

# S3DR-C

SES Solid State Data Recorder - Compact



Product Design Hardware Design Software Design Mechanical Design Electronic Design

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# SES Solid State Data Recorders

The S3DR product family is a low cost, high performance, rugged solution to the processing and data recording needs of an environmentally challenging embedded system, such as those found in aerospace, defence, naval and safety-related or high performance industrial applications.

## Solid State Data Recorder - Compact



**J1**  
Power  
28V DC Nominal  
12V Tolerant - 5W Max, 4W (Typical)  
BS3G100 and Mil-Std-704-E



**J2**  
Multi I/O, 3x RS232/422/485  
Asynchronous Serial, 3 Discrete I/O  
(Additional I/O by request)



High-Speed Synchronous Serial I/O  
RS422 (NRZ Data + Clock),  
IRIG106 PCM Up To 40MHz  
2x CAN Channels or ARINC-429,  
IRIG B, 4 A/D Convertors,  
4 Voice Channels



PCMCIA Flash  
Memory Slot  
A protected enclosure  
holds an industry standard  
ATA Flash Drive  
(Current Max. 16Gb each)



Operation  
-40°C to +85°C  
Storage  
-55°C to +90°C



Highly Compact  
Package 115x85x28  
<0.5kg Weight



Front Panel  
Status Indicators



Supported by Reveal  
SES Data Retrieval  
and Management Tool



The S3DR product family is designed with flexibility and expandability in mind. S3DR-C (Compact) is a specialisation of the more generic product family providing a data recording solution where space and mass are at a premium. The unit features a high-speed recording function that is able to write data to a removable solid state memory module from multiple monitored interfaces at speeds up to 60 Mbits (7.5 Mbytes) per second. Memory modules are available in many sizes up to 16GBytes.

The S3DR-C is extremely configurable through the presence of an onboard embedded computer and FPGA allowing application specific data gathering regimes and I/O options to be accommodated. The S3DR-C can be used as a data recorder or for data uploading applications.

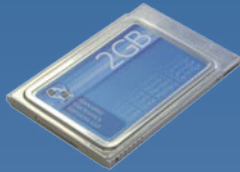
A number of optional peripherals are available including Ground-Replay facilities, remote or cockpit mounted control and display units and ground-based test rigs.

A key feature of the S3DR-C is the wide range of interface options available as standard, including high speed synchronous serial data (IRIG 106), IRIG-B timecode, asynchronous RS232/422/485, CAN bus, ARINC 429, analogue (including voice) and discrete I/O.

## Solid State Removable Memory Module

S3DR-C utilises high speed, high capacity PCMCIA ATA flash, providing low-cost high-performance removable media, with the added advantage that they can be read using a standard laptop, or a special high-speed reader.

SES have qualified a number of extended performance PCMCIA ATA flash cards which can be used with S3DR-C, but the recommended solution is to use SES own design of solid state removable memory modules. These have extended environmental performance and functionality, which when used in conjunction with an SES recorder, provide optimal performance.



SES solid state removable modules are available in the following capacities 256MB, 512MB, 1GB, 2GB, 4GB, 6GB, 8GB and 16GB. All SES cartridges are environmentally enhanced to achieve exceptional environmental performance:

### Performance:

Data Transfer Rates: Sustained read/write rate: 60 MBits per sec(min)

### Enhanced Functionality:

Sanitise (Secure) Erase of all data on media using DoD approved algorithms  
Purge (Destructive) Erase of media.  
Data security (blocking unauthorised access)

### Reliability:

MTBF: >4,000,000 power-on hours.  
Error Rate: Less than 1 bit in error in 10<sup>14</sup>bits read.  
ECC: High reliability based on internal Error Correcting Code function.

### Ruggedness:

Shock: Operating or non-operating 2000G, any axis or direction.  
Vibration: Operating or non-operating 30G peak to peak (sine), 10-2000Hz, any axis or direction, 14G (random)  
Temperature: -40°C to 85°C (operating), -40°C to 100°C (non operating)  
Humidity: >95% condensing ±4% to Mil-Std-810F Method 507  
Altitude: 80,000ft  
Water/Dust Ingress: Fully Sealed to IP68  
Water Immersion Depth (non operating): 10m  
Case Strength: Bend <4mm at 100N, Torsion 5NM <3°  
Connector Durability: Plug Cycles 10,000 insertions

## REVEAL

REVEAL is a partner product to the S3DR-CE data recorder. It allows the user to extract and manipulate data from a removable memory cartridge and prepare the cartridge for reuse by the S3DR-CE. REVEAL is an application for Microsoft Windows that provides a wealth of features for extracting, interpreting, visualising and analysing data captured using an SES data recorder. Key feature of the tool include:-

- Convert data to a variety of formats to allow analysis with domain specific tools
- Interpret data to demultiplex or decommutate a data stream into its constituent parameters
- Archive data to hard disk, CD or DVD for later analysis or long term storage
- Visualisation of data to allow visual analysis within REVEAL using a framework that supports real-time and fast-time playback where suitable hardware is available
- Declassification of S3DR data storage media
- Annotation of recorded data with supplementary data, for example Form 725

The architecture of the application allows for easy customisation of the application to suit specific requirements, for example introduction of a new plug in to output data in a new format. Alternatively, the underlying components can be reused to provide a bespoke application to automate the extraction and processing of S3DR data cartridges.



## Connectors and Power

Up to three circular military connectors sealed against sand, dust and fluids. One of these connectors is always power, the other 2 connectors provide 14 I/O pins that can be used to select the required functionality of the S3DR-C.

OR

A single high-density micro-D type connector for space constrained applications, providing up to 25 I/O connections and power,



Wide input range power supply (11-32V, 4 Watt at 28V nom.) tested to BS3G100, providing all power conditioning for internal supplies.

Hot-swappable solid state removable memory module (PCMCIA ATA Flash format).

Can be configured for "continuous loop" recording or "one-off" continuous recording which can either start from power-on, discrete input or from an external trigger.

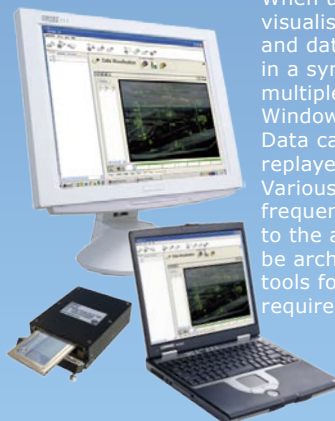
## Case Study: S3DR-C Cockpit Voice and Data Recorder

Using the available inbuilt interfaces S3DR-C can be configured to record a wide variety of data sources. In one configuration (SES part number 25200), the S3DR-C can provide the following inputs:-

- 2 Rx Channels of Arinc 429
- 3 Channels of Audio Line In @44.1 KSPS 10-bit
- 1 Channel of Microphone Level input @44.1KSPS 10-bit
- 2 Discrete Inputs (Event, Start/Stop)
- 16 GByte Solid State Cartridge (up to 48 hours voice recordings, with databus (GPS))

The Arinc429 databus can be used for recording aircraft flight data parameters, such as GPS position, speed, heading and time.

When used with the REVEAL data visualisation tool, captured audio and data bus traffic are displayed in a synchronised manner on multiple video screens of a Windows XP analysis workstation. Data can be statically viewed or replayed in real-time or fast time. Various analysis functions, such as frequency analysis, can be applied to the audio data. Finally data can be archived or exported to further tools for more in-depth analysis as required.



# S3DR-C Specification



Size:	115mm(d) x 85mm(w) x 28mm(h) (excluding connectors)
Weight:	< 0.5kg
Case Construction:	Aluminium Alloy Casing
Selectable Interface Options:	High speed Synchronous Serial (various encoding schemes including Manchester, Miller and IRIG 106) at up to 40Mb/sec 3xRS232 or 3xRS485 or 2xRS422 serial links 2xARINC429 Rx hannels 2xCANBus 4x A/D 10-bit resolution, sampling at 625KSPS or 4x 10-bit Voice Channels at 40.4KSPS 6 Digital Inputs 2 Digital Outputs IRIG B Timecode Input
Recording Memory Media:	PCMCIA Card (Types I and II)/SES High Capacity Cartridge
Max Recording Rate:	60 Mbit/s (from all sources)
Power Requirements:	28V, 4W (typical)
Customisation Options:	NVIS Goggle Compatibility

OPERATING TEMPERATURE:	-40°C to 85°C
STORAGE TEMPERATURE:	-55°C to 90°C
TEMP/HUMIDITY:	Tested to MIL-STD-810F method 507.4
EMC:	Tested to Def-Stan 59-41 Part 3 DCE01, DCE02, DCE03, DRE01, DRE02, DCS01, DCS02, DCS03, DRS01, DRS02
VIBRATION:	Tested to MIL-STD-810F method 514.5 Procedure I (Category 12 - Jet Aircraft)
NORMAL ACCELERATION:	±25g in all axes for 10s
SHOCK ACCELERATION:	Normal working with 3 impacts, ±40g peak in all axes 11m/s, terminal peak sawtooth
MAGNETIC INFLUENCE:	BS3G100 Part 2, Section 2
ALTITUDE:	up to 50,000ft
INGRESS:	Protected to IP 64. Tested to MIL-STD-810F Method 506.1 Proc III

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