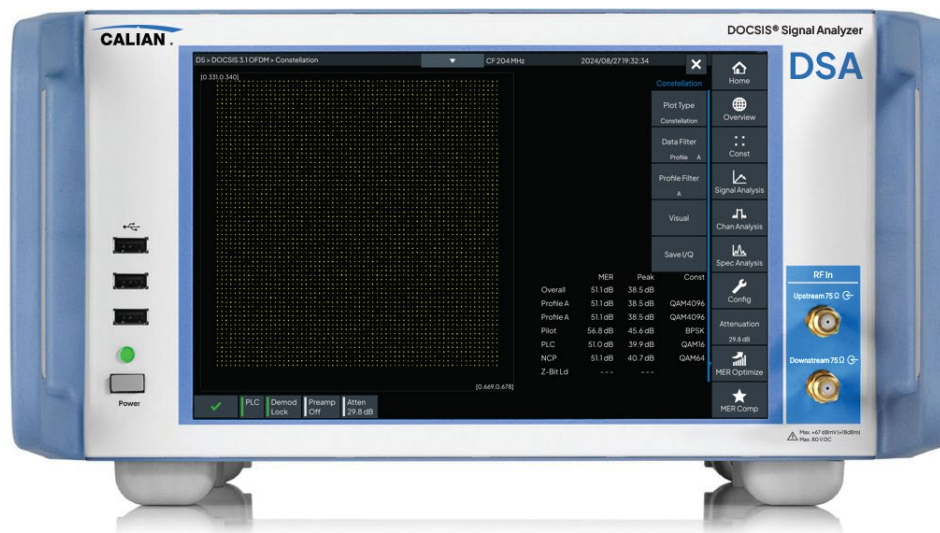


DOCSIS Signal Analyzer Getting Started



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Subject to change - Data without tolerance limits is not binding.

Trade names are trademarks of the owners

The following abbreviations are used throughout this manual:

Calian DOCSIS Signal Analyzer is abbreviated as DSA.

CE Declaration of Conformity



This is to certify that:

Rohde & Schwarz	2118.7800.02	DOCSIS Signal Analyzer (DSA)
	2118.7800.03	
Calian	2118.7800.03 – DSA-684US/DS Upgrade	DOCSIS Signal Analyzer (DSA)
	DSA-US/DS	
	DSA-DS	
	DSA-684US/DS	

complies with the provisions of the Directive of the Council of the European Union on the approximation of laws of the Member States:

- Relating to electrical equipment for use within defined voltage limits (2014/35/EU)
- Relating to electromagnetic compatibility (2014/30/EU)
- Relating to the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) (2011/65/EU with all its amendments, including (EU) 2015/863)
- Relating to waste electrical and electronic equipment (WEEE) (2012/19/EU)

Conformity is proven by compliance with the following standards:

EMC

EN 61326-1:2013
EN 61326-2-1:2013
EN 55011:2016/A11:2020-03
EN 61000-3-2:2014-08
EN 61000-3-3:2013-08
EN 61000-4-11/AC:2020-06

Safety

EN 61010-1:2010-10
EN 61010-2-030:2010-06
CAN/CSA-C22.2 No. 61010-1:2012-05
CAN/CSA C22.2 No. 61010-2-030:2012-05
UL 61010-1:2012-05-11
UL 61010-2-030:2012-05-11

RoHS

EN IEC 63000:2018

UKCA Declaration of Conformity



This is to certify that:

Rohde & Schwarz	2118.7800.02	DOCSIS Signal Analyzer (DSA)
	2118.7800.03	
	2118.7800.03 – DSA-684US/DS Upgrade	
Calian	DSA-US/DS	DOCSIS Signal Analyzer (DSA)
	DSA-DS	
	DSA-684US/DS	

complies with the provisions of the Directive of the Council of the European Union on the approximation of laws of the Member States:

- Relating to electrical equipment for use within defined voltage limits (2014/35/EU)
- Relating to electromagnetic compatibility (2014/30/EU)
- Relating to the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) (2011/65/EU with all its amendments, including (EU) 2015/863)
- Relating to waste electrical and electronic equipment (WEEE) (2012/19/EU)

Conformity is proven by compliance with the following standards:

EMC

EN 61326-1:2013
EN 61326-2-1:2013
EN 55011:2016/A11:2020-03
EN 61000-3-2:2014-08
EN 61000-3-3:2013-08
EN 61000-4-11/AC:2020-06

Safety

EN 61010-1:2010-10
EN 61010-2-030:2010-06
CAN/CSA-C22.2 No. 61010-1:2012-05
CAN/CSA C22.2 No. 61010-2-030:2012-05
UL 61010-1:2012-05-11
UL 61010-2-030:2012-05-11

RoHS

EN IEC 63000:2018

UKCA

Meets the requirements of the following applicable UK directives and carries the UKCA marking accordingly:

Electrical Equipment (Safety) Regulations 2019
Electromagnetic Compatibility Regulations 2010
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2011
For the assessment of electromagnetic compatibility, the limits of radio interference for Class A equipment as well as the industrial immunity requirements have been used as a basis.

RoHS/WEEE Certificate



This is to certify that:

Rohde & Schwarz

2118.7800.02

DOCSIS Signal Analyzer
(DSA)

2118.7800.03

2118.7800.03 - DSA-684US/DS Upgrade

Calian

DSA-US/DS

DOCSIS Signal Analyzer
(DSA)

DSA-DS

DSA-684US/DS

complies with the provisions of the Directive of the Council of the European Union on the approximation of laws of the Member States

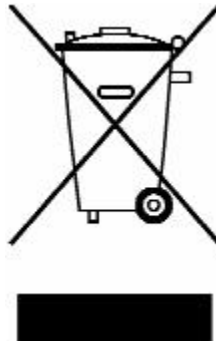
- Relating to the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) (2011/65/EU with all its amendments, including 2015/863)
- Relating to waste electrical and electronic equipment (WEEE) (2012/19/EU)

RoHS

Conformity is proven by compliance in accordance with EN IEC 63000:2018.

WEEE

Product labeling is in accordance with EN 50419:2022



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Documentation Overview

Quickstart Guide

The printed Quickstart Guide gives a brief outline of accessing the DSA interface and documentation. A QR code and link is provided to the Getting Started guide hosted on the Calian website.

Getting Started

The Getting Started guide is available via link to a Calian website provided in the Quickstart Guide enclosed with the product. It contains the following information (which is also available in this User Manual):

- Section 1
 - This section lists the main features of the instrument and briefly describes its concept of operation.
- Section 2
 - This section briefly describes the front and rear panel interfaces.
- Section 3
 - This section describes setting up the instrument to get it ready for operation.
- Section 4
 - This section provides an overview of instrument operation.

User Manual

The User Manual provides the following information:

- Section 1
 - This section introduces the instrument's features and concept.
- Section 2
 - This section describes the instrument interfaces, setup, and operation.
- Section 3
 - This section describes the DOCSIS measurements that can be carried out using the instrument.
- Section 4
 - This section describes the details of the local GUI.
- Section 5
 - This section describes setup of the network settings.

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- Section 6
 - This section describes setup and use of the remote GUI.
- Section 7
 - This section describes the details of using SCPI.
- Section 8
 - This section describes SNMP and how to access the MIB.
- Section 9
 - This section describes the SFP+ Protocol.
- Section 10
 - This section summarizes the instrument specifications.
- Section 11
 - This section describes maintenance required for the instrument.

Online Help

The online help provides the User Manual in a GUI viewer window.

Document Conventions

The following conventions are used throughout the DSA User Manual.

Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements both on the screen and on the front and rear panels, such as dialog boxes, softkeys, menus, options, buttons, etc., are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
<i>Input</i>	Input to be entered by the user is displayed in italics.
File names, commands, program code	File names, commands, coding samples and screen output are distinguished by their font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

Other conventions

- **Remote commands:** Remote commands may include abbreviations to simplify input. In the description of such commands, all parts that have to be entered are written in capital letters. Additional text in lowercase characters is for information only.
- **Select/press/click/toggle:** These terms may refer to any of the described GUI interaction methods, i.e., using a finger on the touchscreen, a mouse pointer in the display, or a key on a keyboard.
- **Important information:** The following graphical inserts are used to provide notes, warnings, cautions, and notices:



Note

Note to provide useful information.



Warning

Warning to take actions or avoid actions to ensure the instrument works correctly.



Caution

Caution to take actions or avoid actions to ensure the safety of the operator(s).

NOTICE

Notice

Notice to take actions or avoid actions to ensure the instrument is not damaged.

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Safety Information

The product documentation helps you use the DSA safely and efficiently. Follow the instructions provided here, keep the product documentation nearby, and offer it to other users.

Intended Use

The DSA is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the DSA only for its designated purpose. Observe the operating conditions and performance limits stated in the data sheet.

Where do I Find Safety Information?

Safety information is part of the product documentation. It warns you about the potential dangers and gives instructions how to prevent personal injuries or damage caused by dangerous situations. Safety information is provided as follows:

- General Safety Instructions are provided below.
- Section 3.2 provides safety instructions specific to this product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

Safety Instructions

Products from Calian are manufactured according to the highest technical standards. To use the products safely, follow the instructions provided in this document. Keep this document nearby and offer it to other users.

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the data sheet, manuals, and the printed "Safety Instructions". If you are unsure about the appropriate use, contact Calian customer service.

Using the product requires specialists or specially trained personnel. These users also need sound knowledge of the user interface and the product documentation which are available in English language only.

Never open the casing of the product. Only service personnel authorized by Calian are allowed to repair the product. If any part of the product is damaged or broken, stop using the product. Contact Calian customer service by email at at.service@calian.com.

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Lifting and Carrying the Product

The maximum weight of the product is provided in the data sheet. To move the product safely, you can use lifting or transporting equipment such as lift trucks and forklifts. Follow the instructions provided by the equipment manufacturer.

Choosing the Operating Site

Only use the product indoors. The product casing is not waterproof. Water that enters can electrically connect the casing with live parts, which can lead to electric shock, serious personal injury, or death if you touch the casing.

Unless otherwise specified, you can operate the product up to an altitude of 2000 m above sea level. The product is suitable for pollution degree 2 environments where nonconductive contamination can occur. For more information on environmental conditions such as ambient temperature and humidity, see the data sheet.

Setting up the Product

Always place the product on a stable, flat, and level surface with the bottom of the product facing down. If the product is designed for different positions, secure the product so that it cannot fall over.

If the product has foldable feet, always fold the feet completely in or out to ensure stability. The feet can collapse if they are not folded out completely or if the product is moved without lifting it. The foldable feet are designed to carry the weight of the product, but not an extra load.

If stacking is possible, keep in mind that a stack of products can fall over and cause injury.

If you mount products in a rack, ensure that the rack has sufficient load capacity and stability. Observe the specifications of the rack manufacturer. Always install the products from the bottom shelf to the top shelf so that the rack stands securely. Secure the product so that it cannot fall off the rack. See Section 3.3.

Connecting to Power

The product is an overvoltage category II product. Connect the product to a fixed installation used to supply energy-consuming equipment such as household appliances and similar loads. Keep in mind that electrically powered products have risks, such as electric shock, fire, personal injury, or even death.

Take the following measures for your safety:

- Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source. If the power adapter does not adjust automatically, set the correct value and check the rating of the fuse.

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- Only use the power cable delivered with the product. It complies with country-specific safety requirements. Only insert the plug into an outlet with protective conductor terminal.
- Only use intact cables and route them carefully so that they cannot be damaged. Check the power cables regularly to ensure that they are undamaged. Also ensure that nobody can trip over loose cables.
- If the product needs an external power supply, use the power supply that is delivered with the product or that is recommended in the product documentation or a power supply that conforms to the country-specific regulations.
- Only connect the product to a power source with fuse protection of maximum 20 A.
- Ensure that you can disconnect the product from the power source at any time. Pull the power plug to disconnect the product. The power plug must be easily accessible. If the product is integrated into a system that does not meet these requirements, provide an easily accessible circuit breaker at the system level.

Cleaning the Product

Use a dry, lint-free cloth to clean the product. When cleaning, keep in mind that the casing is not waterproof. Do not use liquid cleaning agents.

Meaning of Safety Labels



Potential Hazard

Read the product documentation to avoid personal injury or product damage.



Electrical Hazard

Indicates live parts. Risk of electric shock, fire, personal injury or even death.



Hot Surface

Do not touch. Risk of skin burns. Risk of fire.



Protective Conductor Terminal

Connect this terminal to a grounded external conductor or to protective ground. This connection protects you against electric shock if an electric problem occurs.

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1. Introduction

This section provides an overview of the DOCSIS Signal Analyzer (DSA).

1.1 Concept and Features

The DSA is an advanced piece of test equipment designed to analyze upstream and downstream DOCSIS 3.0 and 3.1 signals. See section 10 of the User Manual and the DSA data sheet for detailed specifications.

Downstream Input Features

- Real-time DOCSIS 3.1 OFDM receiver (54 to 1794 MHz)
- Real-time DOCSIS 3.0 SC-QAM receiver (J.83 A/B/C, 54 to 1002 MHz)
- Real-time J.83 QAM receiver (54 to 1002 MHz)

Upstream Input Features

- Real-time DOCSIS 3.1 OFDMA receiver (5 to 204 MHz for model DSA-US/DS, 5 to 684 MHz for model DSA-684US/DS)
- Real-time DOCSIS 3.0 ATDMA receivers (5 to 85 MHz)
- Real-time J.83 QAM receiver (5 to 204 MHz) (K-1502 option)

Other Features

- Touchscreen GUI, remote GUI, HDMI out
- Spectrum analyzer
- Reference input and output
- Trigger input and output
- SFP+ interface
- ASI output
- Generator timing interface
- 4 USB 2.0 interfaces
- LAN supports remote GUI, SCPI, SNMP, and remote update

The DSA displays many useful measurements such as constellation points, I/Q density, amplitude/phase/group delay vs. subcarrier, BER, MER, CER, echo pattern, I/Q imbalance, CCDF, AM hum, etc. The DSA also provides upstream and downstream generic spectrum analyzers, generic J.83 QAM signal analysis, and it supports a number of other interfaces to aid testing.

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The DSA receives DOCSIS signals using automatic or manual configurations both in the field and in the laboratory. When used with the SFD, the DSA can carry out high-fidelity performance measurements of DOCSIS upstream and downstream signals to and from cable modems. Proprietary generator timing synchronization and proprietary pilot carrier interfaces are provided for the use of the DSA in the field.

Configuration and control of the unit is done via the touchscreen GUI, remote GUI, SCPI, or SNMP. Remote control through SCPI or SNMP commands allows the DSA to be used in automated test systems. The DSA can be adapted to various application requirements using its many supported configurations.

2. Hardware Tour

This section provides an overview of the DSA front and rear panel interfaces. Specifications for the interfaces are contained in the data sheet.



Cable Strain Relief

Use care when attaching and removing all cables, and properly strain relieve connected cables when in use. Do not apply force up or down, or side to side on any connections, especially ethernet and USB ports.

2.1 Front Panel

This section provides an overview of the front panel. The legacy Rhode & Schwarz® models (2118.7800.02 and 2118.7800.03) have Rhode & Schwarz® trademark on the front panel. Please see the Rohde & Schwarz® user manual (2118.7969.02) for reference.

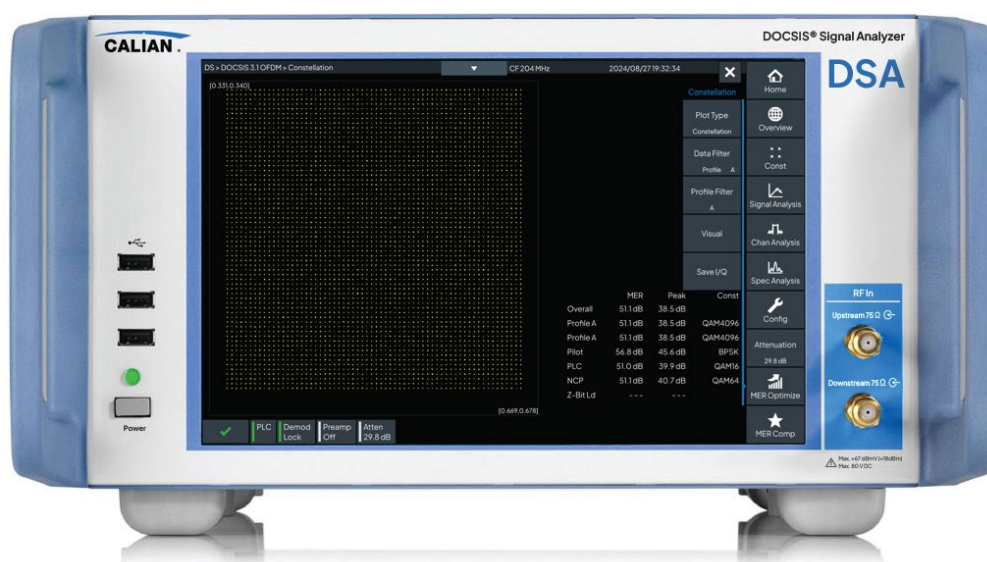
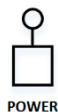


Figure 2-1 Front Panel

Power LED



Indicates the DSA power status:

- **Green:** The DSA is in operational mode (or booting up).
- **Amber:** The DSA is in standby mode.
- **Off:** The DSA AC power is switched off or disconnected.

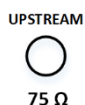
Power Button

When AC power is connected and switched on via the rear panel, this button toggles between DSA operational and standby modes. DSA settings are preserved in standby mode.



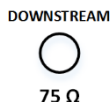
USB Connectors

Provides three USB 2.0 ports for connecting a mouse, keyboard, and memory device.



Upstream RF Input Connector

Provides a male 75 Ω F connector for the upstream RF input.



Downstream RF Input Connector

Provides a male 75 Ω F connector for the downstream RF input.

2.2 Rear Panel

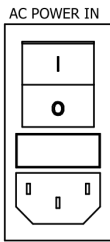
This section provides an overview of the rear panel.



Figure 2-2 Rear Panel

AC Power Connector

Provides a grounded AC power inlet. The instrument is equipped with a universal power supply that accepts voltages from 100 to 240 VAC $\pm 10\%$, 50/60 Hz.



AC Power Switch

The AC power switch is located above the AC power connector. When this switch is turned on with the unit plugged in, the DSA enters operational mode.

AC Power Fuse

See sections 3.3.1 and Section 10 of the User Manual for details.

Reference In Connector



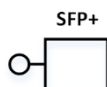
Provides a 50 Ω BNC connector input for an external 10.00 MHz or 10.24 MHz frequency reference.

Reference Out Connector



Provides a 50 Ω BNC connector output of a 10.00 MHz or 10.24 MHz frequency reference.

SFP+ LED



Indicates a link has been established over the SFP+ interface.

SFP+ Connector

Provides a connector for the output of DOCSIS 3.0/3.1 upstream and DOCSIS 3.1 downstream decoded payloads.



Generator Control Connector

Provides an RJ45 connector for a proprietary auxiliary timing interface to the Calian SFD DOCSIS generator. This connector includes link and activity LEDs.



ASI Out Connector

Provides a 75 Ω BNC connector for output of the DOCSIS 3.0 downstream MPEG stream.



Trigger In Connector

Provides a 50 Ω BNC connector input for triggering.



Trigger Out Connector

Provides a 50 Ω BNC connector output for triggering.



USB Connector

Provides a USB 2.0 port for connecting a mouse, keyboard, or memory device.



LAN Connector

Provides an RJ45 connector for control and monitoring of the DSA. This connector includes link and activity LEDs.



HDMI Connector

Provides an HDMI connector for an external monitor.



Ground Terminal

Provides a screw and locking washer for connection to rack ground. The use of this terminal is optional because the primary ground is via the AC power input.

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3. Setup

This section describes how to prepare the instrument for operation and how to connect external devices. Please observe the safety instructions for operating the instrument.

3.1 Unpacking

When unpacking the instrument:

- Check the supplied equipment against the delivery note to make sure all items are present.
- Carefully check the instrument for any damage.
- If there is damage, please inform the carrier immediately. Keep the packing material and box to support your claim.
- The original packaging is also useful for transporting or shipping the DSA later on.



Packing Material

Retain the original box and packing material. If the instrument needs to be transported or shipped at a later date, you can use the material to protect the instrument.

Risk of Instrument Damage

Insufficient protection against mechanical and electrostatic effects during transportation and shipment can damage the instrument.

- Always make sure that sufficient mechanical and electrostatic protection is provided.
- When shipping an instrument, the original packaging should be used. If you do not have the original packaging, use sufficient padding to prevent the instrument from moving around inside the box. Pack the instrument in antistatic wrap to protect it from electrostatic charging.
- Secure the instrument to prevent any movement and other mechanical effects during transportation.

NOTICE

The carrying handles at the front and side of the casing are designed to lift or carry the instrument. Do not apply an excessive external force to the handles. Observe the information on transporting heavy instruments in the basic safety instructions included at the front of this manual.

Accessory List

The instrument comes with the following accessories:

- Power cable
- Two F connector barrel adapters
- Printed “Quickstart Guide”

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3.2 Safety

General Safety

Risk of Injury and Instrument Damage

The instrument must be used in an appropriate manner to prevent electric shock, fire, personal injury, or damage.



- Do not open the instrument casing.
- Read and observe the Safety Instructions provided with the Getting Started Guide. In addition, read and observe the safety instructions in the following sections.
- Notice that the data sheet may specify additional operating conditions.

Risk of Instrument Damage

An unsuitable operating site or test setup can cause damage to the instrument and to connected devices. Ensure the following operating conditions before you switch on the instrument:

NOTICE

- The instrument cover is in place and screwed on.
- Vent holes are not obstructed, and airflow is not blocked on the side panels. The spacing from the wall should be at least 10 cm.
- The instrument is dry and shows no sign of condensation.
- Signal levels at the inputs do not exceed permissible limits.
- Signal outputs are not overloaded or incorrectly connected.
- The instrument may be operated only in a horizontal position, and the surface on which it is placed must be level.
- The ambient temperature must be in the range specified in section 10 and the DSA data sheet.
- The general safety instructions also contain information on operating conditions that will prevent damage to the instrument.
- The instrument's data sheet may contain additional operating conditions.

Electrostatic Discharge (ESD)

NOTICE

Risk of Instrument and Equipment Under Test Damage

Electrostatic discharge (ESD) can cause damage to the electronic components of the instrument and the device under test (DUT). ESD is most likely to occur when you connect or disconnect a DUT or test fixture to the instrument's test ports. To prevent ESD, use a wrist strap and cord and connect yourself to the ground, or use a conductive floor mat and heel strap combination.



For details, refer to the safety instructions at the front of this manual.

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Electromagnetic Compatibility (EMC) and Electromagnetic Interference (EMI)

Risk of Electromagnetic Interference

To prevent electromagnetic interference from affecting the measurement results, the instrument must be operated only when closed and with all shielding covers fitted. Only suitable and shielded signal and control cables may be used.

NOTICE

- This applies particularly to cables that are connected to the rear or front panel. Regardless of the data rate and timing, high signal levels can occur at individual points in the signal spectrum. The cables should have at least 80 dB shielding protection up to 1 GHz, which generally requires the use of cables with double shielding.
- When wiring the LAN interface (1000 BASE-T), make sure that a suitable cable (e.g. Category 5e) is used.
- Note the EMI/EMC classifications in the data sheet.

3.3 Installation

The instrument is designed for interior use in the laboratory or field. It can be used on a bench top or installed in a 19" rack.

Risk of Instrument Damage

NOTICE

The permitted operating orientation for the DSA is horizontal (not tilted such that the left or right side is pointing upwards).

The area next to the unit must remain unobstructed to provide adequate airflow through the meshed ventilation grid on each side.

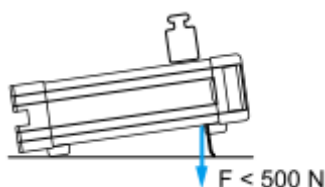
Bench Top

If the DSA is operated on a bench top, the surface should be flat. The instrument can be used in horizontal position, standing on its feet, or with the support feet on the bottom extended. Ensure there is enough room provided behind the unit to access the rear power switch and to be able to disconnect the power cable.

Risk of Injury and Instrument Damage

The feet may collapse if they are not folded out completely or if the instrument is shifted. This may cause damage or injury.

- Fold the feet completely in or completely out to ensure stability of the instrument. Never shift the instrument when the feet are folded out.
- When the feet are folded out, do not work under the instrument or place anything underneath.
- The feet can break if they are overloaded. The overall load on the folded-out feet must not exceed 500 N.

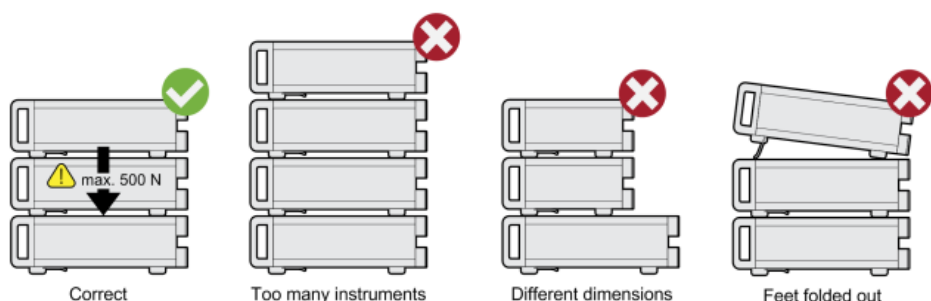


Risk of Injury and Instrument Damage

A stack of instruments may tilt over and cause injury. Furthermore, the instruments at the bottom of the stack may be damaged due to the load imposed by the instruments on top.

Observe the following instructions when stacking instruments:

- Never stack more than three instruments. If you need to stack more than three instruments, install them in a rack.
- The overall load imposed on the lowest instrument must not exceed 500 N.
- All instruments must have the same dimensions (width and length).
- If the instruments have foldable feet, fold them in completely.



Rack Mounted

To install the DSA in a 19" rack, use the rack adapter kit. You should install brackets on which the DSA can rest before securing the ears of the front panel to the rack. See the installation instructions included in the adapter kit.

Risk of Instrument Damage

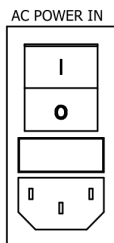
When the DSA is installed in a rack, insufficient airflow can cause the instrument to overheat, which may disturb the operation and even cause damage.

NOTICE

Make sure that all fan openings are unobstructed, that the airflow perforations are unimpeded, and that the minimum distance from any rear obstruction is 10 cm.

3.3.1 AC Power

The instrument is equipped with a universal power supply that automatically adapts to different AC voltages and frequencies. Refer to section 10 of the User Manual and the DSA data sheet for voltage and frequency ranges.



- The AC power connector and switch are located on the rear panel of the instrument.
- Use the supplied AC power cable to connect the instrument to the AC power supply. Since the instrument complies with safety class EN61010-1, it should only be connected to a socket with a ground contact.
- A standard EU power cord (with CEE 7/7 plug) is provided with every unit and if the buyer is located outside the EU, a power cord compliant with safety regulations for that location is supplied.
- Use only the supplied detachable power cable or a properly rated replacement cable.

AC Power Fuse

Before changing the fuse, switch off the instrument and disconnect it from the power supply.

The instrument is equipped with one fuse (see section 10 of the User Manual and the DSA data sheet for details). The fuse is located in the AC inlet module on the rear panel of the instrument.

To change the fuse:

- Open the cover on the fuse box and remove the fuse holder.
- Replace defective fuse and put the fuse holder back into place.
- Close the fuse box cover.

3.3.2 RF Inputs

Connect the downstream and upstream RF inputs as needed.

Risk of Instrument Damage

When connecting the RF inputs, heed the signal limits specified in section 10 of the User Manual and the DSA data sheet, or the inputs may not work correctly, or the instrument may be damaged.

NOTICE

Two F connector barrel adapters are provided with the DSA; it is recommended that these adapters be used at all times to prevent physical damage to the DSA RF input connectors.

3.3.3 Network

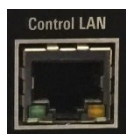
The instrument is equipped with a network connection and can be connected to an Ethernet local area network (LAN). The LAN interface is configured under “Setup” > “Config” > “Network”. Refer to section 5 of the User Manual for detailed information about configuring the DSA for connection to a network.

The instrument can also be remotely controlled via the network via a remote GUI, SCPI, or SNMP. Remote operation allows someone to operate the instrument from an external computer situated anywhere in the world. For example, if you are working in one part of a building, you can operate one or more instruments that are part of a test setup located in another part of the building. Remote control of the instrument via the LAN interface is described in sections 6, 7, and 8 of the User Manual.

Risk of Network Failure

NOTICE

Always coordinate the connection of the instrument to the network with the network administrator. Any errors that occur during the connection process can affect the entire network. Make sure that the instrument is switched off when you connect and disconnect the network cable. This is the only way to ensure that the network connection is reliably detected and any disruptions during the operation of the instrument are avoided.



The instrument is connected to the LAN using a standard Ethernet cable via the LAN interface on the rear of the instrument. The network interface functions with 1000 Mbps Ethernet IEEE 802.3u. The TCP/IP network protocol and the associated network services are preconfigured. To exchange data within a LAN, every computer or instrument that is connected must have a unique IP address. See section 5 of the User Manual for details.

3.3.4 Optional Connections

Connect the following external devices to the DSA, as needed.

3.3.4.1 ASI Output

The DSA provides an ASI interface for output of the MPEG stream. This applies to the following DSA downstream modes:

- EuroDOCSIS 3.0 (DOCSIS 3.0 SC-QAM J.83 Annex A)
- DOCSIS 3.0 (DOCSIS 3.0 SC-QAM J.83 Annex B)
- DOCSIS 3.0 SC-QAM J.83 Annex C
- J.83 QAM (J.83 Annex A/B/C)

3.3.4.2 SFP+ Interface

The DSA provides a 1GE/10GE SFP+ interface for output of the applicable decoded payload data for the following DSA modes:

- DOCSIS 3.1 OFDM downstream
- DOCSIS 3.0 ATDMA upstream
- DOCSIS 3.1 OFDMA upstream

This interface supports IPv4, ARP, and ping. To use the SFP+ interface, the following DSA parameters need to be configured:

- Configure the DSA SFP+ network settings.
- Select 1 GE or 10 GE data rate.
- In dynamic upstream analysis mode, select upstream or downstream for output.
- Select profile(s) to output, as applicable.
- Connect the DSA to a network via an SFP+ cable.
- The following equipment is known to be compatible with the DSA:
 - SFP+ to Ethernet converter (1 GE) model FCLF-8520-3 made by Finisar.
 - Bel Fuse model SFP-1GBT-06 converter (1 GE).
 - Amphenol copper (passive) cables, model SF-SFPP2EPASS (10 GE).
 - Note: Other copper SFP+ (10 GE) cables may work, but have not been tested.

The protocol used by the SFP+ interface is defined in section 9 of the User Manual.

3.3.4.3 SFD Interfaces

The DSA supports two proprietary interfaces to the SFD:

- **Generator Control**
 - This interface provides proprietary timing synchronization from the DSA to the Calian SFD.
 - The interface provides DOCSIS timestamps and a sync timing signal.
 - In parallel, the DSA sends commands to the SFD via SCPI to send UCD and MAP messaging on the downstream DOCSIS signal.
 - Used for CM ranging analysis network measurement mode (see section 3.5 of the User Manual), where the SFD generates downstream traffic, and the DSA provides synchronization timing via the generator control interface to the SFD.
- **Proprietary Pilot Carrier**
 - This RF interface provides a proprietary pilot carrier from the Calian SFD to the DSA (in addition to DOCSIS upstream bursts on the same RF output).

- The SFD generates a proprietary pilot carrier that provides synchronization and upstream burst timing.
- The proprietary pilot carrier has a bandwidth of approximately 0.75 MHz.
- Used for SFD upstream analysis network measurement mode (see section 3.4 of the User Manual), where the SFD generates upstream traffic with a proprietary pilot carrier, which the DSA receives via its upstream RF input.

3.3.4.4 USB Interfaces

The USB 2.0 interfaces of the DSA allow you to connect USB devices directly to the instrument. The DSA provides three USB interfaces on the front panel and one more on the rear panel for connecting a memory device, keyboard, or mouse.

3.3.4.5 Memory Device

A USB memory device is detected automatically when it is connected. The following formatting standards are supported: FAT, NTFS, EXT2, EXT3, and EXT4.

To disconnect a USB memory device from the DSA, click the utility menu button and select the eject icon.

3.3.4.6 Keyboard

A USB keyboard is detected automatically when it is connected. The default input language is “English - US”. The following additional languages are supported by the DSA:

- Danish
- Finnish
- French
- German
- Italian
- Norwegian
- Polish
- Portuguese
- Romanian
- Russian
- Spanish
- Swedish

The keyboard language is configured under “Setup” > “Config” > “Keyboard”, or it can be selected in the file save dialog windows.

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3.3.4.7 Mouse

A USB mouse is detected automatically when it is connected. The mouse does not require configuration.

3.3.4.8 External Monitor

You can connect an external monitor to the HDMI port on the rear panel of the DSA.



External Monitor Resolution

The external monitor resolution and aspect ratio are the same as the DSA touchscreen display, and cannot be configured on the DSA. Configure the external monitor to be compatible with the touchscreen display resolution (see section 10 of the User Manual and the DSA data sheet).

3.3.4.9 Reference Input

The DSA will automatically detect the input clock frequency and lock to it, if the reference source is within ± 0.75 ppm of the two supported frequencies of 10.00 MHz or 10.24 MHz. There will be a delay of a few seconds when changing frequencies. When the reference source is outside that range, the DSA will indicate the reference input is unlocked.

3.3.5 Date and Time

Set the DSA date, time, and timezone using “Setup” > “Config” > “Date/Time”. This is used for instrument data file timestamps and error log timestamps.



Internal Battery

The DSA contains a real-time clock that is powered by an on-board battery when the DSA is not connected to a main AC supply. The expected lifetime of the battery is 5 years. When the battery life expires, the DSA must be returned to the factory to replace the battery.

3.3.6 Software

The instrument uses a Linux operating system. Access is not provided to the operating system, but rather to a touchscreen graphical user interface (GUI) through which you can configure the instrument’s settings. A description of the local GUI is provided in section 4 of the User Manual.

Risk of Instrument Damage

The instrument software and operating system are not user configurable:

NOTICE

- Only software authorized by Calian for use in the instrument may be installed. In case of doubt, please contact your Calian service.
- Changes to the system are only permissible in agreement with Calian.
- Updating the operating system is NOT allowed without permission.

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If any of the above warnings are NOT heeded, the stability and performance of the system may be impaired. Calian shall not assume any liability for faults caused by impermissible manipulations of the system.

3.3.7 Powering On

To turn on the instrument, set the AC switch on the rear of the instrument to the **I** position. Once the instrument has powered up, the unit boots up, during which the status LED on the front panel is green. At completion of boot-up, the home screen is displayed, and the DSA is ready for operation, with the instrument settings reflecting the last saved configuration. The LAN port can be used to monitor the DSA status and reconfigure the instrument.

Pressing the front panel power button toggles the DSA into and out of standby mode. When the DSA is in standby mode, the status LED on the front panel is amber.

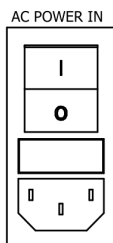


Warm-up Time

When the DSA AC power is first switched on, or when switching from standby mode to operational mode, the instrument requires a warm-up time of 30 minutes to achieve calibrated operation.

The DSA automatically monitors the health of the instrument during power-up and continuously during operation. When the instrument detects a fault, it will be indicated on the touchscreen display. There are no serviceable parts; the unit must be returned to Calian for service.

3.3.8 Powering Off



Press the front panel power button such that the DSA is in standby mode, where the front panel LED is amber. Then set the AC switch on the rear of the instrument to the **O** position. None of the LEDs on the instrument should be lit.



Risk of losing Settings and Data

If you set the power switch to the O position or unplug the AC power cord before the instrument settings have been saved, the current settings and measurement data may be lost. Therefore, always press the front panel power button to ensure the DSA is in standby mode before removing AC power. (Do not hold down the front panel power button for an extended time, or it will remove power without first entering standby mode.)



Risk of Injury and Equipment Damage

In the event of a hazardous situation, unplug the device from power. Ensure the power plug is easily reachable and accessible at all times.

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3.3.9 Preset

When you click the “Preset” button on the home menu, the unit is restored to its factory presets or the last user-specified preset. You must then confirm this action in a pop-up dialog window. For more details, see section 4.4.5 of the User Manual.

4. Operation

The DSA can be operated from:

- The touchscreen GUI
- A remote GUI
- A computer using SCPI
- A computer using SNMP

This section describes the basics of operating the DSA using the local GUI on the touchscreen display. See sections 3 and 4 of the User Manual for details.

4.1 Measurement Modes

The following operational modes are supported by the DSA:

- Downstream:
 - EuroDOCSIS 3.0 (DOCSIS 3.0 SC-QAM J.83 Annex A)
 - DOCSIS 3.0 (DOCSIS 3.0 SC-QAM J.83 Annex B)
 - DOCSIS 3.0 SC-QAM J.83 Annex C
 - J.83 QAM (J.83 Annex A/DVB-C, Annex B, and Annex C)
 - DOCSIS 3.1 OFDM
 - Spectrum analyzer
- Upstream:
 - DOCSIS 3.0 ATDMA
 - DOCSIS 3.1 OFDMA
 - Spectrum analyzer
 - J.83 QAM (J.83 Annex A/DVB-C, Annex B, and Annex C) (K1502 option)
- Network measurements:
 - Dynamic upstream analysis
 - SFD upstream analysis
 - CM ranging analysis

Only a subset of modes can be active simultaneously (and only one of those modes can be displayed at a time):

- One DOCSIS downstream mode, or J.83 QAM mode, or a network measurement mode.

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- The downstream spectrum analyzer.
- One DOCSIS upstream mode, or the same network measurement mode as above.
- The upstream spectrum analyzer.

When another mode is selected, measurements in progress will be interrupted and the settings and results will be lost.

The unit comes with a default configuration for each mode, and you can change, store, and recall these configurations. Configuration and control of the unit is done via the touchscreen GUI, remote GUI, SCPI, or SNMP. Remote control through SCPI or SNMP commands allows the DSA to be used in automated test systems. The DSA can be adapted to various application requirements using its many supported configurations.

4.2 Command Modes

The DSA operates in one of the following command modes at any one time:

- **GUI**
 - This is the local GUI, displayed and accessed via the DSA touchscreen.
 - It is the first operational mode entered after DSA power-up or when toggling the front panel power switch.
 - When the DSA is in remote GUI mode, the DSA screen is blank with a “LOCAL” button displayed. You can return control to the local GUI by clicking the “LOCAL” softkey.
 - See sections 3 and 4 of the User Manual for details.
- **SCPI**
 - The DSA can be remotely commanded using SCPI commands via the LAN.
 - This mode is entered when the DSA receives a SCPI command.
 - Terminating the SCPI session returns the DSA to the local GUI.
 - See section 7 of the User Manual for details.
- **SNMP**
 - The DSA can be remotely commanded using SNMP commands via the LAN.
 - This mode is entered when the DSA receives an SNMP command.
 - Terminating the SNMP session returns the DSA to the local GUI.
 - See section 8 of the User Manual and the DSA MIBs for details.
- **Remote GUI**
 - You can control and monitor the DSA from a remote terminal via the LAN.
 - This is available via a VNC-based server.

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- See section 6 of the User Manual for details.
- **Standby**
 - When the AC power to the DSA is connected and the rear panel power switch is turned on, the front panel power switch can be toggled to enter and exit standby mode.
 - In standby mode, the DSA internal circuitry is powered down and the fans are off.
 - To avoid losing instrument settings or configuration, you must ensure the DSA is in standby mode before turning off the rear panel power switch or disconnecting AC power to the unit.
- **Off**
 - The DSA will boot up into operational mode and display the local GUI after turning on the rear panel power switch.
 - The DSA is completely unpowered by turning off or disconnecting the rear panel AC power.
 - To avoid losing instrument settings or configuration, AC power should only be turned off or disconnected when the DSA is in standby mode.

4.3 GUI Operation

This section outlines the basics of DSA GUI navigation, whether it is via the touchscreen GUI or a remote GUI. For detailed GUI operation, see sections 3 and 4 of the User Manual.

All measurement results are displayed on the screen on the front panel. Additionally, the screen display provides status and setting information and allows you to switch between various measurement tasks. The screen is touch-sensitive, which is the primary means of user interaction for quick and easy handling of the instrument.

Risk of Instrument Damage

The touchscreen may be damaged by inappropriate tools or excessive force.

Observe the following instructions when operating or cleaning the touchscreen:

NOTICE

- Never touch the screen with ball point pens or other pointed objects with sharp edges.
 - It is recommended that you operate the touchscreen by finger only.
 - As an alternative, you may use a stylus pen with a smooth soft tip.
 - Never apply excessive force to the screen. Touch it gently.
 - Never scratch the screen surface, for example with a fingernail.
 - Never rub it strongly, for example with a dust cloth.
-

4.3.1 Touchscreen

A touchscreen reacts in a specified way when a particular element on the screen is tapped by a finger or a pointing device. Any GUI elements that can be clicked on by a mouse pointer can also be tapped on the screen to trigger the same behavior, and vice versa. Using the touchscreen, the following tasks (among others) can be performed by the tap of your finger (see sections 3 and 4 of the User Manual for details):

- Changing a setting
- Changing the display
- Moving a marker
- Zooming into a display
- Selecting a new measurement
- Scrolling through a list
- Saving results and settings

4.3.2 Buttons

Touchscreen buttons are softkeys, which are virtual buttons provided by the software on the GUI. Softkeys are dynamic, i.e., depending on the selected button, a different list of softkeys is displayed on the right side of the screen. A list of softkeys for a certain function is called a menu. Softkeys can either perform a specific function directly or open a dialog box.

4.3.3 GUI Elements

The GUI is comprised of the elements depicted in the following figure.

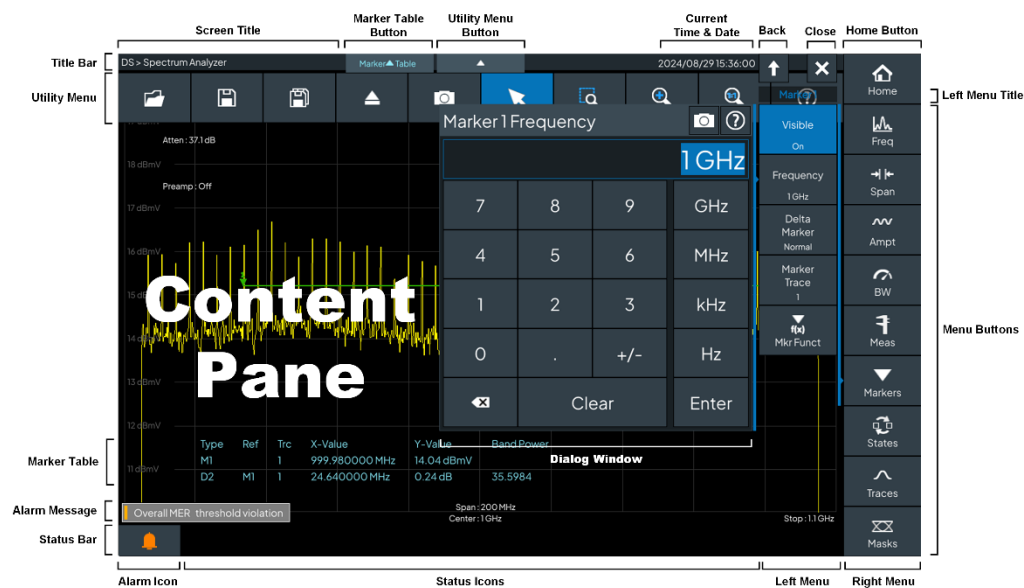


Figure 4-1 GUI Elements

These GUI elements are described in the following sections:

- Home
- Right menu
- Left menu
- Utility menu
- Dialog windows
- Status bar
- Title bar
- Content pane

4.3.4 Home

The home screen will be displayed by default, or when you click the “Home” button. See the example screen below, which shows a blank content pane.

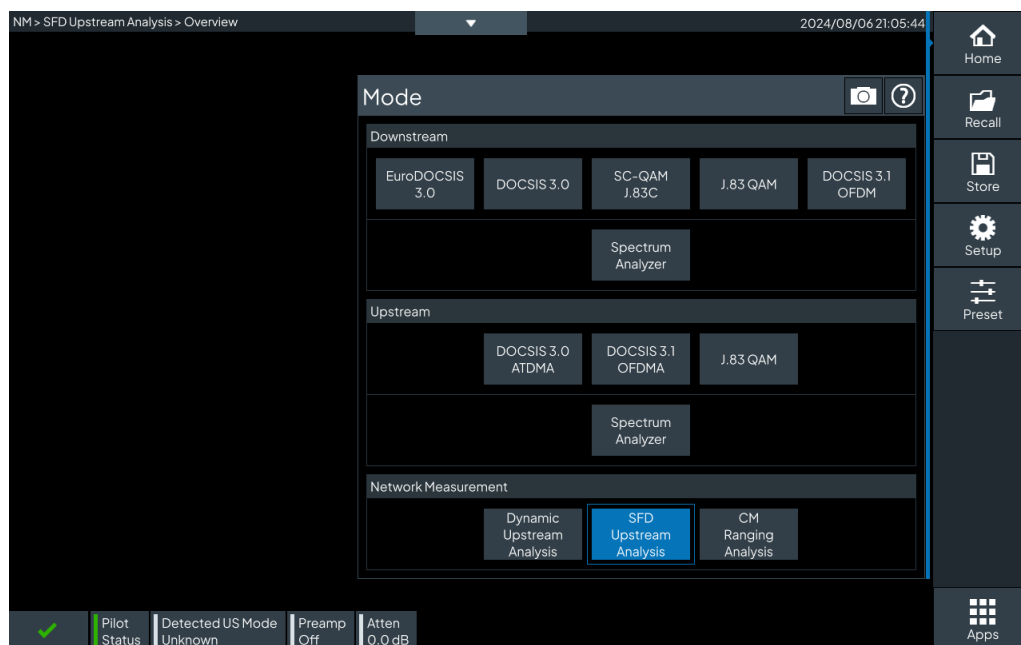


Figure 4-2 Home Screen

The “Home” button is always visible. When you click this button, the main right menu and mode dialog window will be displayed as shown above. The content pane will not change, but it will be overlaid with the dialog window displaying the DSA mode selections. You can then select a new mode of operation, or return to the previous mode by clicking outside of the mode dialog window.

The mode dialog window is displayed whenever the “Home” button is clicked. It allows the activation and termination of the DSA operational modes, as well as providing some status indications (e.g., what modes are currently active). Up to three or four modes can be active simultaneously (but only one of those modes can be displayed at a time):

- One DOCSIS downstream mode, or J.83 QAM mode, or a network measurement mode.
- The downstream spectrum analyzer.
- One DOCSIS upstream mode, or the same network measurement mode as above.
- The upstream spectrum analyzer.

4.3.5 Right Menu

This section describes the right menu buttons; refer to the home screen depicted in the previous figure. The right menu provides the “Home” button and the main menu buttons, which may also show higher-level secondary menus.

The main right menu consists of the following buttons:

- **“Home”**
Pops up the mode dialog window, if it is not already displayed.
- **“Recall”**
Pops up a file recall dialog window that allows any stored configuration to be restored to the instrument. Note that the touchscreen GUI user cannot recall configurations stored via the remote GUI, SCPI, and SNMP.
- **“Store”**
Pops up a file save dialog window that allows the current instrument configuration to be stored.
- **“Setup”**
Displays the instrument setup menu buttons in the right menu (see description below).
- **“Preset”**
Pops up the preset confirmation dialog window. Once you provide confirmation, the DSA restores its default settings and clears any stored spectrum analyzer settings, traces, masks, and markers.
- **“Apps”**
Pops up the “Apps” dialog window, where you can select applications other than the DSA main application. Currently, only “TV Scan” is offered, which is described in section 4.4.6 of the User Manual.

When “Setup” is selected from the home menu, the setup menu buttons appear in the right menu as shown below.

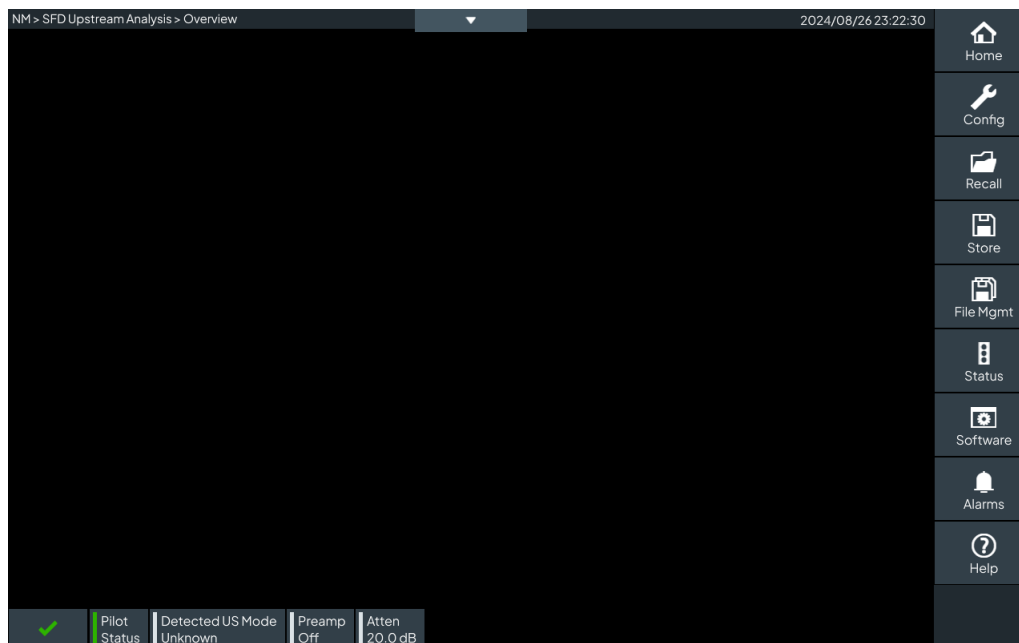


Figure 4-3 Setup Menu

The following menu buttons are provided:

- **“Config”**
Configure reference output, amplitude units, network settings, remote GUI, keyboard language, date/time, and screen brightness.
- **“Recall”**
Recall previously stored instrument configuration.
- **“Store”**
Store instrument configuration, store new user preset, restore factory preset.
- **“File Mgmt”**
Provide file management functions.
- **“Status”**
Display instrument information and status.
- **“Software”**
Install or remove software options, view option status information and the time remaining for each option.
- **“Alarms”**
Open the error dialog window, clear errors.
- **“Help”**
Provides the DSA User Manual and other instrument information.

4.3.6 Left Menu

Lower-level menus are displayed just to the left of the right menu, overlaying the right side of the content pane. The example below also shows a dialog window that was activated from the left menu. A title appears near the top of the left menu identifying the current menu. The left menu can be closed using the close icon (X) at the top of the menu, which will also close any associated dialog windows that may be open.

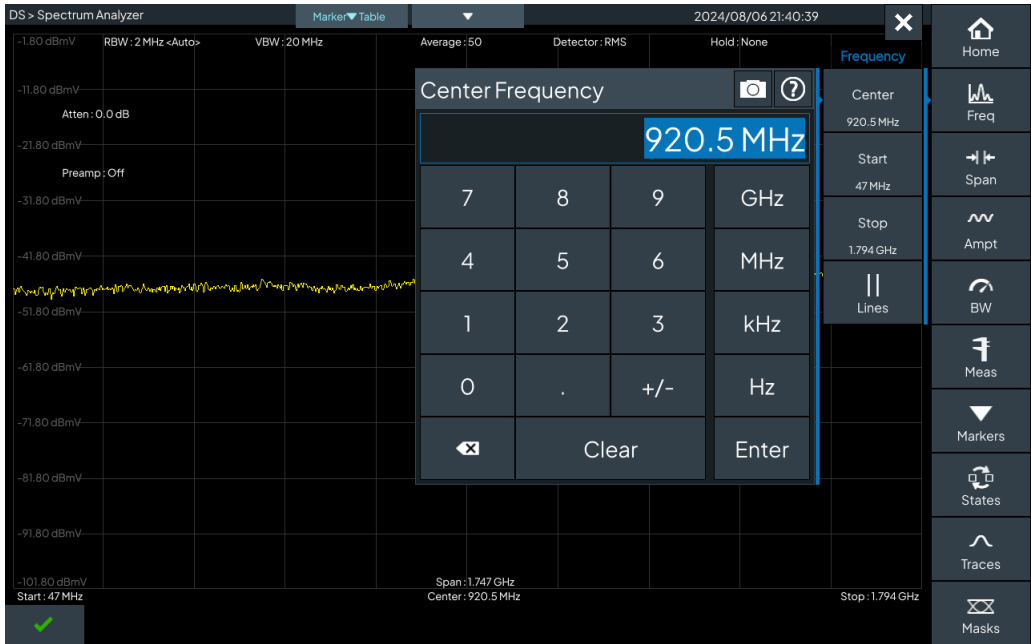


Figure 4-4 Left Menu and Dialog Window

Lower-level left menus display a back button (up arrow) to the left of the close button. This button will back out of the left menu hierarchy until the top-level left menu is displayed, which only shows the close button.

4.3.7 Utility Menu

The utility menu button is always visible at the top center of the screen. When you click this button, the utility menu will be overlaid across the top of the content pane as shown below.



Figure 4-5 Utility Menu

This menu provides the following buttons:

- 
 - **Recall**
Recall a previously stored instrument configuration.
- 
 - **Store**
Store the current instrument configuration.
- 
 - **File Management**
Move, copy, delete files.
- 
 - **Eject**
Safely eject a USB storage device.
- 
 - **Snapshot**
Save a snapshot of the entire screen to a PNG file. A preview of the snapshot is provided, which may be discarded or saved.
- 
 - **Selection**
Exit zoom area (next button). Closes the utility menu.
- 
 - **Zoom Area**
Zoom within a rectangle defined by mouse or touch drag. Only applies to graphical plots; not text, menus, or dialog windows.
- 
 - **Zoom In**
2x zoom where cursor is clicked or at touch point.
- 
 - **Zoom Out**
Zoom out to 1:1 in one step.
- 
 - **Help**
Opens relevant (context-sensitive) section of the DSA User Manual in a viewer dialog window. The DSA cannot be commanded via the GUI while the viewer window is open.

4.3.8 Dialog Windows

Dialog windows are opened when needed for user confirmation or user configuration entry. They overlay the content pane, to the left of the left menu. The mode dialog window in the home screen was shown in Figure 4-2 and a typical frequency entry window was shown in Figure 4-4.

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4.3.8.1 Status Bar

The status bar (see Figure 4-1) is located below the bottom of the content pane. It consists of an alarm button at the left and status icons to the right. Clicking the alarm button pops up the alarm log. Alarm messages will briefly pop up just above the alarm button if an alarm is detected. See section 4.6 of the User Manual for more details.

4.3.9 Title Bar

The title bar runs across the top of the screen and contains the following elements:

- Screen title at left, in breadcrumb format for context.
- Button to display/remove marker table for spectrum analyzer functions.
- Button to display/exit utility menu.
- Current date and time at right.

4.3.10 Content Pane

The content pane is the main area of user interaction for each DSA mode, displaying plots, status, and measurement results. Depending on usage, it will be temporarily overlaid with display elements such as dialog windows, utility menu, left menus, help viewer window, markers, lines, zoom area outline, etc.

The parameters displayed in each of the content pane screens and related menu buttons are described in detail in section 4 of the User Manual.

4.3.11 File Transfer

Transferring files to or from the DSA can be accomplished using

- GUI controls (Section 4.4.4.4 of the User Manual) to copy to or from a USB storage device
- SCPI (Section 7.7 of the User Manual)
- SNMP (Section 8 of the User Manual)
- Secure File Transfer Protocol (SFTP) over the control LAN interface (Section 2.3.4 of the User Manual).

4.4 Help

Help is available from the following sources:

- From the utility menu (? icon), which provides context-sensitive help from the DSA User Manual for the current screen.
- From the home screen: “Setup” > “Help”, which provides access to the DSA User Manual.

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- From the printed Getting Started guide that came with the instrument.
- From customer support (see preface).

4.5 Example Application

For one of the simpler example applications to try first, see the DOCSIS 3.1 OFDM downstream description in section 3.1.2 of the User Manual.