MARKER:	OFF
PICTURE:	FULL
LOC. OSC:	0.0MHz
dB DIV:	10 dB
DC@RF:	OFF
RBW FILTER:	100KHz
SAVE/RECALL	HELP ?
EXIT	

MRK. BW (Marker Bandwidth): Selections include OFF, ON, and BW.PWR. The ON selection provides a variable BW with two vertical markers on the display which may be varied by rotating the touch control knob. The MRK BW selection adds a power measurement to the selected band at the bottom center of the spectrum analyzer display.

DELTA MARKER: Turns on or off a white marker which along with the existing red marker provide two adjustable frequency locations. At the center bottom of the spectrum analyzer display is added a Delta Marker Power (Delta MRK.P) measurement which indicates the level difference between the red and white frequency locations.

PICTURE: Changes how the spectral energy is displayed within the spectrum analyzer graph from a FULL to a CONTOUR view. The FULL selection fills in the displayed spectral energy with color. The CONTOUR selection outlines the top of the spectral energy with a colored line.

LOC. OSC: Provides user changes to the local oscillator setting of the meter. This feature is rarely used with TV broadcast measurements and should remain at 0MHz.

dB DIV: Provides 1, 2, 5, 10 dB selections to change the resolution of the spectrum analyzer's vertical increments or dB level.

MODE: Provides a selection for ANALOG or DIGITAL mode for the spectrum analyzer.

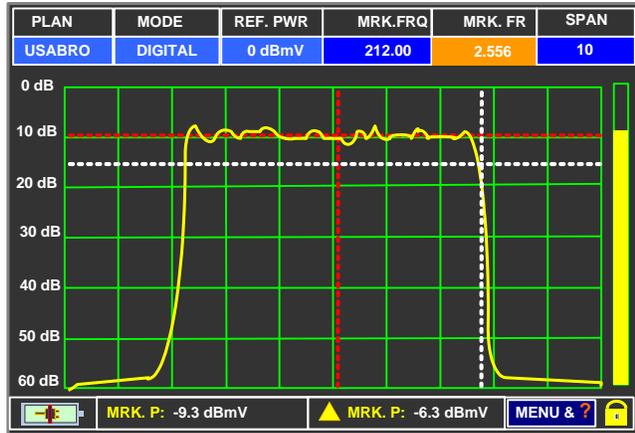
DC@RF: Provides a convenient selection output DC voltage to the RF input jack to power an inline amplifier, preamplifier or down converter.

SAVE/RECALL: Provides memory for 20 captured spectrum analyzer screens which may be recalled and viewed on the screen.

HELP ICON: Provides help to automatically determine a cable channel's signal type, modulation type, and symbol rate for automatic tuning.

6.62 CATV Spectrum Analyzer Delta Marker Measurement

The Spectrum Analyzer includes a Delta Marker measurement. The measurement provides an additional white horizontal and vertical marker or cursor on the spectrum analyzer display. The CHAN header is replaced by a MRK. FR. (Marker Frequency) header. This header field indicates the frequency position of the white marker. The header field may be touched and selected to move the white marker horizontally on the display screen. You may also touch locations on the screen and the white marker moves to the touch point. The red marker is not moveable in the Delta Marker function. To select the DELTA MARKER function touch the MENU&? field and in the popup menu touch the Delta (Triangle) Marker listing so it indicates “ON.” .



The Delta Marker measurement provides a frequency difference measurement and a level difference measurement between the location of the red marker and the white marker. The Delta Frequency is indicated under the MRK FR. Header. The Delta Marker power or level is indicated in the bottom center measurement field.

6.63 Spectrum Analyzer Marker Bandwidth Measurement

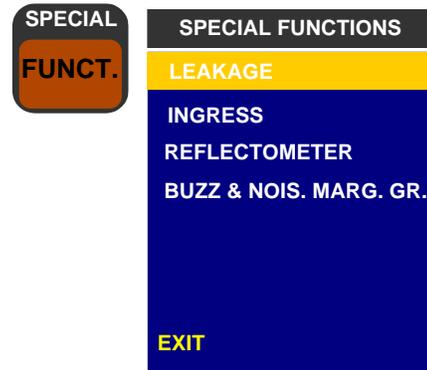
The Spectrum Analyzer includes a marker bandwidth (MRK.BW.) measurement. This measurement provides a means to select a bandwidth of interest for a level measurement. The bandwidth is adjustable from 0 to 8MHz. When the MRK BW function is turned ON the spectrum analyzer marker frequency field (MRK.FR.) is not selectable.

This Marker Bandwidth (MRK.BW) measurement anchors the reference marker (MRK. FR) so it may not be selected or moved. The test produces two bandwidth markers, red horizontal lines, which begin at the reference MRK FR. and move apart as the control knob is rotated. The CHAN header is replaced by a MRK BW. header and the associated marker bandwidth value is shown. The field may be touched and selected to adjust the 2 red widening bandwidth markers with the control knob.

To select the MARKER BANDWIDTH feature from the Spectrum Analyzer screen, touch the MENU&? Field. In the popup menu touch the MRK.BW field at the right so it indicates “BW.PWR.” Touch EXIT and then touch the MRK BW header and rotate the control knob to select the bandwidth. The bottom center field in the spectrum analyzer display indicates the power measurement in the selected bandwidth.

6.7 CATV Special Functions

The CATV Special Functions menu provides several listings. The CATV Special Functions Menu is selected by pressing the SPECIAL FUNCT icon on the HOME Menu when the CATV icon is highlighted. You may also press the SPECIAL FUNCT icon when in the CATV PLAN SELECTION MENU after choosing a channel plan for your measurements. This section provides an overview of the special functions available for CATV signal testing.



LEAKAGE:

Measures the field intensity of a signal(s) emitted or “leaking” from the shielded cable system. Elevated leakage levels indicate a shielding problem which should be corrected.

INGRESS:

Shows the potential ingress interference problems in the upstream cable spectrum by providing a spectrum analysis from 5 to 65 MHz. Includes a peak hold function for capturing random noise or interference spikes.

BUZZ & NOISE MARG. GR.:

(Buzzer with Noise Margin Graph): Provides a buzzer to indicate the relative improvement or degradation of a TV digital channel Noise Margin.. Provides an active Noise Margin performance graph showing increases or decreases in signal performance during a moving 7 second segment..

The following sections of this manual provide more information on these CATV special functions.

6.71 CATV LEAKAGE TEST

The Leakage Test measures the field intensity of a signal(s) emitted or “leaking” from the shielded cable system. Elevated leakage levels indicate a shielding problem which should be corrected to prevent potential interference to other signal transmissions and avionics. The Leakage Test further provides help in isolating leakage and in finding points of ingress. To select the Leakage Test function, with the CATV icon highlighted touch the SPECIAL FUNCT icon on the HOME MENU. Touch the LEAKAGE field in the CATV SPECIAL FUNCTIONS Menu to advance to the Leakage Test Setup Menu.



LEAKAGE TEST SETUP:

The LeakageTest Setup menu provides settings used to set criteria for the Leakage Test. Settings provide compensation for the antenna, antenna factors, and distance.

Area

The Area setting adapts the leakage test to standards established in Europe and USA. Set to USA for leakage testing in North America. This establishes the remaining Leakage Setup fields in the menu for selections to match standards for cable system leakage testing in the USA.

Antenna Type (USA ONLY)

The ANT. TYPE field provides selections for the type of antenna to be used for the Leakage Test. The selections include: MONOPOLE, DUCK, or BIPOLE. To use the supplied antenna set the antenna type to DUCK. Touch the ANT. TYPE field to highlight the right selection box. Touch the selection box to increment through selections.

Antenna Factor

The Antenna Factor setting compensates the Leakage Test measurements to conform with a calibrated or reference leakage field for a certain antenna type, mounted condition, and system measurement components. Touch the ANT FACTOR field to highlight the right selection field. Touch the selection field to increment through available settings which may be used to increase or decrease values to match the relative gain or loss of the antenna/system being used compared to the reference. When using the supplied duck antenna a setting of 200 is recommended.

NOTE: The Antenna Type selections result in three programmed antenna factors, 100 for the dipole, 90 for the monopole, and 75 for the rubber duck antenna.

Distance

The Distance setting compensates the Leakage measurement based upon the estimated distance from the leak source. Touch the DISTANCE field to highlight the selection field at the right. Touch the field to increment distance settings to set a value for the distance from the leak source.

Threshold

The Threshold setting determines the uV/M level at which an audible alarm on the unit is sounded to indicate leakage. The audible sound varies in pitch based on the amount of leakage present to indicate when you are getting closer to the leak. A setting of 20mV/meter is the FCC standard and the meter's default setting.

To Perform a Leakage Test:

To perform a Leakage Test, connect the test antenna to the RF Input of the meter. Touch the SPEC FUNCT icon with the CATV icon highlighted to access the CATV Special Functions Menu. Touch the LEAKGE listing or field to advance to the Leakage Setup Menu. After appropriate setup selections, touch the START field at the bottom to begin measurements.

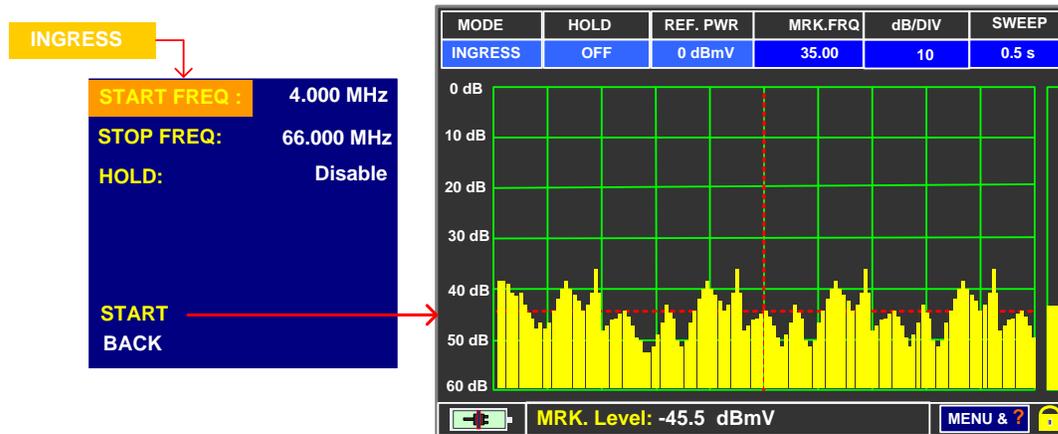
To change the Leakage Test frequency, touch the MENU &? field at the bottom right of the display screen. Touch the FREQUENCY listing to enter the test frequency. *Note: The selected frequency does not need to exactly match your transmitter frequency as the bandwidth of the meter is sufficiently wide to receive and measure properly.* The Leakage Test meter displays both the real time cable leakage factor (LIVE VAL) and the maximum leakage factor detected during the same measurement session (PEAK VAL).

The PEAK VAL measurement holds the peak value until the Leakage Test session is stopped and restarted. To restart a session, press the EXIT field and reselect the SPECIAL FUNCTION and LEAKAGE TEST field to restart the test.

The measurement session does get stopped and reset when editing the test frequency, therefore the PEAK VAL displays the maximum value of the cable leakage factor detected by the meter on all the test frequencies set on the meter by the user while performing the same measurement session.

6.72: CATV INGRESS TEST

The CATV Ingress Test is a special function which shows potential ingress interference problems in the upstream cable spectrum by providing a spectrum analysis from 5 to 65 Mhz. Connect the upstream cable signal to the RF input on the top left of the meter. From the HOME Menu with the CATV icon highlighted touch the SPECIAL FUNCTION icon. Touch the INGRESS listing in the SPECIAL FUNCTION Menu to advance to the INGRESS TEST.



The Ingress Test shows a spectrum analyzer display with a frequency span selected for the Ingress Test. To measurement an ingress signal, touch the MRK. FREQ. header field and touch the screen location in which you want the marker to relocate. You may also use the Control Knob to move the cursor. The signal level at the marker location is displayed at the display bottom row (MRK Level) with the relevant measurement unit. A horizontal dotted line shows the real time signal level value at the current marker position (current frequency value).

REF.PWR: Reference Value

With the Standard Navigation Mode highlight the top level (end of scale) value on the y-axis and set the appropriate end of scale value.

HOLD:

Touch the HOLD header to select the field. Touch the field to increment to “ON.” The max HOLD feature saves and shows a line above the normal signal signature indicating the spurious noise levels. This feature is useful for finding spurious or intermittent noise frequencies.

MRK. FRQ: Moving the Marker (Frequency Value)

Touch the MRK. FREQ. header field and touch the screen location in which you want the marker to relocate. You may also use the Control Knob to move the cursor. The relevant signal level measurement at the marker location is indicated at the bottom of the display (bottom row, MRK).

SWEEP: Edit the Sweep Time

This field changes the sweep time. Touch the SWEEP header to highlight the field. Touch the field below to increment through available sweep speeds from 50mS to 50s.

MRK. LEVEL - Marked Level: The level of a signal at the selected marker frequency.

NOTE: You may use the MENU & ? Popup Menu to gain access and adjust the spectrum analyzer’s ingress start and stop frequencies.

6.73 CATV BUZZER & NOISE MARGIN GRAPH TEST

The BUZZER & NOISE MARGIN GRAPH test, abbreviated BUZZ&NOIS. MAR. GR, is a special function which provides a time charted graph of the Noise Margin measurement of a selected satellite transponder. It further is accompanied by the alignment buzzer. The test may be used for satellite dish alignment or to monitor the received signal performance of a satellite dish or LNB

To select the BUZZ&NOIS MAR.GR. function from the Home Menu, touch the SPECIAL FUNCT icon with the CATV icon highlighted. If the CATV icon is not highlighted, touch the CATV icon and from the CATV PLAN SELECTION MENU, after selecting the desired channel plan, touch the SPECIAL FUNCT icon at the right. Then touch the BUZZ&NOIS MAR.GR listing which takes you directly to the test function.

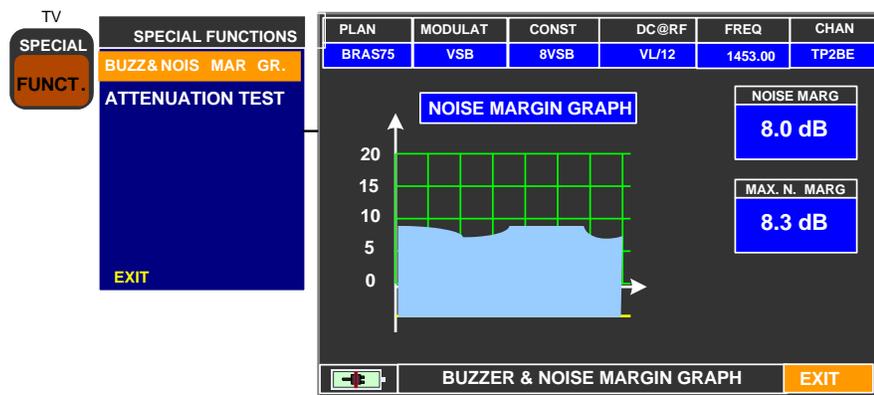
Measurements in the BUZZ&NOIS MAR.GR function include the following:

NOISE MARG:
The Current Noise Margin measurement

MAX N. MARG:
Maximum or best Noise Margin measurement since the test began – signal lock

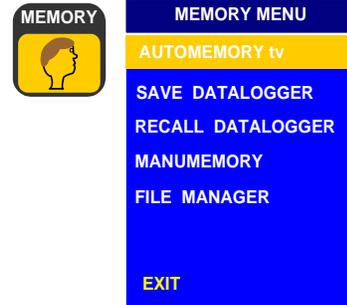
MIN N. MARG: Minimum or worst noise margin measurement since test began – signal lock.

The received signal performance (noise margin) is graphed from left to right scrolling a 7 second window of performance. Each horizontal increment represents a 1 second time interval. Interruptions are marked as a yellow line falling to the bottom of the chart moving to the left. Variations in noise margin are clearly seen as rising or falling levels along the top of the chart. Levels on the right of the graph clearly indicate the maximum and minimum variations since the onset of the test began.



6.8 CATV Memory Management

The MEMORY MENU provides channel plan creating, test logging features and channel plan management functions. The MEMORY MENU is accessed by pressing the MEMORY icon with the head/brain picture on it. On the Home Menu or in the TV BROADCAST PLAN SELECTION Menu touch the MEMORY icon. The MEMORY MENU functions are summarized below: The following sections of this manual provide more details.



AUTOMEMORYtv: Scans channels of a master TV or cable channel plan and automatically discovers active channels and builds an AUTO named channel plan with channels found meeting minimum level settings.

SAVE DATALOGGER: Scans the channels in a channel plan and records performance measurements to a log file. The scanning progress and test summary is shown during the scanning.

RECALL DATALOGGER: Selects and recalls a previously scanned and stored log file by name for reviewing the test results

MANUMEMORY: Provides creation and editing of manually created transponder/channel plans.

FILE MANAGER: Provides selection of logger and satellite manual created channel plans for renaming or deleting.

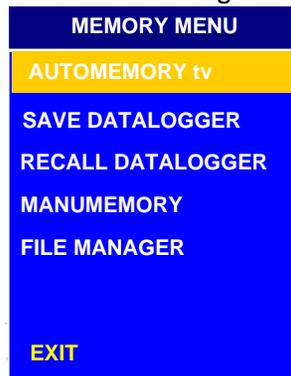
Touch a listing in the MEMORY MENU to begin a function as listed above.

6.81 AUTOMEMORYtv – Scan CATV Channels to Create a Channel Plan

The AUTOMEMORYtv feature found in the MEMORY MENU provides the ability to automatically scan CATV channels in a standard tuning plan and discover the active digital and analog channels. The active channels are retained creating a channel tuning plan for the meter. The file containing the active channels is named as an AUTO plan with a numeric reference (Example: AUTO 1).

Auto scanning channels and creating a channel plan provides the convenience of only listing the channels available in your area for meter selection. All inactive channels are removed from the channel plan. Auto scanning channels to create a channel plan further configures each available channel as either analog or digital so the meter automatically applies the proper signal measurements.

To perform the AUTOMEMORYtv scan, with the CATV icon highlighted on



the HOME MENU touch the MEMORY icon. The meter advances to the MEMORY MENU. Touch the AUTOMEMORYtv listing which brings up a configuration box. The listing in the configuration box are listed and explained below.

FROM PLAN: Selects the master tuning plan to use for scanning for channels. Use USABRO for scanning broadcast TV channels in North America. Use USACBL for scanning cable TV channels in North America.

TO FILE N: Selects the AUTO channel plan name for reference. This is the new or existing channel plan name which channel data is to be stored during the scan. This name may be selected and used for CATV meter tuning after the channel scan is complete and the plan is successfully created.

LEVEL: Defines the minimum signal level of an analog channel required to consider the analog signal a valid channel prior to adding it to the channel plan.

POWER: This defines the minimum signal level of a digital channel during the channel scan required to consider the digital signal a valid channel.

DISCOVERY: This defines the modulation signal types that the meter looks for during the channel scan. This field may offer TERRESTRIAL ONLY, CABLE ONLY, or TERR & CABLE selections. Select CATV ONLY when scanning for cable channels as this provides the fastest auto-scan time.

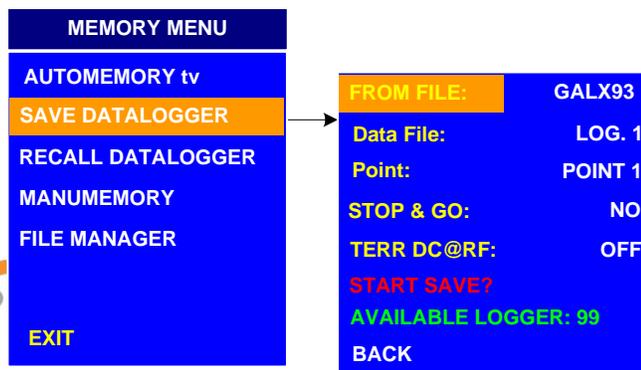
START SAVE?: Starts the automemory scan saving channel information to the AUTO file specified.

To Create an AUTOMEMORY Channel Plan:

1. Navigate to the MEMORY MENU and touch the AUTOMEMORYtv field.
2. Set the FROM PLAN field to USACBL by touching the listing on the right.
3. Set the TO FILE N field to select an AUTO file name. Note: If the AUTO file selected already contains channel data, the bottom field changes from START SAVE? to START OVERWRITE? Touching the START OVERWRITE? field begins a scan replacing the data in the existing AUTO file.
4. Touch the LEVEL and/or POWER fields and set as desired.
5. Touch the START SAVE? field to begin the channel scan.
6. Wait a few minutes and watch the display screen which illustrates the scanning process and indicates the channels as discovered. The meter indicates complete when all the channels have been scanned.

6.82 SAVE DATALOGGER – CATV Auto Measure & Store

The SAVE DATALOGGER feature within the MEMORY MENU scans the channels in a selected channel plan and captures performance measurements for each channel to



a log file. The logged data file is stored in one of the 99 available memory locations and is named for latter recall and test result viewing. To begin a data logger capture, select the SAVE DATALOGGER by touching the MEMORY icon on the Home Menu with the TV icon highlighted. Touch the SAVE DATALOGGER listing in the MEMORY MENU.

The SAVE DATALOGGER has a configuration menu with several fields which impact the function. Following is a brief description of these fields.

FROM FILE: This field indicates the selected channel plan in which the individual channels will be scanned and tested. This field may be highlighted and a channel plan selected.

Data File: This is the file name where the scanned measurement data is to be stored.

Point: This is a name for the test point associated with the log file data.

STOP&GO: Provides for stopping the log measurements when changing from a satellite transponder to a cable channel or broadcast channel when the manual memory channel plan contains a mix of signal types. This provides the user a time to change connections.

TERR DC@RF: Provides an on/off switch for enabling DC voltage to the RF jack when measuring broadcast TV. Not applicable in the Satellite mode.

START SAVE?: Starts the logging saving transponder performance testing data to the Data File name in the Date File field.

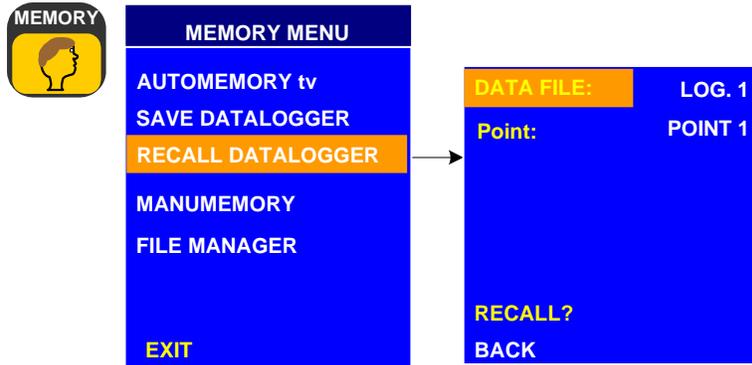
AVAILABLE LOGGER: 99: Indicates the available memory locations for storing logging data files.

When the DATA LOGGER begins scanning transponders, a LOGGER FUNCTION screen shows the scanning/logging progress. A Total Test Report section, on the right of the display screen, indicates the progress of the scan and summarizes the performance of each transponder tested. The transponder is color coded in the report indicating a pass, marginal or fail status. Near the bottom of the LOGGER FUNCTION screen the transponder currently being tested is highlighted. A picture indication shows if the transponder was digital or analog.



6.83 RECALL DATALOGGER - View CATV Data Log File

The RECALL DATALOGGER within the MEMORY MENU provides a means to recall existing memory log files containing satellite transponder performance test data. The log files available for recall are files created with a SAVE DATALOGGER function covered in the previous section.



To recall a data logger file touch the MEMORY icon on the HOME Menu with the SAT icon highlighted. Touch the SAVE DATALOGGER listing in the MEMORY MENU. In the DATA FILE field of the selection box, touch the listing on the right and rotate the touch Control Knob to increment through the available log files. Press the RECALL field to view the file’s measurement contents.

The DATALOGGER viewer shows the file name and point number in the upper left to identify the logger file. The name of the channel or transponder is shown in the left column. The digital or analog signal type is listed and the associated performance measurements are shown horizontally for each transponder/channel.

LOG. 1 POINT 1		EXIT			
NAME	TYPE	PRW LVL	MER C/N	bBER A/V	aBER PER
■ E5	DVB-T	67.8	29.2	5x10 ⁻⁵	<E-8
■ 37	DVB-H	63.2	23.3	<10 ⁻⁶	<E-8
■ s18	An TV	71.6	49.3	8.2	<E-6
■ s21	DVB-C	75.5	>36	<10 ⁻⁹	<E-6
■ PR 5	An Sat	65.7			<E-8
■ PR 6	DVB-S	58.1	12.7	1x10 ⁻⁴	<E-8
■ PR 7	DVB-S2	67.8	12.8	8x10 ⁻³	<E-7

RECALL DATALOGGER

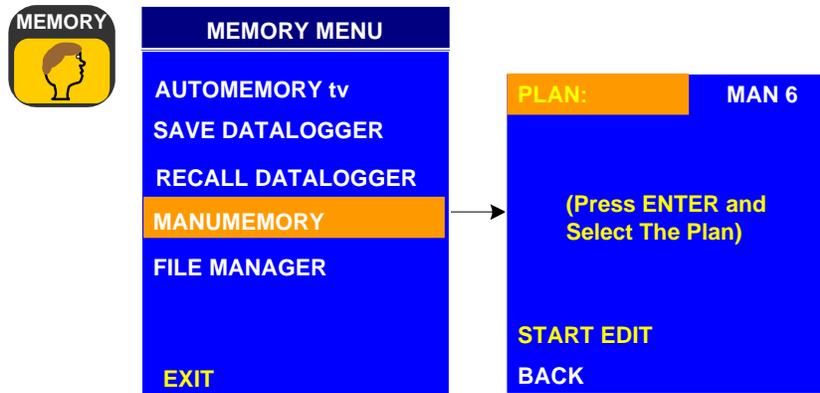
An indication of transponder signal performance is provided with a color coded box at the left of the transponder name. A green box indicates the transponder passed test performance criteria and is good. A red box indicates a performance issue.

6.84 MANUMEMORY – Creating or Editing CATV Channel Plans

The MANUMEMORY feature found in the MEMORY MENU provides the ability to manually create a tuning plan which may include a list of broadcast channels. The file containing the active channels is named as a MANU plan with a numeric reference (Example: MANU 1). Manually creating a channel plan provides the convenience of only listing a few channels available in your area or desired for special testing application. Only the channels created and added to the list are available in the MANU channel plan for selection and measurement.

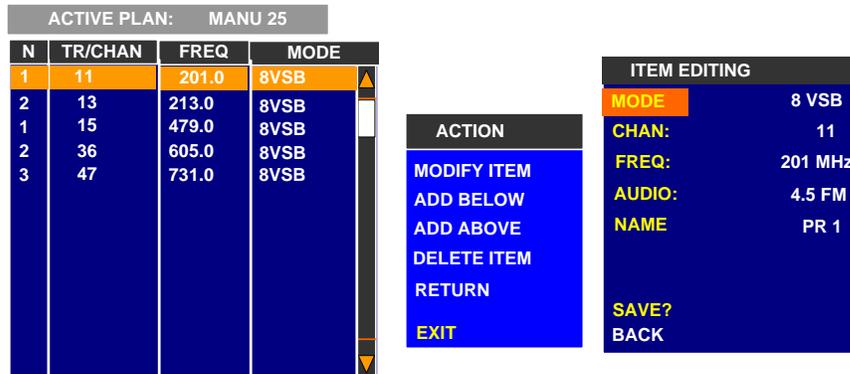
The MANUMEMORY feature permits entry of individual channels one at a time. For this reason it is ideal for creating a channel plan in which there is a small number of channels. When creating a channel plan with many channels the AUTOMEMORYtv or use of the SMART software is recommended.

The DSA 1491 provides management features for the MANU files. The MANUMEMORY feature permits edits or changes to listed channels within a previously created manual (MANU) channel plan. The following sections provide information on creating and editing a MANU channel plan.



To Manually Create a Plan:

1. To create a transponder/channel plan navigate to the MANUMEMORY feature by touching the MEMORY icon and touching the MANUMEMORY listing in the MEMORY MENU.
2. In the PLAN field at the top of the configuration box touch the listing at the right to highlight the field. Move your finger over the arrow portion of the touch control knob to increment through available memory channels.
3. Select a manual channel plan number of choice. Press the START EDIT field to begin construction of a manual plan. *NOTE: The name of the selected manual file can be renamed. See the next section of this manual for instructions on how to rename an existing manual file.*
4. The ITEM EDITING menu appears to enable entry of transponder. Touch the SAVE? field to add a listing after changing the individual fields to the desired values.



MANUMEMORY ACTIONS

MODIFY ITEM: Produces the ITEM EDITING menu which permits changes to the settings for the transponder listing highlighted

ADD BELOW: Produces the ITEM EDITING menu in which you may select the parameters of a transponder signal and dish characteristic to add a listing below the currently highlighted field.

ADD ABOVE: Produces the ITEM EDITING menu in which you may select the parameters of a transponder signal and dish characteristic to add a listing below the currently highlighted field.

DELETE ITEM: Deletes the highlighted listing from the selected plan.

EXIT: Returns to previous menu

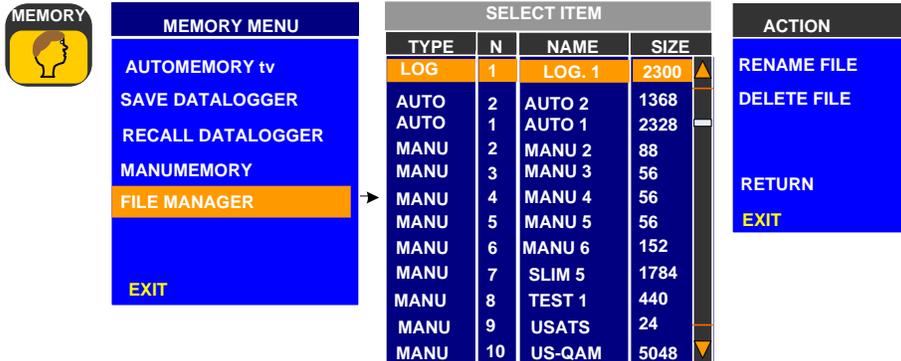
To Edit an Existing Plan:

1. To make changes or additions to an existing manual memory plan navigate to the MANUMEMORY feature by touching the MEMORY icon followed by touching the MANUMEMORY listing in the MEMORY MENU.
2. In the PLAN field at the top of the configuration box touch the listing at the right side to highlight the file name. Rotate the control knob to increment through the available memory plans.
3. Select the file name in which you want to edit or add listings. Press the START EDIT field to begin editing.
4. Touch MODIFY ITEM from the listings to produce the ITEM EDITING Menu. Modify the items in the Menu to match the transponder and satellite dish characteristics as needed. Press the SAVE? field to write the changes to the highlighted channel listing.

Press BACK to return to the previous menu without making changes.

6.85 CATV FILE MANAGER – Renaming or Deleting Files

The FILE MANAGER, found in the MEMORY MENU, provides management of the logger and transponder/channel plan files. The FILE MANAGER provides the ability to rename or delete files from the meter’s memory. To access the FILE MANAGER from the Home Menu, touch the MEMORY icon followed by a touch of the FILE MANAGER listing in the MEMORY MENU.



You can rename or delete files that were created with the DATA LOGGER as in scanning a TV channel plan and capturing performance measurement data to a test file. These test files are identified as LOG file types and are typically named as LOG 1, LOG2, etc. You can also rename or delete files that were created by the AUTOMEMORY feature or with a MANUMEMORY feature of the meter. These are channel plan files and are typically named “AUTO 1,” “AUTO 2”, etc. or “MANU 1,” “MAN 2, etc. by the meter. However, these file names can be changed to a more recognized or descriptive name as desired. The following section summarizes how to rename, or delete these files in the FILE MANAGER function.

To Rename a File:

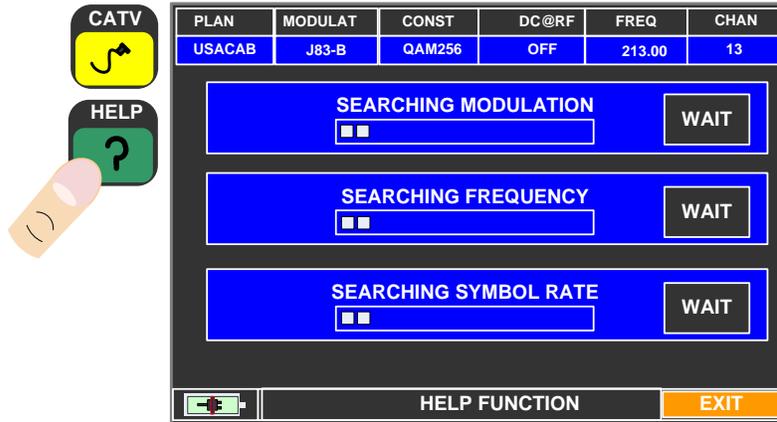
1. Navigate to the MEMORY MENU. Touch the FILE MANAGER listing.
2. Scroll up or down in the listed files to find the file you want to rename. Touch the listing to select or highlight the listing and press the ENTER pushbutton in the center of the larger touch Control Knob.
3. Touch the RENAME FILE listing in the ACTION MENU which appears.
4. A naming overlay appears on the screen. Touch letters to enter into naming boxes. Press > to advance to the next box. Continue until the name is complete. Touch the EXIT box.

To Delete an Existing File:

1. Navigate to the MEMORY MENU. Touch the FILE MANAGER listing.
2. Scroll up or down in the listed files to find the file you want to delete. Touch the listing to select or highlight the listing and press the ENTER pushbutton in the center of the larger touch Control Knob.
3. Touch the DELETE FILE listing in the ACTION MENU which appears to delete the selected file: **NOTE: DELETION IS PERMANENT – THE FILE CANNOT BE RECOVERED.**

6.9 CATV HELP

The HELP icon on the DSA 1491 refers to help or assistance tuning in a digital channel. The HELP function is designed to help determine for a user the RF type of signal within a cable TV channel.



Initiating a HELP function on the DSA 1491 directs the meter to automatically analyze the TV channel and determine the RF modulation type, bandwidth/center frequency, and RF symbol rate. The DSA 1491 methodically analyzes the digital signal to determine these parameters. If the parameters are within the receiver capabilities the meter finishes by advancing to the measurement page with the channel displayed. If the channel has no recognizable signal or is a proprietary modulation scheme, the DSA 1491 reports “NO SIGNAL.”

To initiate a HELP function simply locate a HELP icon and touch it. The HELP icon is located within the Spectrum Analyzer’s popup menu. When in the Spectrum analyzer touch the MENU & ? field at the bottom right of the screen. Touch the HELP icon.

The HELP FUNCTION screen informs you of the meter’s progress in determining the type of digital signal or detecting an analog signal within the channel. The boxes on the right in the center list the modulation, frequency, and symbol rates as discovered by the meter. When the search is completed, “FOUND” is displayed on all three measurement status boxes at the right.

The HELP FUNCTION screen maintains the same header fields as in the CATV measurement page. The fields indicate the plan, channel, channel frequency, constellation, and modulation for the selected channel. To return to the previous menu, press the EXIT field at the bottom right of the display.

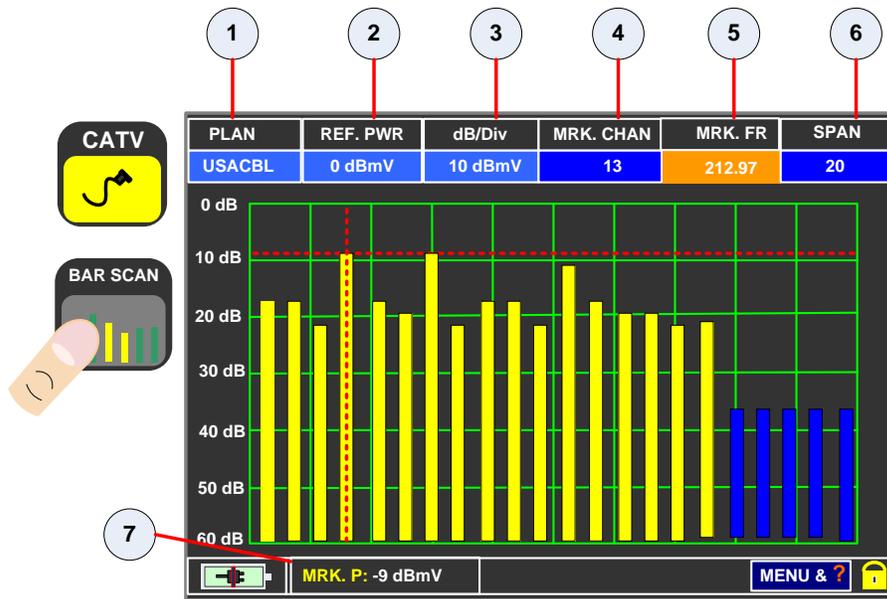
For CATV channel signal analysis or HELP:

1. Touch select the CATV icon. Touch a channel plan. Touch the MEAS icon.
2. Touch the CHAN field header and select the TV channel.
3. Touch the “MENU & ?” field at the bottom right. Touch the HELP icon in the Popup Menu.

4. Wait while the meter analyzes and determines the channel symbol rate, frequency and modulation type. FOUND is shown in all three boxes when successful. When successful the meter defaults to the measurement page for the transponder or channel. Touch EXIT at any time to exit the search.

6.10 CATV BAR SCAN Test

The BAR SCAN measurement shows multiple bars forming a bar chart. Each bar of the chart represents the level of a TV-RF channel. The Bar Scan is essentially a simplified spectrum display in which multiple channel levels through a frequency span are indicated with bars on a level chart. The number of channels plotted in the bar chart is determined by the selected span (SPAN). For a TV Bar Scan measurement touch the BAR SCAN icon with the TV icon highlighted. The following sections provide more information on the Bar Scan measurement and fields on the Bar Scan display screen.



Bar Scan Basics

Each bar displays the signal level measured in a specific channel within the channel plan. The SPAN value determines the number of channels or bars displayed in the bar chart. A yellow bar represents a digital signal channel while a solid blue bar represents an analog signal channel. The marker, a vertical red dotted line, is initially positioned on the channel near the center of the display which is the center of the span of channels.

Bar Scan Measurement Initialization

When the Bar Scan measurement is selected the meter automatically defaults the center channel of the span to the last channel selected in the Channel Measurement function of the meter. To select the center channel for the Bar Scan test prior to a measurement, press the MEAS button and select the desired channel. Press the HOME button to return

to the HOME menu and with the TV icon highlighted touch the BAR SCAN icon. The Bar Scan measurement further selects a level reference based upon the selected channel's signal level. Be sure to select an active channel so a proper reference (REF) level is automatically selected.

- 1. PLAN:** Indicates the channel plan selected for measurement. The plan includes the channel list that will be measured and plotted into the BAR SCAN test results.
 - 2. REF PWR Reference Power:** The reference value establishes the level of the top horizontal bar of the bar graph. To change the reference value, touch the REF field header and touch the value field below to see selections. Touch the desired selection.
 - 3. dB/DIV.:** The db/Div field displays the level change represented between adjacent horizontal lines or divisions in the bar graph. This field may be highlighted and changed to predetermined values (5 dB/DIV, 10 dB/DIV).
 - 4. MRK CHN:** The Bar Scan display or span is centered upon a selected channel shown in the field under the CHAN header. The CHAN field is selectable and the channel value may be changed. Changing the value moves the red cursor or marker on the display. Highlight the CHAN field and use the UP and DOWN arrow pushbuttons to move the marker to the desired channel or bar.
 - 5. MRK FREQ. - Marker Frequency:** The Bar Scan display or span is centered upon a selected channel which has a standard frequency reference. The MRK FR field is selectable and the value may be changed. Changing the value moves the red cursor or marker on the display. When the MRK FR is selected and changed, the channel value changes to dash lines indicating the frequency is no longer standard for the channel selected.
 - 6. SPAN:** The SPAN field determines the number of channels and a relative frequency span included in the bar graph or scan. To change, highlight the field and use the UP or DOWN key to change the span between pre-defined values, from (10, 20, 32, 64, 128).
 - 7. MARKER P – Marker Power or Level Measurement:** This field indicates the level of the channel marked by the red cursor on the display. The unit of measurement is set in the METER CONFIGURATION MENU. A horizontal dotted line shows the real time signal level value measured in the currently selected channel
- MENU &?:** Touch this field to gain access to the Popup Menu which contains a selection for configuring the BarScan Special Test from a BarScan measurement to a TILT measurement. Highlight the selection field and select the “BARS” setting to configure for a BarScan Test. Select the “TILT” setting to configure the test for a Tilt Test explained in the next section.

6.11 CATV BAR SCAN – TILT Test

In the Tilt measurement the signal level difference between two user-defined channels is measured. The two channels can be directly set while the Tilt Test is running. A bar display is used and cursors show the signal level difference between the two specified channels. The display shows the analog channels as solid blue bars and digital channels as dashed yellow bars. To enter the Tilt measurement, highlight the TILT icon on the Home Menu and press the ENTER button. The following sections describe the functions within the Tilt measurement screen.

To select the CATV TILT test, touch the CATV icon and select the channel plan to use for the test. Touch the BAR SCAN icon. Touch the MENU field at the bottom right of the BARSCAN display to open the menu. Touch the BARS TYPE field to highlight the selection on the right side. Touch the highlighted field on the right side until it reads "TILT." Touch EXIT.



1. PLAN: The currently selected channel plan.

2. Reference Power – REF PWR:

The reference value establishes the dBmV level of the top horizontal bar of the bar graph. This field may be changed by red highlighting the field and pressing the UP and DOWN arrow pushbuttons.

3. 4. Selecting Tilt Channels (Pilot 1, Pilot 2): The CH1 and CH2 fields at the top center of the display specify the measurement channels. The triangle shapes at the bottom of the scale indicate the measurement channels. To edit the signal level end-of-scale value, with the Standard Navigation Mode highlight the top level (end of scale) value on the y-axis and select the requested end of scale value.

5. Edit the Scale dB/Div: This field displays the level change represented between adjacent horizontal lines or divisions in the bar graph. This field may be highlighted and the changed to predetermined values.

6. PILOT 1 Marker: The marker that shows the selected PILOT 1 channel.

7. PILOT 2 Marker: The marker that shows the selected PILOT 2 channel.

8. Menu: Menu used to change the BAR SCAN function between the Bar Scan measurement and the TILT measurement.

10. Tilt Measurement: The Tilt Measurement value indicates the difference in level between channel 1 and channel 2 which are specified in the CH1 and CH2 fields

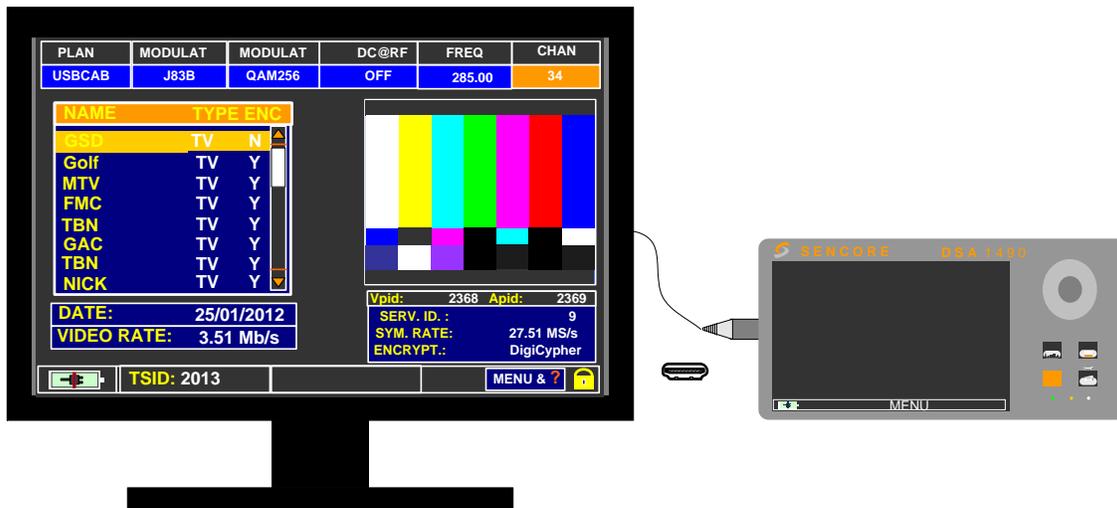
Section 7: Audio/Video In/Out Monitoring

The DSA 1491 offers several A/V input and output features which supplement its TV-RF analyzing capabilities. This section summarizes the audio/video input and output features and provides operational information.

7.1 HDMI Output Monitor – Using an External HDMI Monitor

The DSA 1491 includes an HDMI Output which may be connected to a display equipped with an HDMI Input. The HDMI display, when connected to the DSA 1491's HDMI Output, may be selected and used to display all of the test screens normally seen on the DSA1490 and be used to monitor the audio. The HDMI display may be used to monitor satellite or TV-RF signal measurements, constellation measurement, spectrum analyzer analysis, MPEG services, and program video. Using a larger HDMI monitor can greatly enhance monitoring for satellite and broadcast applications.

When the display video is switched to the HDMI monitor, the display screen on the DSA 1491 goes blank. It is not possible to show simultaneous video on an external HDMI display and on the DSA 1491 simultaneously.



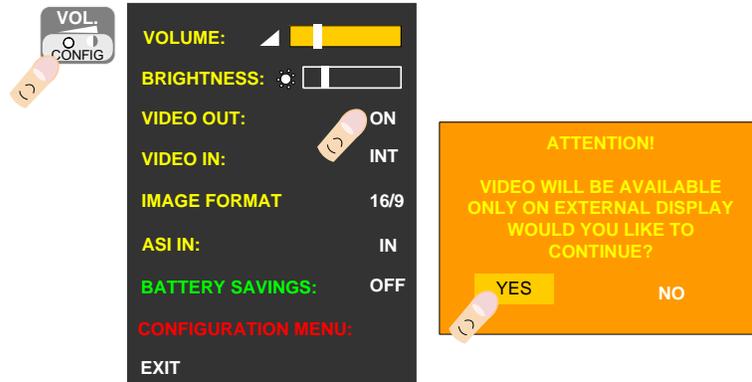
When the DSA 1491 viewing screen is being viewed with an external monitor, selecting tests and navigating remains the same as the touch screen on the meter is active. However, without a physical position reference, touching the screen to select desired fields becomes challenging.

When using an external video monitor, it is advisable to use the touch Control Knob at the upper right of the meter. While a bit more difficult compared to touching the screen, the Control Knob and touch front panel pushbuttons provide full navigation and selection. Some practice may be needed as you shift your interface technique from touching the screen to Control Knob use.

Rotate the Control Knob by moving your finger around the outer raised portion and watch for the moving highlighted field on the external monitor. Touch the center ENTER part of the Control Knob to lock onto one of the highlighted fields. Only selectable fields may be highlighted. Rotate the Control Knob to make selections in the field. Touch the ENTER or center portion of the Control Knob to select and/or release the field to enable navigation.

External HDMI Monitor Viewing

Switching video to an external HDMI video monitor is possible with a selection contained in the VOL/CONFIG pushbutton or Quick View Menu. Touch the VOL/CONFIG pushbutton near the bottom right corner of the meter's front panel to access the menu. The VIDEO OUT field listing provides a selection to transfer viewing from the meter's display to an external video display. When you select the VIDEO OUT field and increment to "ON" or touch the field to change it to "ON," a warning box pops up informing you that you about to lose video on the meter's display. It further prompts you for confirmation with a YES or NO box to select. Touch the YES box on the display if you want to continue. Touch NO on the display if you want to return to the Quick View menu. Touching YES, switches off the video measurement screen on the meter transferring all video to the external HDMI or A/V monitor.



If you mistakenly press the YES selection without an external monitor and the meter's display goes black, press and hold down the POWER pushbutton for 3-5 sec. to power the unit off. Wait a few seconds and press the POWER pushbutton to power the unit back on. This restores viewing to the meter's display.

When using the HDMI Output, a lost HDMI connection to the display is automatically sensed. When the HDMI cable is disconnected, the display of the meter is automatically switched back on.

The audio is automatically provided to an HDMI monitor through the HDMI connection. The audio is provided at a fixed digital level and the volume is not controlled by the VOLUME adjustment in the VOL/CONFIG Menu. Use the volume control within the HDMI monitor to adjust for monitoring.

The HDMI interface is automatic in that the digital video output is scaled to the display. However, the image format or aspect ratio may be varied in the VOL/CONFIG Quick View Menu to improve the image size and better match the display. Touch the VOL/CONFIG button and touch the IMAGE FORMAT field. Touch the listing at the right to select either a 4:3 or a 16:9 format.

7.2 Analog Audio/Video Monitor - Using an External NTSC or PAL Monitor

The DSA 1491 includes an analog Audio/Video Output which may be connected to a composite video NTSC or PAL analog monitor, depending on DSA1491 model. The A/V Output requires the use of a 4 section mini-plug as described in Section 1.2. Use a common A/V adapter cable which adapts from the mini-plug male connector to RCA phono male connectors. Connect the RCA phono connector carrying the video, typically color coded yellow, to the video input of the composite video NTSC/PAL monitor. Connect the audio connectors, typically red and white, to the audio inputs of the NTSC/PAL monitor.

Switching the display video of the DSA 1491 to an external composite video display requires switching the DSA 1491 to a VIDEO OUT mode. Touch the VOL/CONFIG pushbutton near the bottom right corner of the meter's front panel to access the Quick View Menu. Touch the VIDEO OUT field and then touch the field at the right.

When you select the VIDEO OUT field and increment to "ON" or touch the field to change it to "ON," a warning box pops up informing you that you will lose video on the meter's display. It further prompts you for confirmation with a YES or NO box to select. Touch the YES box on the display if you want to continue. Touch NO on the display if you want to return to the Quick View menu. Touching YES, switches off the video measurement screen on the meter transferring all video to the composite video monitor.

If you mistakenly press the YES selection without an external monitor and the meter's display goes black, press and hold down the POWER pushbutton for 3-5 sec. to power the unit off. Wait a few seconds and press the POWER pushbutton to power the unit back on. This restores viewing to the meter's display.

The analog audio provided by the A/V Output jack is variable and may be varied using the VOLUME adjustment in the Quick View Menu. Unlike the video, the audio is constantly available and may be monitored without switching the video output to external in the VOL/CONFIG Quick View Menu.

7.3 Audio/Video In

The video display of the DSA 1491 may be used as an NTSC or PAL composite video monitor through the use of the AUDIO/VIDEO Input and a 4 pin mini-plug to RCA phono connection cable. Select the VOL/CONFIG or Quick View menu by touching the VOL/CONFIG pushbutton at the bottom right of the meter. Touch the VIDEO IN field and touch the listing at the right to change to "EXT." This puts the meter into a video monitoring mode to monitor composite video and accompanied audio. No RF measurements are available when in this mode.

Section 8: ASI Measurements

The popular asynchronous serial interface (ASI) is a common signal link between broadcast, satellite, and cable equipment. In addition to all the RF satellite, cable and broadcast TV signal analysis, the DSA 1491-ASI provides both ASI input and ASI output capabilities. The ASI input may be used as a transport stream monitor providing signal confirmation and providing details regarding the stream's MPEG services. The ASI output is the demodulated TV-RF signal in an ASI format from the satellite or TV/CATV tuner of the DSA 1491. For example the ASI output may feed an ASI monitor or MPEG analyzer.



The ASI Input and ASI Output are BNC connectors located on the top side of the DSA 1491-ASI when viewed from the front. The ASI Input and ASI Output capabilities are included in the DSA 1491.

Note: ASI uses 75 ohm coaxial cables with BNC connectors to carry 188 or 204 byte MPEG data packets. ASI has a fixed data rate of 270Mbits/s carrying variable rate (0Mbits/s to about 200 Mbits/s) transport streams.

8.1 ASI OUTPUT – Demodulated TV- RF to ASI OUTPUT

The DSA 1491 offers a demodulated ASI output containing the MPEG transport stream of the selected satellite transponder or TV channel. The ASI output is the demodulated MPEG transport stream from either the satellite tuner/demodulator or the TV tuner/demodulator.

The ASI output is always active and requires no user menu selection to enable. However, to produce an MPEG transport stream output from the ASI Out jack you must be properly tuned, locked, and demodulating a digital TV-RF signal. Always select and setup the DSA 1491 as described in this manual to test the TV-RF channel/transponder. Check the TV-RF signal measurements to be sure the transponder/channel is of a sufficient quality so it may be demodulated. A QTY indication of PASS in the main measurement page along with a displayed video indicates an acceptable signal quality. Do not expect an ASI output if the lock symbol is unlocked, the RF measurements are of poor quality (QTY=POOR), and/or the video monitor portion of the measurement display is not showing video or broken video.

An ASI output signal is not possible when the meter's RF tuning parameters are set for analog, FM, radio or other non-digital video demodulating settings. There will be no ASI output when an analog TV-RF channel is being received or if the meter is in an analog tuning mode. Setup the meter for a digital channel RF measurement.

ASI Output Note: If you are inputting an ASI signal to the ASI Input and have the ASI IN mode selected in the CONFIG. Quick View menu, the ASI input signal is routed to the ASI Output of the meter. Therefore, the DSA 1491 may monitor an MPEG transport stream while passing through the ASI signal.

8.2 ASI INPUT MPEG Monitoring/Testing

The DSA 1491 adds the capability of testing an ASI input signal to determine if it contains an active transport stream. It further indicates what MPEG video/audio services exist and provides information regarding the individual services. This section explains how to configure the meter for selecting an ASI input and what measurements are provided in the MPEG LIST feature of the meter. The DSA 1491 also provides extended ASI TS stream analysis in the ASI-IP Analyzer. Please see the next section of this manual – Section 9.

Selecting and Monitoring the ASI INPUT

To select the ASI Input for monitoring and testing, touch the CONFIG button to bring up the Quick View Menu. Touch the ASI IN field and touch the highlighted portion at the right of the field so it indicates “ON.” When an ASI signal is being received the DSA1491 automatically switches to the ASI input showing MPEG video/service information on the display screen. To disable the ASI IN feature, touch the ASI IN field and touch the highlighted portion to indicate “OFF.”

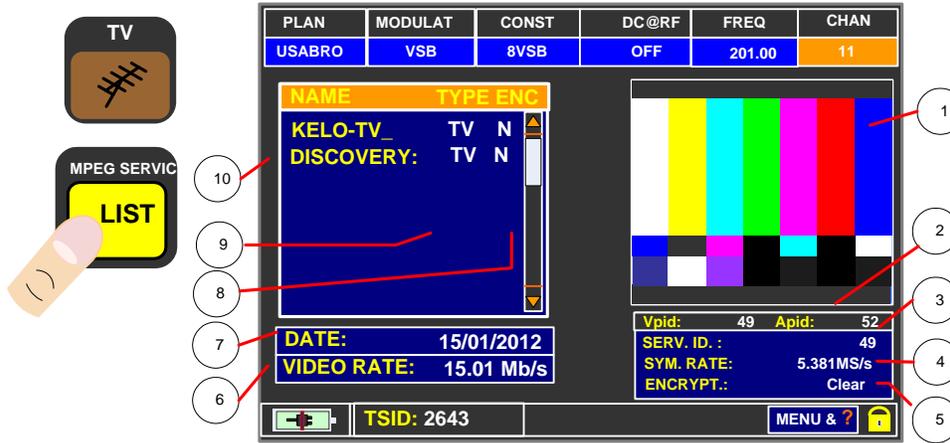


8.21 ASI Input - MPEG Service List Page Description

Analyzing an MPEG transport stream via the ASI INPUT of the DSA1491 uses the MPEG SERVICE LIST feature of the meter. The MPEG SERVICE LIST measurement page provides information regarding the MPEG stream and video service/programs within the stream. It further provides selection of services for monitoring and testing.

The MPEG SERVICE LIST page may be accessed in two ways. From the HOME Menu with the TV icon highlighted, touch the MPEG SERVICE LIST icon. Secondly for convenience from the TV Main Measurement Page, touch the box below the displayed video. Touch the same box to return to the Main Measurement Page from the MPEG SERVICE LIST page.

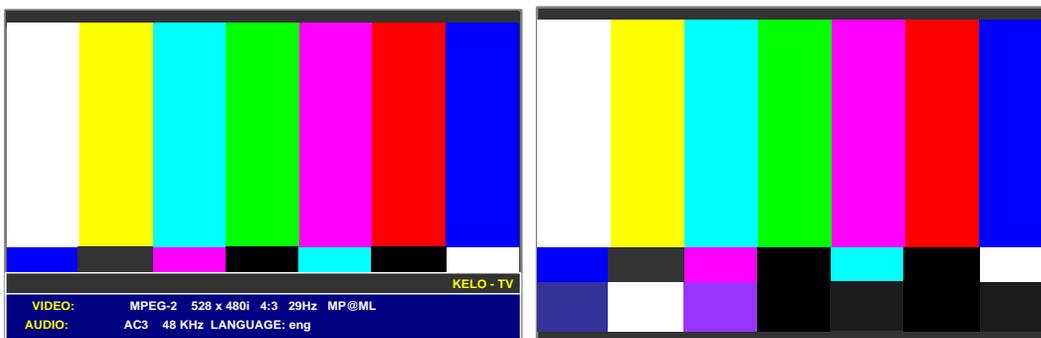
The MPEG SERVICE LIST measurement page provides information regarding the ASI input MPEG transport stream and the selected video service/program contained in the stream. The top and bottom fields are the same as listed and described in the Main Measurement page in section 4.3 or 5.3 of this manual. The unique fields are numbered in the following figure and a brief description of these fields is provided below.



1. **Demodulated Video Display:** Shows the demodulated video of the selected service from the selected satellite transponder.
2. **VPID/APID:** Indicates the VPID (Video Packet Identifier Number) and APID (Audio Packet Identifier Number) of the selected video service/program.
3. **Service ID:** The video service/program identification number
4. **Symbol Rate:** The RF symbol rate of the channel's digital signal
5. **Encryption Status:** Indicates if the video service selected is in the clear or encrypted.
6. **Video Rate:** The MPEG data rate of the selected video service/program
7. **Date:** The current date as listed in the MPEG stream
8. **Encryption Status:** Indicates if the individual services are encrypted (YES) or in the clear non-encrypted (NO).
10. **Service List:** List the video services/programs in the MPEG transport stream

8.22 TV MPEG Video Service Monitoring

The video displayed in the Main Measurement Page or in the MPEG SERVICE LIST page may be expanded to fill the display screen. For a full screen view of the demodulated video of a selected video service touch the displayed video section of the screen.

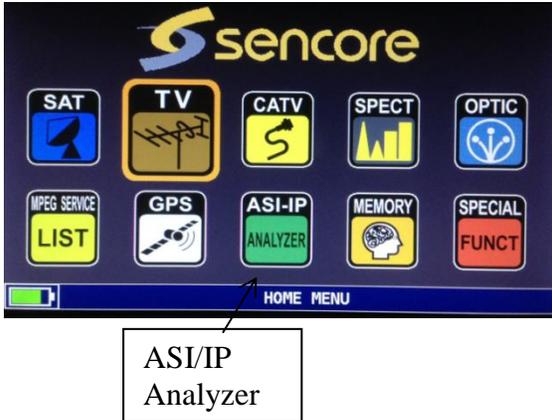


DSA 1491– User Manual

The displayed video initially indicates the video service name along with associated MPEG header video and audio information. This information is located along the bottom of the display and includes the video resolution, aspect ratio, and MPEG compression level. The audio information includes the format, and data rate. After a few seconds for review, the bottom section is pushed to the bottom of the display. When viewing a full video display you may return to the previous measurement screen by touching the center of the screen.

Section 9: ASI-IP Analyzer

The DSA 1491 provides an ASI-IP Analyzer which provides detailed information on the transport stream. Information pages providing detailed service bit rate analysis, ETR 101-290 analysis, DVB table information, and IP analysis. To select the ASI-IP Analyzer press the ASI-IP ANALYZER icon on the Home Menu. The following manual sections provide an overview of the measurement pages within the ASI-IP Analyzer.



ASI-IP Analyzer Inputs

The ASI-IP Analyzer can analyze a transport stream from several available inputs. To select an input touch the ASI-IP icon to select the ASI-IP Analyzer. Touch the top INPUT field to produce a dropdown list of selectable inputs. Touch the desired input to select it.

When analyzing RF signals from the satellite or broadcast/cable tuner the demodulated transport stream can be routed to the ASI-IP Analyzer by selecting the RF(75 ohm) input. When feeding a TS stream into the ASI IN the stream may be routed to the analyzer by selecting the ASI IN input selection. When wanting to de-encapsulate a transport stream from IP feeding the TS Over IP LAN port, select the IP input.

PLAN	INPUT	CONST
USABRO	F(75ohm)	8VSB
TS Bitrate	OPTICAL	39Mbps
Stuff. Bit	RF(75ohm)	36Mbps
Service Num	ASI IN	3
	IP	

RF (75 ohm): Routes the demodulated TS stream from the selected SAT, TV or CATV, tuner to the ASI-IP Analyzer

ASI IN: Routes the transport stream input from the ASI Input jack to the ASI-IP Analyzer

IP: De-encapsulates the transport stream from the IP-TV input and routes the stream to the ASI-IP Analyzer. *Note: The IP-TV functionality is an option on the DSA 1491. A license is required in order to de-encapsulate and analyze the IP.*

9.1 ASI – IP Analyzer: Bitrate/Services Analyzer (Page 1)

The ASI Analyzer provides 3 pages of analysis. The first measurement page provides TS bitrate analysis and services information. To select or advance measurement pages, touch the NEXT field at the bottom right of the display screen. Touch again to increment to the next page and then back to page 1.

PLAN	INPUT	CONST	DC@RF	FREQ	CHAN
USABRO	F (75ohm)	8VSB	OFF	213.00	13

TS Bitrate: 19.39Mbps		Service Info KSFY CW	
Stuff. Bitrate: 0.06Mbps		65 - VIDEO - 8.985	
Service Number: 3		68 - AUDIO - 0.396	

Service	LCN	Bitr.
KSFY-DT		6.88
KSFY CW		9.38
METV		2.42

NID: 13-1		NETW: KSFY-DT	MENU & ?
------------------	--	----------------------	---------------------

TS Bitrate (Upper Left center): This field provides an overall bitrate analysis of the stream and indicates the stuffing bitrate. It also lists the number of services contained in the stream.

Services Field (Bottom Left Center): This field provides a list of the services found in the transport stream. The LCN column provides information as to how many languages are provided with the stream. The Bitr.l column provides a bitrate analysis of the bit rate of each of the services in the stream.

Service Info (Right center): This field provides a listing of the service PIDS associated with the service selected in the Service field to the left. Touch any of the listed services in the service fields to display service related information.

9.2 ASI – IP Analyzer: TR 101-290 Analysis (Page 2)

The ASI-IP analyzer includes a TR 101-290 analysis including Priority 1, Priority 2 and Priority 3 analysis. The TR 101290 analysis on is on Page 2. From the previous Bitrate/Services Analyzer page, touch the NEXT field where the page is indicated at the lower right of the menu.

Status lights are used to indicate current and past compliance to the ETR 101-290 guidelines as defined for Priority 1-3. The following indicator lights are used:

- Green:** No errors detected as defined by the standard for that measurement.
- Red:** Errors are detected exceeding the criteria of the test defined by the standard.
- Yellow:** An error has occurred in the past – but is now compliant to the standard
- Black:** The test is not applicable as this table or item is not available in the stream
- Grey:** The test does not apply and is not being performed

To reset the analysis and error counters – increment the page selection to reselect page 2.

Priority 1 analysis is indicated on the left center of the analysis screen with listed items 1.1 through 1.6. These tests are summarized below. Priority 1 compliance is important to insure compatibility between digital signal encoders and decoders.

PLAN	INPUT	DiS	POL/BND	FREQ	TRANSP
AMC103	F(75ohm)	OFF	HL/18	4091.9	---
Priority 1		Priority 2		Priority 3	
● 1.1 Sync Loss	0	● 2.1 Transp.	0	● 3.1 PID NIT	0
● 1.2 Sync byte	0	● 2.2 CRC	0	● 3.2 SI rep	0
● 1.3.1 PAT Int	0	● 2.3.a PCR rep	0	● 3.3 Buffer err	0
● 1.3.2 PAT PID	0	● 2.3.b PCR disc	0	● 3.4 Unref. PIDs	0
● 1.3.3 PAT scr	0	● 2.4 PCR acc	0	● 3.5 SDT	0
● 1.4.a Cont[Ord]	0	● 2.5 PTS	0	● 3.6 EIT	0
● 1.4.b Cont[Tri]	0	● 2.6.a CAT[Scr]	0	● 3.7 RST	0
● 1.4.c Cont[Los]	0	● 2.6.b CAT[Table]	0	● 3.8 TDT	1
● 1.5.1 PMT Int	0	TIME: 0:00.08		PAG 2/2	
● 1.5.2 PMT Scr	0			NEXT	
● 1.6 PID Err	0				
NID: 1		NETW: PBS		MENU & ?	

Priority 1 Analysis Descriptions:

- 1.1 Sync loss:** Sync loss occurred – two or more consecutive corrupted sync bytes occurred.
- 1.2 Sync byte:** A sync byte value is in error (not equal to 0x47).
- 1.3.1 PAT Int:** A Program Association Table interval error. An interruption occurred as a PAT did not occur every 500 ms.
- 1.3.2 PAT PID:** An improper use of PID 0x0000 occurred
- 1.3.3 PAT scr:** An error occurred regarding the scrambling control field not being 00 for PID 0x0000.
- 1.4.a Cont [Ord]:** Continuity Error –. Incorrect transport stream packet order was detected
- 1.4.b Cont [Tri]:** Continuity Error- A packet occurred twice
- 1.4.c Cont [Los]:** Continuity Error - A lost or missing TS packet occurred

1.5.1 PMT Int: A PMT table interval error occurred. An interruption occurred as a PMT did not occur within 500 mS from a previous PMT occurrence for one of the program PMTs.

1.5.2 PMT Scr: An error occurred regarding the scrambling control field not set to 00 for one of the program PMTs

1.6 PID Err: A video or audio PID referenced in the PMT is not found in the TS stream for over 5 sec.

Priority 2 Analysis is important for compatibility between encoder and decoders in continuous or periodic monitoring applications.

Priority 2 Analysis Descriptions:

2.1 Transport error: The transport stream error indicator field in the TS stream header is set to “1” indicating the packet is tagged as having an error.

2.2 CRC error: A CRC (cyclic redundancy check) indicates an error with one of the tables

2.3a PCR repetition error: An irregularity has occurred in the interval between successive PCRs occurring in the stream. A PCR interval exceeded 40 mS.

2.3b PCR discontinuity error: A difference between consecutive PCR values is outside the 100 mS without the discontinuity indicator set

2.4 PCR accuracy error *(On selected Service): The frequency accuracy of the PCR exceeds +/- 500 ns

2.5 PTS error: The Presentation Time Stamp did not occur within 700 mS.

2.6a CAT [SCR]: An error occurred regarding the scrambling control field not set to 00 for one of the CAT tables

2.6b CAT [Table]: A video or audio PID references a CAT table that cannot be found or is missing.

Priority 3 analysis is important for application specific application dependent monitoring.

Priority 3 Analysis Descriptions:

3.1 PID NIT error: A PID is improperly identified as a NIT or the interval between table occurrence is exceeded.

3.2 SI Rep: An SI table has a repetition interval that is non-compliant – the interval between table occurrence is either too long or too short

3.3 Buffer Error: A buffering error is detected

3.4 Unref. PIDS: (Unreferenced PIDS) PID found in stream that is not referenced in a PMT within 0.5 sec.

3.5 SDT error: The SDT table error exists or the interval between table occurrences is exceeded.

3.6 EIT error: EIT table error or interval between tables is in error

3.7 RRT/RST error: An RRT table error or the interval between tables is exceeded. An RST error

3.8 TDT error: A TDT table error exists or the interval between table occurrences is in error

9.3 ASI – IP Analyzer: PSI/SI Table Analysis (Page 3)

The ASI-IP Analyzer provides PSI information regarding the PAT, CAT, NIT, and SDT tables contained in a DVB signal. From the previous TR 101-290 Analyzer page, touch the NEXT field where the page is indicated at the lower right of the menu. In the PSI/SI Table Analyzer page touch the PAT, CAT, NIT or SDT fields at the left of the display. Analysis information available is shown in the center field. When the listing at the left is not illuminated, the table is not available for selection in the stream. Below is information provided by the PSI/SI Table Analysis.

PAT: Program Association Table information – indicates the transport stream IDs and programs along with their associated PIDs

CAT: Conditional Access Table information – indicates the type and PID information

NIT: Network Information Table data- network ID, transport stream IDs, satellite descriptions, and service list descriptions

SDT: Services Description Table information

PLAN	INPUT	DiS	POL/BND	FREQ	TRANSP
---	ASI IN	---	---	---	---
PAT	Transport stream Id: 101 Program number = 0, Network PID = 0x0010 Program number = 1, PMT PID = 0x1389				
CAT					
NIT					
SDT					
					PAG 3/3 NEXT

PSI/SI Table Analysis

PLAN	INPUT	DiS	POL/BND	FREQ	TRANSP
---	ASI IN	---	---	---	---
PAT	- CA descriptor	PowerVu(0xE00), PID = 90			
CAT					
NIT					
SDT					
					PAG 3/3 NEXT

PSI/SI Table Analysis

PLAN	INPUT	DiS	POL/BND	FREQ	TRANSP
---	ASI IN	---	---	---	---
PAT	Network Id: 8260 - NW name descriptor				
CAT	Number of TS: 1 TS: 1/1				
NIT	TS Id: 101 Original MvId: 826 - Sat. delivery descr.				
SDT	- Service list descr.				
					PAG 3/3 NEXT

PSI/SI Table Analysis

PLAN	INPUT	DiS	POL/BND	FREQ	TRANSP
---	ASI IN	---	---	---	---
PAT	TS Id: 101 Original MvId: 826 Num of services: 1 Service: 1/1				
CAT	serv. name: Dvation HD provider: type: digital television				
NIT	- Service descriptor				
SDT	- CA system descr.				
					PAG 3/3 NEXT

PSI/SI Table Analysis

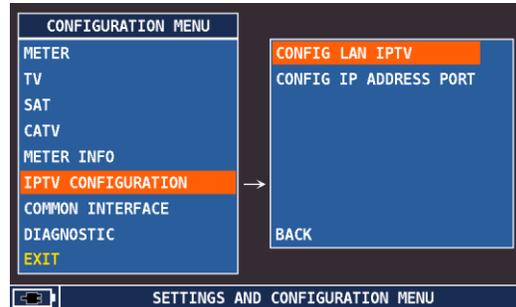
9.3 ASI – IP Analyzer: IP Measurements (Page 4)

The ASI-IP Analyzer provides analysis of an IP-TV input to the TS OVER IP LAN port of the DSA 1491. This feature is an optional feature available with the DSA 1491. The IP Measurements are available on page 4 of the ASI-IP Analyzer function when the IP-TV licensing is active and the IP input is configured and selected.

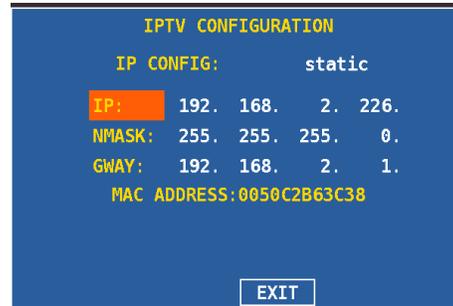
IP Input Setup

This LAN connector is used as the input and output port for the IP-TV analysis and streaming features provided by the DSA 1491.

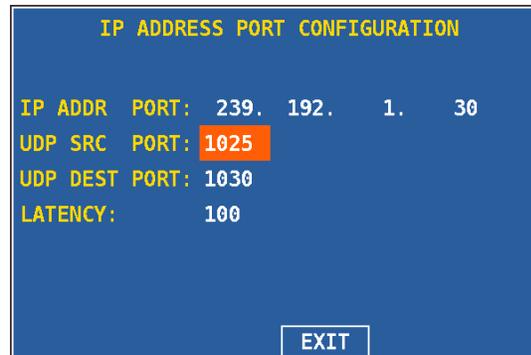
The network and IPTV addressing is done in the IPTV CONFIGURATION menus. To access the IPTV CONFIGURATION field navigate to the CONFIGURATION MENU screen and touch the IPTV CONFIGURATION listing. The IPTV CONFIGURATION menu appears to the right and includes the selectable fields CONFIG LAN IPTV, and CONFIG IP ADDRESS PORT.



The CONFIG LAN IPTV selection provides a menu used to configure the TS Over IP LAN port of the DSA 1491 for connection to a network. The static configuration provides entry of IP, Network Mask and Gateway address entries. Touch the field and enter address values as needed using the popup menu.



The CONFIG IP ADDRESS PORT provides configuration of the IPTV multicast IP and UDP source (SRC) and destination (DEST) port. Touch the CONFIG IP ADDRESS PORT listing. Touch the field for entry. A popup menu provides numeric entry for the individual fields.



For connection to a multicast, configure the port network IP address, mask and gateway. In the IP ADDRESS PORT CONFIGURATION menu enter the multicast address in the IP ADDR PORT field. Enter the destination port in the UDP DEST PORT field. Enter a LATENCY value default of 200. Enter a larger value if more latency or delay is needed.

IP Input Selection

To start IP-TV measurements touch the ASI-IP icon on the meter’s Home Menu. Touch the top INPUT field to produce a dropdown list of selectable inputs. Touch the IP field and press in the large Control Knob to enter. The meter connects to the network as defined and subscribes to the IP-TV stream as configured. The DSA 1491 de-encapsulates the transport stream and provides four measurement pages described in the ASI-IP Analyzer section of this manual.

IP: De-encapsulates the transport stream from the IP-TV input and routes the stream to the ASI-IP Analyzer. *Note: The IP-TV functionality is an option on the DSA 1491. A license is required in order to de-encapsulate and analyze the IP*

PLAN	INPUT
USATSC	F (75ohm)
TS Bitrate: Stuff. Bit: Service Num	OPTICAL
	RF (75ohm)
	ASI IN
	IP

When de-encapsulating the IP-TV stream, upon selection of the IP input the 1st page of the ASI-IP Analyzer is initiated. If the page does not populate, check the IP Over TS LAN port configuration as presented on the previous page and check the source IP-TV. Page 1 of the ASI-IP Analyzer provides Service and Service Info of the TS stream de-encapsulated from the input IP-TV stream. See section 9.1 of this manual for a complete description.

PLAN	INPUT	DiS	POL/BND	FREQ	TRANSP
---	IP	---	---	---	---

TS Bitrate: 19.39Mbps Stuff. Bitrate: 1.23Mbps Service Number: 3	Service Info SDPB 1 49 - VIDEO - 13.936 52 - AUDIO - 0.394 53 - AUDIO - 0.000
---	---

Service	LCN	Bitr.
SDPB 1	11.35	
SDPB 2	3.72	
SDPB 3	2.70	

PAG 1/4	
NEXT	

	NID: 23-1	NETW: SDPB 1	MENU & ?
--	------------------	---------------------	---------------------

IP Measurements (Page 4)

The IP-TV measurements provide an analysis of the input and network performance. With proper setup and input selection, press the page selection field at the bottom right to advance to page 4. The following measurements are provided.

Time:
Indicates the elapsed time from when the IP stream was acquired and test results accumulated.

Protocol Type:
Indicates the IP encapsulation protocol of the incoming IP stream.

PLAN	INPUT	BW	DC@RF	FREQ	CHAN
---	IP	---	---	---	---

<p>IP Measures:</p> <p>Time: 0:04.41</p> <p>Protocol type: rtp</p> <p>Packet num: 7</p> <p>Packet length: 188</p> <p>Bitrate: 19392827</p> <p>FEC type: double L: 20 D: 4</p> <p>Lost packet: 0</p> <p>Corrected pkt row: 0</p> <p>Corrected pkt col.: 0</p> <p>Min. lat.: 93 Max. lat.: 93</p> <p>Overunderun: 0</p> <p>Lock loss: 0</p> <p>Average IAT: 0.548ms</p> <p>Min. IAT: 0.519ms Max. IAT: 1.099ms</p> <p>Std deviation: 0.051ms</p>	<p>Service List</p> <p>SDPB 1</p> <p>SDPB 2</p> <p>SDPB 3</p>
--	--

PAG 4/4
NEXT

NID: 23-1 NETW: SDPB 1 MENU & ?

- Packet Number:** Indicates the number of TS packets in each IP packet.
- Packet Length:** Indicates the byte length of each TS packet.
- Bitrate:** Indicates the IP received bit rate.
- FEC Type:** Indicates the type of FEC coding applied and the L and D values.
- Lost Packets:** Indicates instances in which IP packets were lost or missing.
- Corrected pkt row** - Corrected packets in row: Indicates corrected FEC packets in the rows of FEC coding.
- Corrected pkt col.** - Corrected packets in column: Indicates corrected FEC packets in the columns of FEC coding
- Min. lat.** – Minimum Latency Time: The minimum latency time required to process the FEC coding as measured during the measurement period.
- Max. lat.** - Maximum Latency Time: The maximum latency time needed to process the FEC coding as measured during the measurement period.
- Overunderun** - Buffering memory overflow or underflow events during the measurement period.
- Lock Loss:** Indicates the number of events in which IP TS stream lock was lost.
- Average IAT** (Inter arrival packet time.
- Minimum IAT:** The minimum value of inter arrival packet time deviation measured during the measuring period.
- Maximum IAT:** The maximum value of inter arrival packet time deviation measured during the measuring period.
- Std Deviation** -Standard Deviation:

Section 10: Optic Power Measurements

An optional optical power measurement is available with the DSA1490. The following section describes the optical measurements available with this option.

10.1 Optic Power Function

When working with optical cables and signals please adhere closely to the following warning.

WARNING ! HAZARD !

Never look inside the end of the fiber optic cable. Signals in the cable may cause eye injury.

An integrated Optical Power Meter provides a convenient measurement tool for determining if the level of an optical signal is present and if the link loss is appropriate. A measurement at several popular light wavelengths is provided. Connect the optical cable to the meter at the top OPTICAL IN connector using one of the available adapters. Several adapters are provided to make connection to popular fiber connector types. See the next section of this manual. From the Home Menu, touch the OPTIC icon.



Always make sure the fiber optic connector is properly secured to the meter when making measurements. Periodically clean the optical sensor using ONLY a gas duster - Canned Air.

Set the WAVELENGTH

Touch the WAVELENGTH field at the top right of the measurement screen. Repeat touch the wavelength field or rotate the Large Knob to increment through available values. Select the desired value (850nm, 1310nm, or 1550nm).



Optical Power Measurement

The display indicates the current optical power PWR. The current power level is displayed on the Optical Power Graph level and Optical Power field for the appropriate value (850nm, 1310nm, or 1550nm)

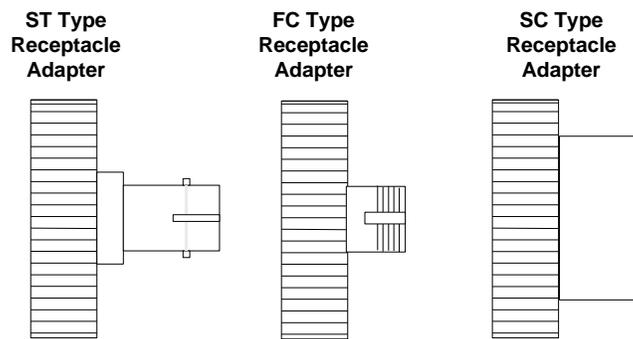
Optical Cable Loss Measurement

An optical measurement may be stored and used as a reference value in which to compare subsequent measurements. The optical power delta or difference between the stored and current measurement is then shown in the LOSS field. This permits the easy calculation of link loss on an optical cable.

To store a reference (REF) value, input and measure the optical signal power at the desired test point. With the test active, highlight the STORE field and press ENTER.

10.2 Optical Input Connectors

The optical option on the DSA 1491 is supplied with several fiber cable adapters. The adapters provide connection from common fiber cable connectors to the optical power meter input jack of the meter. The following section illustrates and describes these adapters.



ST Type Adapter

The ST Type Adapter provides an optical connection from the common ST or “Straight Tip” type fiber connector. The female receptacle accepts connection from a male end ST type fiber connector. The SLM1478 is shipped with this connector already attached to the Optical Power Meter Input Jack.

FC Type Adapter

The FC Type Adapter provides an optical connection from the common FC or “Ferrule Connector” fiber cable connector. The female receptacle accepts connection from a male end FC type fiber connector.

SC Type Adapter

The SC Type Adapter provides an optical connection from the common SC fiber cable connector. The female receptacle accepts connection from a male end SC type fiber connector.

The above adapters are all shipped with a cover or plug to prevent dirt from entering into the receptacle when attached to the Optical Power Meter Input Jack. Be sure to always keep the cover or plug in place to prevent dust and dirt from entering.

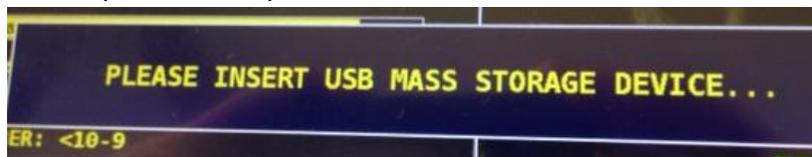
Section 11: Screen Shot Captures

The DSA 1491 offers a simple means to capture and store measurement screens for sharing with others for analysis or for storing test results. The captured images are stored as bitmap files and may be named for identification. The files are written to a USB memory stick inserted into the USB A port at the top center of the meter.



11.1 Capturing Screen Shots to a USB Memory Stick

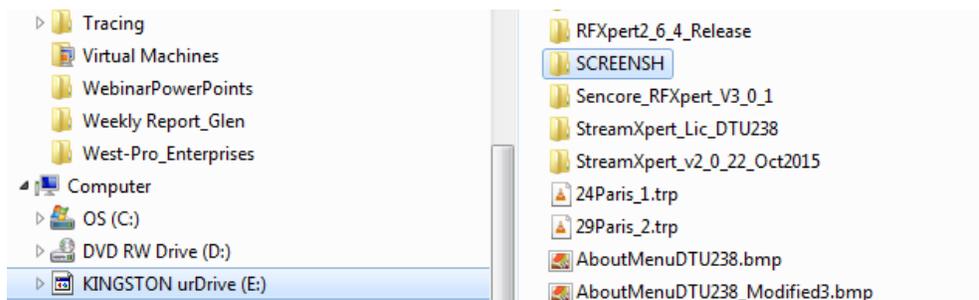
Configure instrument measurement screen to show measurements as desired. Insert a USB memory stick into the USB A port at the top center of the meter. Press the front panel SCREEN SHOT pushbutton. Commonly the first time you press the SCREEN SHOT pushbutton you are prompted to install a USB stick. Install the USB drive or if the stick is already installed, returned to the desired measurement screen and repeat the SCREEN SHOT pushbutton press.



When the SCREEN SHOT pushbutton is pressed you hear several audible beeps from the unit spears while the screen is being captured. Then the file name entry menu appears in which to enter a file name for the captured image.

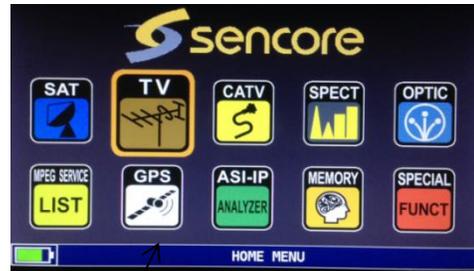


Screen Shot captures are written to the USB memory stick and placed into a created folder called "SCREENSH." Files are saved as bit map (.bmp) files.



Section 12: GPS Measurements

An optional GPS measurement features is available for the DSA 1491. The GPS feature provides global positioning system measurements. A GPS IN jack on the top center of the DSA 1491 provides connection to an external antenna. The GPS signal is analyzed and measurement results displayed. To perform GPS measurements connect a GPS antenna to the GPS IN jack. On the Home Menu touch the GPS icon.



GPS

The following GPS signal quality and positioning Indications are provided.

Signal Quality: An indication of the quality of the GPS antenna reception signal.

Altitude: The altitude as detected by GPS



Speed: The rate or a location change as detected by GPS

GPS Time (UTC): The GPS Universal Time Code

Latitude: The latitude position as determined by GPS system

Longitude: The longitude position as determined by the GPS system

INPUTs:

1 PPS IN: Accepts a pulse per second (PPS) signal from a PPS source or beacon to increase time measurement accuracy.

10 MHz IN: Accepts a reference 10 MHz clock input for improved time/frequency accuracy.

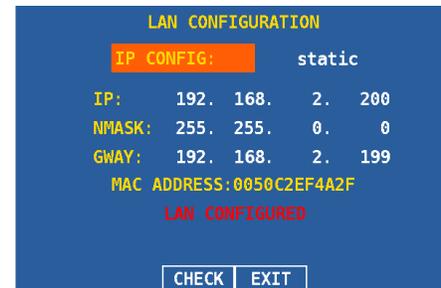
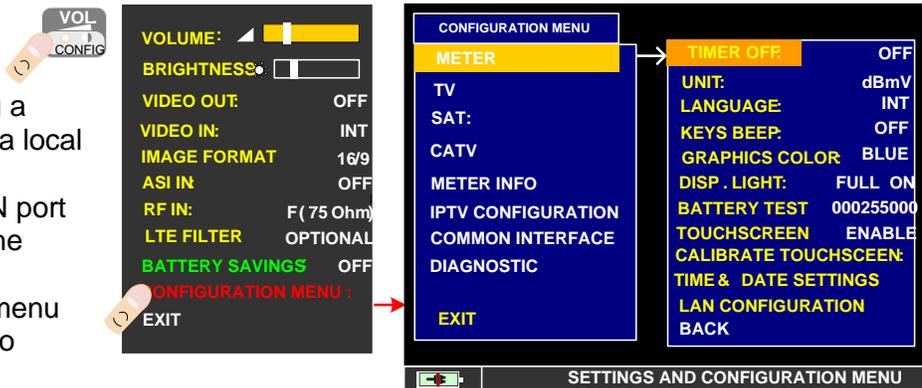
Section 13: Remote Measurement Application

The DSA 1491 contains a remote network control and monitoring capability. This is offered as an option with the DSA 1491. The REMOTE CONTROL option permits a user to use a WEB browser application to connect to the DSA 1491 via a network connection. A user interface within the meter permits remote measurement and spectrum analyzer views of a selected RF channel. The remote application permits channel selection and control.



13.1 Connecting

The REMOTE CONTROL application requires establishing a meter connection to a local network via the MANAGEMENT LAN port on the right side of the meter. The LAN CONFIGURATION menu provides selections to configure the MANAGEMENT LAN connection port. The menu provides selection for a DHCP (Dynamic Host Connection Protocol) IP connection/configuration or static connection/configuration. The static configuration provides entry of IP, Network Mask and Gateway address entries. To configure a LAN connection, navigate to the CONFIGURATION MENU and touch the METER field. Select – touch the LAN CONFIGURATION field. Select DHCP or static and enter the desired address values. A “LAN CONFIGURED” status is indicated when the meter is connected.



In some networks it may be simpler to establish connection by using the network’s DHCP. Select the IP CONFIG field and touch the Static/DHCP field at the right until it reads DHCP. Plug in the network cable to the MANAGEMENT LAN jack of the meter.

DSA 1491– User Manual

The network will detect the port and assign it an IP address. You may also touch the CHECK box at the bottom of the LAN CONFIGURATION menu. DHCP assigns the IP ADDRESS and connects the meter to the LAN.

Use a network connected PC, open a web browser (Firefox, IE, or Chrome) and enter the IP Address of the meter follow by /index.html

For example: **10.0.15.187/index.html**

Note: You must enter the complete address above to reach the IP address and download the starting page of the Remote Control user interface.



13.2 User and Password Entry

Upon connection to the DSA 1491's remote control interface the Unit/Status page appears indicating the meter information. At the bottom of the page are entry fields for entering in a Username and Password. You must correctly enter the username and password to enter and perform monitoring and logging functions.

Username:

The username is the model of the unit with an underscore character preceding it and following it. Look at the Name row of the Meter Info above and enter the model information. You must include a space in the name as indicated by the model name.

Example: **_DSA 1491_**

Password:

The password is the serial number of the unit. Look at the Meter Info information above and enter the serial number into the Password field.

Example: **53938**

Sencore

Meter Info	Value
Name	DSA 1491
Serial Number	53938
HW version	1.00us.M65
FW version	2.42a
Boot version	1.10
uC version	1.08 - TEMP: 29 C
Status	Free Monitoring (M)

Username:

Password:

Login

13.3 REMOTE CONTROL – Settings/Monitor Overview

The Remote Control application menu includes several sections as listed and defined below.

Main: Provides meter information including model, serial number, versions and status.

Monitor: Provides remote monitoring of channel measurements. Compares to thresholds defined for measurements to show a pass or fail condition. Channel parameters are entered in the Settings-Monitor section.

Logger: Provides measurements and logging of multiple channel measurements as defined in the Settings-Logger menu.

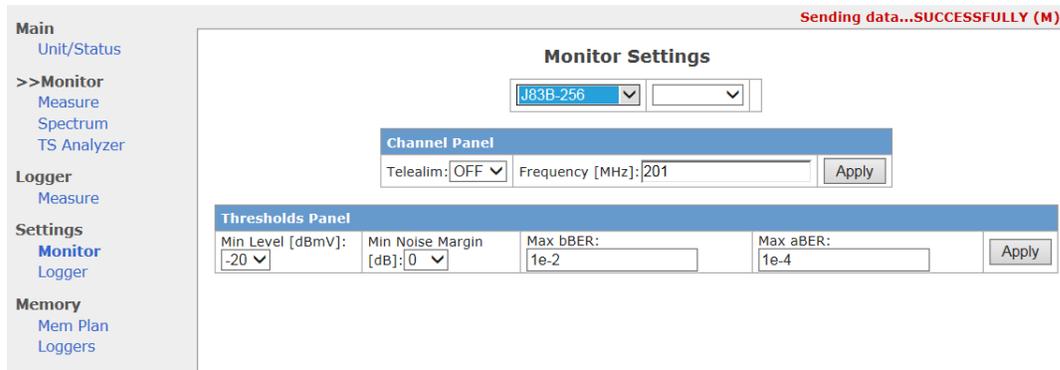
Settings: Provides entry of settings for the channel Monitor functions and Logger functions.

Memory: Provides remote viewing of the meter memory – channel plans.



13.4 Settings - Monitor

The Settings – Monitor section provides selection and control of the meter to establish the channel and threshold criteria for the Monitor tests including the Measure, Spectrum and TS Analyzer. The first step when using the Remote Control application is to select the Monitor section under the Settings to configure an RF channel or carrier for analysis.



The top of the Monitor Settings page provides selection of the signal modulation type. Choose the modulation type for the signal to be monitored.

Channel Panel: This section provides entry of the center channel frequency of the digital channel to be monitored. Enter the center frequency of the digital channel to be monitored.

Thresholds Panel: The section provides entry of the thresholds referenced to determine if the measurements are good or bad and to establish when the signal monitor measurement show good (green) or bad (red). Enter the minimum signal level with the drop down arrow in the Min. Level (dBmV) field. Enter the minimal acceptable noise margin in the Nim. Noise Margin drop down field. Enter the maximum bBER in the Max bBER field. Example enter the minimum value as “1e-2.” Enter the maximum aBER in the Max aBER field

Apply: Click on this field to apply all the entries entered or selected in the Channel Panel or Thresholds Panel.

13.5 Monitoring - Measure

The Measure tab provides measurement data of the selected channel. The Channel Panel section indicates the channel information including the mode, symbol rate, and center channel frequency. The Thresholds Panel section indicates the thresholds or settings used to determine the Measure Panel color coded pass or fail (red or green) indications. The Measure Panel provides measurements relative to the channel mode. For digital channels the Power level, MER, Noise Margin (NsMar) and BER values are indicated. Green colored measurement values indicate passing values meeting the threshold panel settings. Red colored measurement values indicate values which do not meet the threshold panel settings.

Measure ●

Measure...done (M)

Channel Panel			
VSB mode:	Symbol Rate [KS/s]:	Telealim:	Frequency [MHz]:
VSB 8	5381	OFF	201

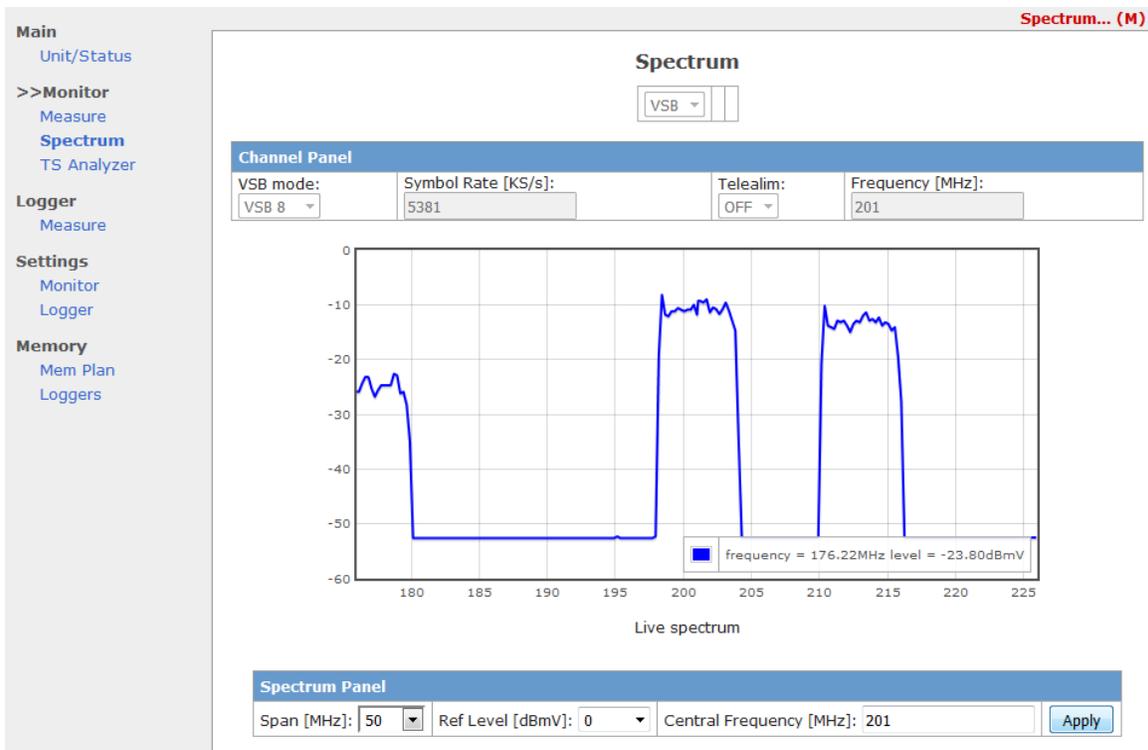
Thresholds Panel			
Min Level [dBmV]:	Min Noise Margin [dB]:	Max bBER:	Max aBER:
-20	0	1e-2	1e-4

Measure Panel	
Power	-8.3 dBmV
MER	37.4 dB
NsMar	15.7 dB
bBer	< e-6
aBer	< e-8

13.6 Monitoring – Spectrum

The Spectrum field within the Monitor section provides a spectrum analysis of the selected channel or frequency. The spectrum is captured from the meter and presented in the application. The spectrum is continually updated with measurement captures from the meter. The Channel Panel provides channel mode, symbol rate and frequency information. This is selected in the Settings – Monitor section.

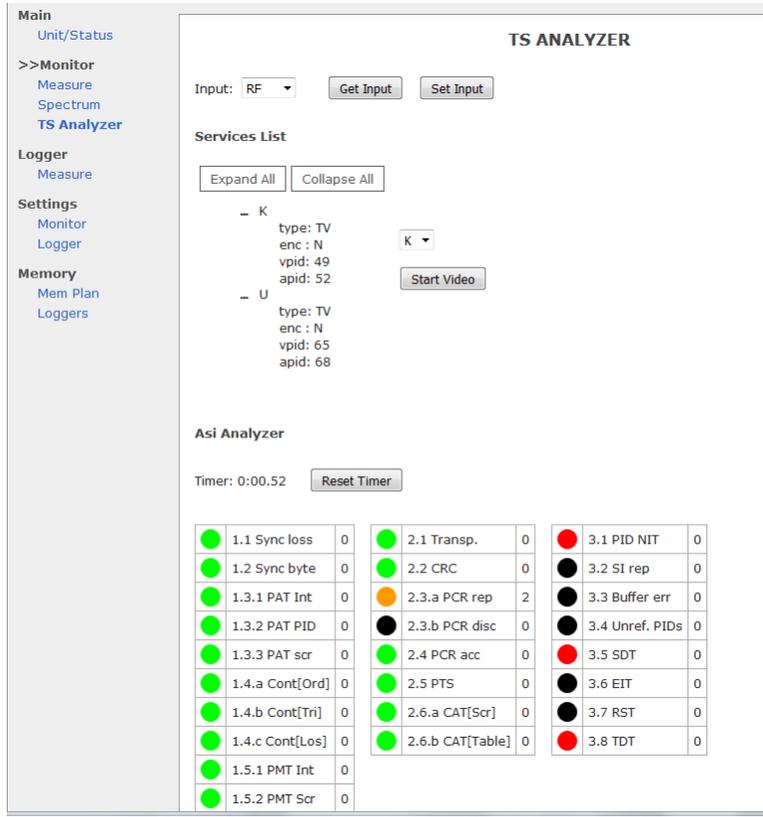
Spectrum Panel: The Spectrum Panel section permits entry or changes to the Spectrum Analyzer’s span, reference Level and center frequency. Select from the drop down list or click on the frequency field and enter the center frequency. Click on the Apply field to enter the selected changes to the meter.



13.7 Monitoring – TS Analyzer

The TS Analyzer provides remote monitoring of the TR101290 analysis provided by the DSA 1491. The TR101290 option must be licensed to enable use.

Get Input – Set Input: The ASI Analyzer provides analysis of the demodulated RF, ASI, and TS over IP inputs. The input to the TS analysis can be selected remotely within the TS Analyzer. Click on the drop down in the Input field and select from the listed inputs. To populate the available inputs click on the Get Input field. Click on the Set Input field to select from the highlighted input in the drop down list.



Services List: The Services List section indicates the available services within the transport stream being analyzed. Click on the Expand All box to see the list of services. Click on the Collapse All box to shorten the list or collapse the listings.

13.8 Settings – Logger

The Settings-Logger section provides settings which define the channels and channel good/bad thresholds for the Logger function. The Logger – Measure function performs measurements of each of the channels defined in the Logger Settings section and logs the measurements in a memory file. The files stored for each channel may be down loaded with the Memory – Loggers function.

Number of Channels: Sets the number of channels to be scanned and measured during the Logger – Measure function. Click the drop down and select the number of channels to be defined. For each of the channels define a section in the Settings – Logger indicating the channel parameters and thresholds.

Channel Panel: This section provides entry of the center channel frequency of the digital channel to be monitored. Enter the center frequency of the digital channel to be monitored.

Thresholds Panel: The section provides entry of the thresholds referenced to determine if the measurements are good or bad and to establish when the signal monitor measurement show good (green) or bad (red). Enter the minimum signal level with the drop down arrow in the Min. Level (dBmV) field. Enter the minimal acceptable noise margin in the Nim. Noise Margin drop down field. Enter the maximum bBER in the Max bBER field. Example enter the minimum value as “1e-2.” Enter the maximum aBER in the Max aBER field

Apply: Click on this field to apply all the entries entered or selected in the Channel Panel or Thresholds Panel.

Sending data...SUCCESSFULLY (L)

Logger Settings

Number of Channels: 3 ▾

CHANNEL 1 VS8 ▾

Channel Panel			
VSB mode:	Symbol Rate [KS/s]:	Telealim:	Frequency [MHz]:
VS8 ▾	5381	OFF ▾	201

Thresholds Panel			
Min Level [dBuV]:	Min Noise Margin [dB]:	Max bBER:	Max aBER:
49 ▾	6 ▾	1e-3	1e-4

CHANNEL 2 VS8 ▾

Channel Panel			
VSB mode:	Symbol Rate [KS/s]:	Telealim:	Frequency [MHz]:
VS8 ▾	0	OFF ▾	213

Thresholds Panel			
Min Level [dBuV]:	Min Noise Margin [dB]:	Max bBER:	Max aBER:
49 ▾	6 ▾	1e-2	1e-4

CHANNEL 3 VS8 ▾

Channel Panel			
VSB mode:	Symbol Rate [KS/s]:	Telealim:	Frequency [MHz]:
VS8 ▾	0	OFF ▾	671

Thresholds Panel			
Min Level [dBuV]:	Min Noise Margin [dB]:	Max bBER:	Max aBER:
49 ▾	6 ▾	1e-3	1e-4

13.9 Logger - Measure

The Logger – Measure function increments through the channels listed and defined in the Settings-Logger section. Measurements of each channel are captured and stored in separate logger files which may be down loaded in the Memory – Loggers section of the Remote Control Application.

Channel Panel: Indicates channel mode, symbol rate, and frequency as setup in the Settings – Logger section.

Thresholds Panel: Indicates channel good/bad threshold levels for the measurements and logger.

Extra Settings Panel: Not applicable with the current version of the application.

The screenshot shows the 'Logger' interface with a sidebar on the left containing navigation options: Main (Unit/Status), Monitor (Measure, Spectrum, TS Analyzer), >>Logger (Measure), Settings (Monitor, Logger), and Memory (Mem Plan, Loggers). The main area is titled 'Logger' and includes a 'Stop Logger' button and a yellow indicator light. Below this are three panels: 'Channel Panel' with fields for VSB mode (VSB 8), Symbol Rate (5381), Telealim (OFF), and Frequency (201); 'Thresholds Panel' with fields for Min Level (49), Min Noise Margin (6), Max bBER (1e-3), and Max aBER (1e-4); and 'Extra Settings Panel' with fields for Video Mismatch (0), Time Before FAIL (10), Max Black Palette (0), and Max Black Screen Size (0). At the bottom is the 'Measure Panel' showing Power (54.2 dBuV), MER (38.8 dB), NsMar (17.1 dB), bBer (< e-6), and aBer (< e-8).

13.10 Memory – Mem Plan and Loggers Loggers

The Memory section of the Remote Control Application provides viewing of the meter’s channel plans. It further provides downloading to a file the measurements captured by the Logger feature.

Mem Plan: Select the Mem Plan feature by clicking of the Mem Plan field. Click on the dropdown at the very top Select Plan field to see a listing of the channel plans within the meter. Click on any of the listed channel plans to load and display the plan information.

Ready Mem Plan (L)

Main
Unit/Status

Monitor
Measure
Spectrum
TS Analyzer

>>Logger
Measure

Settings
Monitor
Logger

Memory
Mem Plan
Loggers

Select plan: TEST 1 ▾

Custom number	Master	Sat Finder programs	Tilt channels
8	USACAB	10,13	

Prg	Mode	Ch	Freq [MHz]	Type	Audio/S.R./B.W.	LNB Pol	DiSEqC	Loc.Osc. [MHz]	Name	Tilt Ch
1	ANALOG-TV	T7	7		4.500 MHz FM				T7	
2	ANALOG-TV	2	55.25		4.500 MHz FM					
3	VSB	3	63	8 VSB	5.381 MS/s					
4	ANALOG-TV	4	67.25		4.500 MHz FM					
5	ANALOG-TV	07	175.25		4.500 MHz FM					
6	ANALOG-TV	13	211.25		4.500 MHz FM					
7	ANALOG-TV	66	475.25		4.500 MHz FM					
8	ANALOG-TV	101	655.25		4.500 MHz FM					
9	ANALOG-TV	158	997.25		4.500 MHz FM					
10	DVB-S		930	DVB-S	1 MS/s	OFF		0	SAT 1	
11	DVB-S		1450	DVB-S	22.222 MS/s	OFF		0	SAT 2	
12	DVB-S		1590	DVB-S	1 MS/s	OFF		0	SAT 3	
13	DVB-S		2250	DVB-S	1 MS/s	OFF		0	SAT 4	
14	VSB	2	57	8 VSB	5.381 MS/s					
15	DVB-S		1350	DVB-S	29.125 MS/s	HL (18V)		5150	PR 15	

Loggers: This feature provides a download of the measurement data for each channel listed in the Logger Settings and captured by the Logger – Measure function. For data (Logger Files) to exist in the Loggers , the Logger function would need to have been active or started previously.

To download data files (Loggers), click on the Loggers field at the left of the main menu. Click on the Loggers Download field. A download menu appears directing the file save to the PC. The file is saved as a .tar file containing multiple .csv files. Use an extraction utility to extract the files. You may open the csv files in a spreadsheet program, such as Excel.

SPECIFICATIONS

STANDARDS:

SAT:	DVB-S, DVB-S2 Single Stream, DVB-S2 Multi-Stream, DSS
TV:	ATSC 8 VSB, Analog NTSC,
CATV:	DVB-C (ETSI EN 300 429), DVB-C Annex A (J83A), DVB-C Annex B (J83B),
ASI:	MPEG-TS on ASI Compliant to EN 50083-9 packet length 188/204 bytes
OPTIC:	Wavelengths: 1310, 1550, 1490, (1610 for USA?)
AUDIO DECODING:	MPEG-1 Layer I / II (ISO-IEC 13818-3) Dolby Digital Plus Dolby AC-3 AAC & HE AAC
VIDEO DECODING:	MPEG-2 MP@ML HDTV (ISO-IEC 13818-2) MPEG-4/AVC (ISO-IEC 14496-10) ITU-T H.264 ITU-T HEVC (2014 with Interchangeable MPEG decoder board)

DIGITAL SATELLITE

Standard:	DVB-S (EN 300421), DVB-S2 Single Stream, DVB-S2 Multi stream, DSS
RF Input:	75 Ω "F" connector
RF Input R/L:	SAT > 16 dB, TV/CATV > 18 dB, SAT >
Optical Input:	Interchangeable connector ST/SC/FC, (selectable input via menu)
Input level range:	30 to 130dBμV
Max input power:	+30 dBm (30V with DC @ RF Switch open)
Frequency range:	930 MHz to 2250 MHz
Tuning:	By Satellite Transponder or direct frequency entry
Frequency resolution:	1MHz (with 100 KHz AFC Control)
Modulation:	QPSK, 8PSK, 16APSK, 32APSK
Roll Off:	Automatic selection in line with the selected standard
FEC:	1/2, 2/3, 3/4, 5/6, 7/8, (QPSK Only DVB-S), Auto selection DVB-S: 1 to 45MS/s, Auto selection DVB-S2: 2 to 45MS/s, Auto selection
Symbol Rate:	(DVB-S2 Multistream): From 1 to 10
ISI Selection:	(DVB-S2 Multi-stream): Automatic detection and reading
ISSY synchronization (DVB-S2 Multi-stream):	On, off. Automatic detection & reading
Pilot (DVB-S2):	Normal, short. Automatic detection and reading
FEC Frame (DVB-S2):	V (13V) / H(18V) polarization, 22kHz tone
LNB Control:	DiSEqC 1.0 and 2.0, SCR & MOTOR

DIGITAL SATELLITE PERFORMANCE

Synchronization Indication:	Unlock, Power Too Low, Lock
RF power level accuracy:	1dB typ. (2dB max)
RF level unit:	dBμV, dBmV, dBm selectable
AFC - Capture range:	0 to 5MHz – step 100kHz
LNB frequency error measurement:	0 to 5MHz – step 100kHz
MER Range:	Up to 25dB
MER Accuracy:	0,5dB up to 18dB - 1dB from 19 to 25dB
BER before Viterbi (DVB-S):	1E-06 to 2E-02
BER after Viterbi (DVB-S):	1E-08 to 0
BCH (DVB-S2):	1E-06 to 1E-02
LDPC (DVB-T2):	1E-08 to 0
PER (DVB-S2):	1E-07 to 0
Constellation:	Constellation diagram with standard-specific grid and zoom
Analog Measurement:	Level

SATELLITE SPECIAL FUNCTIONS:

SAT SCR:	Selects SCR LNB RF's outputs, checks reception (Spectrum or Measurement)
DUAL FEED LNB:	Tests Dual Feed LNB 9°&13°, 13°&19° or 19°&23° or others, Measures two transponders via supplied DiSEqC A/B switch
DiSEqC MOTOR:	Control/Moves motor via DiSEqC commands (Spectrum or Measurement)
SAT FINDER:	Searches/detects 3 transponders to identify a satellite
BUZZER & NOISE MAR:	SAT or TV, Graphs the Noise Margin vs time indicating real time signal quality
SAT POINT:	Spectrum with MAX HOLD -facilitates dish pointing/signal peaking
SAT EXPERT (Option):	Advanced universal SAT pointer, a faster & accurate SAT FINDER

DSA 1491– User Manual

Digital TV (T/T2 Model)

Standard:	DVB-T/DVB-H (ETSI EN 300 744), DVB-T2 (ETSI EN 302 755)
RF input:	1- 75 Ω "F" connector
OPTIC input:	Interchangeable connector ST/SC/FC, (Menu Selected input)
Input level range:	29 to 130dB μ V
Max input:	+30dBm (30V with no int. volts to the RF input)
Frequency range:	47MHz to 1000 MHz
Frequency resolution:	50kHz
OFDM Modulation:	QPSK, 16QAM, 64QAM (DVB-T), 256QAM (DVB-T2)
FFT mode:	2k, 8k (DVB-T), 1k, 2k, 4k, 8k, 16k, 32k (DVB-T2) Automatic selection
Guard Interval:	1/4, 1/8, 1/16, 1/32 (DVB-T), 1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256 (DVB-T2) Automatic selection
FEC:	1/2, 2/3, 3/4, 5/6, 7/8 (DVB-T), 1/2, 2/3, 3/4, 5/6, 7/8, 3/5, 4/5 (DVB-T2) Automatic selection
Channel Bandwidth:	5MHz, 6 MHz, 7 MHz, 8 MHz

Digital TV (ATSC Model)

Standard:	ATSC 8 VSB
RF input:	1- 75 Ω "F" connector
Input level range:	29 to 130B μ V
Max input power:	+30dBm
Frequency range:	47MHz to 1000 MHz

DIGITAL TV MEASUREMENTS

Synchronization indication:	Unlock, Power Too Low, Lock
RF power level accuracy:	0.5dB typ. (1dB max)
RF level unit:	dB μ V, dBmV, dBm Selectable
MER Range:	Up to 38 dB
MER Accuracy:	0.5dB up to 38dB,
bBER before:	1E-09 to 1E-02
aBER after:	1E-09 to 0
Constellation:	Constellation diagram with standard-specific grid and zoom

DIGITAL CABLE

Standard:	DVB-C (ETSI EN 300 429),
Input RF:	1- 75 Ω "F" connector
Optic Input:	Interchangeable connector ST/SC/FC
Input level range:	35 to 130dB μ V
Max input power:	+30dBm (30V with DC @ RF Switch Open)
Frequency range:	4MHz to 1000 MHz
Frequency resolution:	50kHz
Modulation:	16QAM, 32QAM, 64QAM, 128QAM, 256QAM (DVB-C), 1024QAM (DVB-C2)
Symbol rate:	2 to 6.999MS/s - Automatic selection FEC:
Channel Bandwidth:	6 MHz, 7 MHz, 8 MHz

CATV PERFORMANCE

Synchronization indication:	Unlock, Power Too Low, Lock
RF power level accuracy:	0.5dB typ. (1dB max)
RF level unit:	dB μ V, dBmV, dBm selectable
MER Range:	Up to 40 dB
MER Accuracy:	0.5dB typ.
BER before Reed Solomon:	1E-09 to 1E-02
BER after Reed Solomon:	1E-09 to 0
Constellation:	Constellation diagram with standard-specific grid and zoom

DIGITAL CATV & TV SPECIAL FUNCTIONS

AutoDiscovery	Automatic Digital Signal Type ID
Antenna Reception Peaking:	Buzz & Noise Margin Graph
Attenuation Test:	Attenuation of 3 Selected Freq. from Ref. TP.
Leakage:	μ V/M Signal Intensity Meter – shows leakage strength in CATV system
Ingress:	5-65 MHz Spectrum Analyzer with Peak Hold
Bar Scan Test:	Multi-CH. Level via bars
Tilt Test:	Ch. 1/Ch.2 Level Ratio – BarScan Display

OPTICAL

Input interface:	FC / ST / SC exchangeable connectors
Wavelengths range:	WL 1310 - 1490 (1625 for USA) - 1550
Optical input level range:	- 40 dBm to +10 dBm
Optical level resolution:	0.1dB
Optical level accuracy:	0.5dB

ANALOG TV

Standard:	NTSC B-G-I-L-M-N
RF input:	75 Ω "F" connector
Input level range:	5 to 130 dBμV (-50 to 70 dBmV)
Max input power:	+30 dBm (DC @ RF Input Switch Open)
Frequency range:	4 MHz to 1000 MHz
Frequency resolution:	50 kHz
Level indications:	Level to low
Analog Measurements:	Video level, A/V ratio, C/N ratio
RF power level accuracy:	0.5dB typ. (1dB max)
Level Resolution:	0.1 dB
RF level unit:	dBμV, dBmV, dBm selectable
C/N measurement:	30 to 45dB +/-1.5dB Max; 45-50dB +/-2dB
A/V ratio:	4dB to 26dB
A/V ratio accuracy:	1.5 dB typ. (2 dB max.)
Audio carrier FM modulation:	4,5MHz, 5,5 MHz, 6,0 MHz, 6,5 MHz
Measure Filter Bandwidth:	100 kHz

LAN IP/ASI ENCAP./DENCAP. (Option)

IP Interface:	LAN 1 Gb/s Ethernet interface
IP protocol:	UNICAST/MULTICAST RTP/UDP WITH 2 dimensional FEC IGMP v2
Destination MAC Address:	MAC is the host receiver in unicast; in multicast it is the MAC multicast defined by the Destination IP address
FEC:	Pro MPEG CoP#/SMPTE 2022

IP MEASUREMENT

Streaming status:	Present, Not Present
Number of MPEG packet size:	1 - 7
TS packet size:	188, 204
FEC status:	No FEC, FEC1, FEC2
L:	$1 \leq L \leq 20$
D:	$4 \leq D \leq 20$
Input Ethernet port:	1, 2, both
TS Bitrate:	0 - 216 Mb/s
Missing packets recovery:	0 - ∞
IP Stream Jitter:	0 - 1000 ms
IAT:	MIN, MAX, MED, Jitter

ASI MODE

ASI Mode:	MPEG-TS on ASI, (ASI IN set to On in Config. Menu)
ASI Status:	Lock 188, Lock 204, Unlock
ASI Bitrate:	0 - 216 Mb/s
Transport Stream Content:	MPEG2 and MPEG4 HD Service

SAT, TV & CATV SPECTRUM ANALYZER

Frequency range:	4MHz to 2.250 MHz
RF level range:	5 to 130dBμV
Resolution Bandwidth:	TV / CATV = 100kHz, SAT = 4MHz /1MHz selectable
SPAN TV/CATV:	2, 5, 7, 10, 20, 50, 100, 200, 500 MHz, Full (4-1000MHz),VHF,UHF,
SPAN SAT:	50,100, 200, 500 MHz, FULL band 930-2.250 MHz
Video Bandwidth:	Automatic selection
Satellite:	FAST mode = 10kHz, SUPERFAST mode =5kHz
TV & CATV:	FAST mode = 100kHz, SUPERFAST mode =50kHz
Frequency sweep:	Up to 80ms
dB/div scale selection:	1dB/div, 2dB/div, 5dB/div, 10dB/div

SPECTRUM ANALYZER SPECIAL FUNCTIONS

Max-hold function:	Shows maximum level line and the real-time signal spectrum simultaneously
Spectrum save & recall function:	Save spectrum display to internal memory – may recall to view stored spectrums
Marker Measurements:	Single marker: Measures a marked position on spectrum Delta marker: Measures Freq. delta and power measurement delta Marker BW: 3 markers measure bandwidth, and bandwidth power
Help function:	Performs channel auto-discovery from the center signal spectrum (DVB-T/2, DVB-S/S2, DVB-C/C2, Symbol Rate, Center frequency, Full Picture or Envelope, MENU Selectable)
Visualization modes:	GREEN BLUE GREY BROWN configuration menu selection
Trace color schemes Customizable:	

MPEG Service List Function

Network/Program (Bouquet) ID:	Service Names Listed
Modulation Parameters ID:	Modulation Type Shown
Service Encryption Detection:	Yes/No Indicator
Encryption/CA System ID:	Type Listed
Bouquet/Network Service List:	A/V PID List
MPEG 2/4 Demodulator:	Video Program Displayed (Free to air)
LCN:	Detected/Listed

TS Analyzer

TS Analyzer Interface:	RF via F 75 ohm, ASI Input via 75 Ω BNC connectors, IP via RJ45 port, Optical
ASI mode:	MPEG-TS on ASI - compliant to EN 50083-9ujl
Packet length:	188 / 204 bytes
Transport Stream content:	MPEG-2 and MPEG-4 HD Services

TR 101 290 v1.2.1 Analysis

1 st Priority monitoring:	1.1 Sync loss, 1.2 Sync byte, 1.3.1 PAT Int, 1.3.2 PAT PID, 1.3.3 PAT scr, 1.4.a Cont [Ord], 1.4.b Cont [Tri], 1.4.c Cont [Los], 1.5.1 PMT Int, 1.5.2 PMT Scr, 1.6 PID Err
2nd priority monitoring	:2.1 Transport error, 2.2 CRC error, 2.3a PCR repetition error, 2.3b PCR discontinuity error, 2.4 PCR accuracy error *, 2.5 PTS error, 2.6a CAT [SCR], 2.6b CAT [Table] * on a selected Service
3rd priority monitoring:	3.1 PID error, 3.2 SI Rep, 3.4 UNREF PIDS, 3.5 SDT error, 3.6 EIT error, 3.7 RST error, 3.8 TDT error

MPEG TS Information Monitoring

SI tables decoding:	Visualization of service list, stream type
PMT decoding:	Service PID composition; real time refresh on service selection
Bitrate measurement:	TS total bitrate, Stuffing rate Service bitrate,
ES bitrate range:	0 to 270Mb/s Resolution 1kb/s

Data Storing & Logging

Automemory:	Auto Scan detect - store channels creating AUTO tuning plan
Manumemory:	Creates mixed channel/transponder tuning plan for SAT-TV-CATV-RADIO
Datalogger:	Auto measure a MANU or AUTO ch. plan and store measurement data
Data Logger Capacity:	Store up to 1300 channels
Data export:	USB-to connect an external USB device 10/100 Base-T LAN to download data on an external PC
Memory Plans:	99 with 199 transponders per plan
Logger Plans:	99 logger plans

Input/Output Interfaces

LAN IPTV (option):	Encaps./De-encaps. IP to ASI/ASI to IP
Universal Serial Bus (USB):	1x USB-A, USB On-The-Go for USB memory stick 1x USB-B for PC connection
Local Area Network (LAN):	1x 10/100 Base-T Ethernet interface (management)
Asynchronous Serial Interface (ASI):	ASI input on 75Ω BNC connector
ASI output:	75Ω BNC connector
Audio / Video:	Composite A/V input
HDMI output:	Output to switch & view display screen on HDMI monitor
USB Port B:	USB 2.0 B type connector - PC interface

DSA 1491– User Manual

Common Interface
USB B Interface:
Ethernet:* (option:)

PCMCIA slot for single/multi-service CAM modules
SMART Management Software – FW updates, File Export, Create/Edit Ch. plans
Instrument remote measurement application via SNMP*

Other Specifications

CPU:	ARM11 & Cortex ARM7
TFT Display:	TFT LCD Format/Resolution
Display Resolution:	9"- high brightness backlit display 16:10
Resolution:	720p to 1080p
Graphical User Interface:	Selectable color themes (green, blue, grey, brown)
Operation:	(Dual command - TOUCH and/or MECHANICAL)
Touch Screen:	Enable/Disable via Configuration Menu
Control/Pushbuttons:	24 step encoder, 6 button mechanical switch panel
Operating temperature range:	0° C to +50° C
Storage temperature range:	-25° C to 70° C
Humidity:	Up to 90% non condensing
AMSL:	Up to 3.000 m
External power adapter - Input:	110 VAC to 240 VAC- 50 Hz to 60 Hz
Power Supply External Output:	12 VDC - max 3A
Internal Battery:	LI-ion Polymer, 7.4V 4800mAH 35.5 wH, Part #GH1911700505
Energy saving: Battery saving function:	Meter auto-off timer: OFF, 5 min, 10 min
Battery Reconditioning:	Built-in Test & Recovery Algorithm
Battery Operation Time:	4-5 Hrs. Typical Use
Dimensions W x H x D:	323 mm x 175 mm x 60 mm
Body:	Aluminum and Steel
Weight:	Unit only 2,2 kg, Unit with battery and soft bag: 3,1 kg

SUPPLIED ACCESSORIES:

Soft protection bag
AC power adapter 110/270 V to dc 12V 3A
Spare double "F" Female connector
DiSEQC A/B Switch (2way)
USB 2.0 Cable

APPENDIX A – NORTH AMERICA CHANNEL PLANS

Channel Plans

Cable Channel Frequency Plans on FCC Digital, FCC, HRC, IRC, 50-870 Mhz

Based on Joint EIA/NCTA Engineering Committee approval (EIA IS-6 Interim Standard). Frequencies include Aeronautical FCC designated Offset Frequencies (Designated by an *). HRC carriers are computed with a 6.000300 MHz +/- 1 Hz Comb Generator accuracy. VHF and UHF channels are per the FCC designations.

Sub-Band VHF Cable TV Channels, 5-50 Mhz

Channel #	FCC– DIG.	FCC	HRC	IRC	VHF/UHF
T-7	7.00	---	---	---	---
T-8	13.00	---	---	---	---
T-9	19.00	---	---	---	---
T-10	25.00	---	---	---	---
T-11	31.00	---	---	---	---
T-12	37.00	---	---	---	---
T13	43.00	---	---	---	---

Low-High VHF EIA/NCTA TV Channels

Channel #	FCC Digital	FCC Ana.	HRC	IRC	VHF/UHF
1	-----	-----	72.0036	73.2500	-----
2	57.00	55.25	54.0027	55.2500	57.00
3	63.00	61.25	60.0030	61.2500	63.00
4	69.00	67.25	66.0033	67.2500	69.00
5	79.00	77.25	78.0039	79.2500	79.00
6	85.00	83.25	84.0042	85.2500	85.00
7	177.00	175.25	174.0080	175.2500	177.00
8	183.00	181.25	180.0090	181.2500	183.00
9	189.00	187.25	186.0093	187.2500	189.00
10	195.00	193.25	192.0096	193.2500	195.00
11	201.00	199.25	198.0099	199.2500	201.00

DSA 1491– User Manual

12	207.00	205.25	204.0102	205.2500	207.00
13	213.00	211.25	210.0105	211.2500	213.00

CHANNEL PLANS

Mid-band Cable Channels and UHF Broadcast Channels 120-170 Mhz.

Channel #	FCC Digital	FCC	HRC	IRC	VHF/UHF
14	123.00	*121.2625	120.0060	*121.2625	473.00
15	129.00	*127.2625	126.0063	*127.2625	479.00
16	135.00	*133.2625	132.0066	*133.2625	485.00
17	141.00	139.2500	138.0069	139.2500	491.00
18	147.00	145.2500	144.0072	145.2500	497.00
19	152.00	151.2500	150.0075	151.2500	503.00
20	159.00	157.2500	156.0078	157.2500	509.00
21	165.00	163.2500	162.0081	163.2500	515.00
22	171.00	169.2500	168.0084	169.2500	521.00

Aeronautical Offset Freq. Allocation

Super-band Cable TV Channels and UHF Broadcast Channels

Channel #	FCC Digital	FCC	HRC	IRC	VHF/UHF
23	219.00	217.2500	216.0108	217.2500	527.00
24	225.00	223.2500	222.0111	223.2500	533.00
25	231.000	*229.2625	228.0114	*229.2625	539.00
26	237.00	*235.2625	234.0117	*235.2625	545.00
27	243.00	*241.2625	240.0120	*241.2625	551.00
28	249.00	*247.2625	246.0123	*247.2625	557.00
29	255.00	*253.2625	252.0126	*253.2625	563.00
30	261.00	*259.2625	258.0129	*259.2625	569.00
31	267.00	*265.2625	264.0132	*265.2625	575.00
32	273.00	*271.2625	270.0135	*271.2625	581.00
33	279.00	*277.2625	276.0138	*277.2625	587.00
34	285.00	*283.2625	282.0141	*283.2625	593.00

DSA 1491– User Manual

35	291.00	*289.2625	288.0144	*289.2625	599.00
36	297.00	*295.2625	294.0147	*295.2625	605.00

Aeronautical Offset Freq. Allocation

Hyper-band Cable Channels and UHF Broadcast Channels 37-74

Channel #	FCC Digital	FCC	HRC	IRC	VHF/UHF
37	303.00	*301.2625	300.0150	*301.2625	611.00
38	309.00	*307.2625	306.015	*307.2625	617.00
39	315.00	*313.2625	312.0156	*313.2625	623.00
40	321.00	*319.2625	318.0159	*319.2625	629.00
41	327.00	*325.2625	324.0162	*325.2625	635.00
42	333.00	*331.2750 (+25k)	330.0165	*331.2750 (+25k)	641.00
43	339.00	*337.2625	336.0168	*337.2625	647.00
44	345.00	*343.2625	342.0171	*343.2625	653.00
45	351.00	*349.2625	348.0174	*349.2625	659.00
46	357.00	*355.2625	354.0177	*355.2625	665.00
47	363.00	*361.2625	360.0180	*363.2625	671.00
48	369.00	*367.2625	366.0183	*367.2625	677.00
49	375.00	*373.2625	372.0186	*373.2625	683.00
50	381.00	*379.2625	378.0189	*379.2625	689.00
51	387.00	*385.2625	384.0192	*385.2625	695.00
52	393.00	*391.2625	390.0195	*391.2625	701.00
53	399.00	*397.2625	396.0198	*397.2625	707.00
54	405.00	403.25	402.0201	403.2500	713.00
55	411.00	409.25	408.0204	409.2500	719.00
56	417.00	415.25	414.0207	415.2500	725.00
57	423.00	421.25	420.0210	421.2500	731.00
58	429.00	427.25	426.0213	427.2500	737.00
59	435.00	433.25	432.0216	433.2500	743.00
60	441.00	439.25	438.0219	439.2500	749.00
61	447.00	445.25	444.0222	445.2500	755.00

DSA 1491– User Manual

62	453.00	451.25	450.0225	451.2500	761.00
63	450.00	457.25	456.0228	457.2500	767.00
64	465.00	463.25	462.0231	463.2500	773.00
65	471.00	469.25	468.0234	469.2500	779.00
66	477.00	475.25	474.0237	475.2500	785.00
67	483.00	481.25	480.0240	481.2500	791.00
68	489.00	487.25	486.0243	487.2500	797.00
69	495.00	493.25	492.0246	493.2500	803.00
70	501.00	499.25	498.0249	499.2500	-----
71	507.00	505.25	504.0252	505.2500	-----
72	513.00	511.25	510.0255	511.2500	-----
73	519.00	517.25	516.0258	517.2500	-----
74	525.00	523.25	522.0261	523.2500	-----

Cable Channels 75-99

Channel #	FCC Digital	FCC	HRC	IRC	VHF/UHF
75	531.00	529.25	528.0264	529.2500	---
76	537.00	535.25	534.0267	535.2500	---
77	543.00	541.25	540.0270	541.2500	---
78	549.00	547.25	546.0273	547.2500	---
79	555.00	553.25	552.0276	553.2500	---
80	561.00	559.25	558.0279	559.2500	---
81	567.00	565.26	564.0282	565.2500	---
82	573.00	571.25	570.0285	571.2500	---
83	579.00	577.25	576.0288	577.2500	---
84	585.00	583.25	582.0291	583.2500	---
85	591.00	589.25	588.0294	589.2500	---
86	597.00	595.25	594.0297	595.2500	---
87	603.00	601.25	600.0300	601.2500	---
88	609.00	607.25	606.0303	607.2500	---

DSA 1491– User Manual

89	615.00	613.25	612.0306	613.2500	---
90	621.00	619.25	618.0309	619.2500	---
91	627.00	625.25	624.0312	625.2500	---
92	633.00	631.25	630.0315	631.2500	---
93	639.00	637.25	636.0318	637.2500	---
94	645.00	643.25	642.0321	643.2500	---

Aeronautical Offset Freq. Allocation

FM Mid-band Cable Channels

Channel #	FCC Digital	FCC	HRC	IRC	VHF/UHF
95	93.00	91.25	90.0045	91.2500	-----
96	99.00	97.25	96.0048	97.2500	-----
97	105.00	103.25	102.0051	103.2500	-----
98	111.00	*109.2750(+25k)	108.0054	109.2750	-----
99	117.00	*115.2750(+25k)	114.0057	115.2750	-----

Cable Channels 100-136

Channel #	FCC Digital	FCC	HRC	IRC	VHF/UHF
100	651.00	649.25	648.0324	649.25	---
101	657.00	655.25	654.0327	655.25	---
102	663.00	661.25	660.0330	661.25	---
103	669.00	667.25	666.0333	667.25	---
104	675.00	673.25	672.0336	673.25	---
105	681.00	679.25	678.0339	679.25	---
106	687.00	685.25	684.0342	685.25	---
107	693.00	691.25	690.0345	691.25	---
108	699.00	697.25	696.0348	697.25	---
109	705.00	703.25	702.0351	703.25	---
110	711.00	709.25	708.0354	709.25	---
111	717.00	715.25	714.0357	715.25	---
112	723.00	721.25	720.0360	721.25	---
113	729.00	727.25	726.0363	727.25	---

DSA 1491– User Manual

114	735.00	733.25	732.0366	733.25	---
115	741.00	739.25	738.0369	739.25	---
116	747.00	745.25	744.0372	745.25	---
117	753.00	751.25	750.0375	751.25	---
118	759.00	757.25	756.0378	757.25	---
119	765.00	763.25	762.0381	763.25	---
120	771.00	769.25	768.0384	769.25	---
121	777.00	775.25	774.0387	775.25	---
122	783.00	781.25	780.0390	781.25	---
123	789.00	787.25	786.0393	787.25	---
124	795.00	793.25	792.0396	793.25	---
125	801.00	799.25	798.0399	799.25	---
126	807.00	805.25	804.0402	805.25	---
127	812.00	811.25	810.0405	811.25	---
128	819.00	817.25	816.0408	817.25	---
129	825.00	823.25	822.0411	823.25	---
130	831.00	829.25	828.0414	829.25	---
131	837.00	835.25	834.0417	835.25	---
132	843.00	841.25	840.0420	841.25	---
133	849.00	847.25	846.0432	847.25	---
134	855.00	853.25	852.0426	853.25	---
135	861.00	859.25	858.0429	859.25	---
136	867.00	865.25	864.0432	865.25	---

Cable Channels 137-158

Channel #	FCC Digital	FCC	HRC	IRC	VHF/UHF
137	873.00	871.25	870.0435	871.25	---
138	879.00	877.25	876.0438	877.25	---

DSA 1491– User Manual

139	885.00	883.25	882.0441	883.25	---
140	891.00	889.25	880.0444	889.25	---
141	897.00	895.25	894.0447	895.25	---
142	903.00	901.25	900.045	901.25	---
143	909.00	907.25	906.0453	907.25	---
144	915.00	913.25	912.0456	913.25	---
145	921.00	919.25	918.0459	919.25	---
146	927.00	925.25	924.0462	925.25	---
147	933.00	931.25	930.0465	931.25	---
148	939.00	937.25	936.0468	937.25	---
149	945.00	943.25	942.0471	943.25	---
150	951.00	949.25	948.0474	949.25	---
151	957.00	955.25	954.0477	955.25	---
152	963.00	961.25	960.048	961.25	---
153	969.00	967.25	966.0483	967.25	---
154	975.00	973.25	972.0486	973.25	---
155	981.00	979.25	978.0489	979.25	---
156	987.00	985.25	984.0492	985.25	---
157	993.00	991.25	990.0495	991.25	---
158	999.00	997.25	996.0498	997.25	---

Appendix B - Cleaning/ Maintenance Information

CLEANING THE METER

Cleaning the meter from dust and dirt helps maintain the touch screen and other components through the years. Cleaning is simple and requires little attention. Never use chemical aggressive products and/or abrasive or rough clothes as they will scratch the surface material over the display and may damage other components. Always use a soft clean cloth, dampened with warm water or an alcohol solution. You may use a degreasing agent but not abrasive liquid soap. Keyboard and display components should be gently cleaned. Rubbing the keyboard and/or the display(s) may scratch or damage their functions.

MAINTENANCE AND CARE OF THE METER

The Sencore DSA 1491 touch meter has been designed to withstand the rigorous conditions of field use. However, its appearance and useful life may be prolonged by following some simple and effective guidelines.

- The meter's touch screen protective film, although durable, is subject to scratching by continual touches with dirt or sand particles embedded into fingers or gloves. Clean fingers or gloves can reduce scratching and the protective film wear. Use of the supply stylus is advisable in situations where dirty hands and/or gloves are unavoidable.
- The meter's larger touch screen may be damaged by blunt force with a solid pointed object. Use caution to NOT expose to these conditions or potential mishaps. Use the neck or shoulder strap to minimize the chance of dropping the meter. Put the case cover over the front of the meter when in transport.
- The meter has **NOT** been designed to withstand high temperatures (over 60°C or 130° F). Those temperatures can be reached when the meter is left in a vehicle, especially behind the windshield, in an enclosed vehicle in direct sunlight, or in the isolation of the trunk. The LCD display and/or other components will be damaged by the extreme temperature.
- The internal battery rapidly loses its efficiency if exposed to high or low temperatures. This results in reduced meter use time when powered by the internal battery.
- When recharging the internal battery, always allow a good air circulation around the meter and the power adapter.
- The meter is well protected against incidental water drops but is **NOT** waterproof. In case of contact with water, allow the meter to dry thoroughly before trying to turn it on. Do not use a hairdryer or other strong heating sources in an attempt to dry as damage may easily occur.

APPENDIX C - WARRANTY/SERVICE INFORMATION

Your DSA 1491 has been built to the highest quality standards in the industry. Details of this warranty are covered in a separate document shipped with your instrument.

SERVICE INFORMATION

The Sencore Factory Service Department provides all “in and out of warranty” service and complete calibration services for all Sencore instruments. No local service centers are authorized to repair Sencore instruments. Factory service insures you the highest quality work, the latest circuit improvements, factory parts and the fastest turnaround time possible. Most service repairs are completed within 72 hours of their receipt.

RETURNING YOUR DSA 1491 FOR SERVICE

Save the original packing materials for reuse should you ever need to ship your DSA 1491 to the Sencore Factory Service Department for repair or re-calibration. If the original packing material is not available, please follow the following procedure steps 1 thru 7.

1. Use a corrugated shipping container that has a sufficient strength 10-20lbs.
2. Pack the unit inside a plastic bag to protect it.
3. Cushion the unit with a minimum of 3 inches of padding on each side of the instrument, more as required to completely fill the shipping carton. Pack the carton tightly enough to prevent the unit from shifting during shipment.
4. Seal all seams in the container with durable shipping tape.
5. Be sure to enclose the following information: Owner’s Name, Owner’s Address (ship to), Billing Information, Purchase Order (if required), Contact Name and Phone Number, Service Desired or Problem.
6. A Return Authorization Number is required. Please go to the SENCORE web site at www.sencore.com and click on the SUPPORT heading on the home page. Click on the grey box titled Return Authorization, fill out the form, and click SUBMIT at the bottom. You will receive a return email with an RMA number and return instructions.
7. Ship the packaged unit to the address listed below. We recommend Federal Express.

Sencore Factory Service
3200 Sencore Drive
Sioux Falls, SD 57107