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**Interface Control Document
For the
Airborne Digital Video Recorder
Part Number: 400953**

**Document Number
500973
Issue 3**



APPROVALS

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AMENDMENT RECORD

Revision	Date	Amendment Details
1	17 December 2002	First Issue
2	04 September 2003	Corrections: Weight (section 4). Test conditions for temperature variation, and vibration (Section 6).
3	17 September 2003	Section 6, test category of section 7 of the RTCA /DO-160D changed to B. Error within the footer date corrected.



Optional remote control not shown

ABBREVIATIONS

ADVR	Airborne Digital Video Recorder
ARINC	Aeronautical Radio Inc.
BIT	Built In Test
COTS	Commercial Off The Shelf
DC	Direct Current
DVCAM	Digital recording standard (SONY)
DVCR	Digital Video Cassette Recorder
EL	Electro Luminance
FFWD	Fast Forward
FPU	Front Panel Unit
ICD	Interface Control Document
LED	Light Emitting Diode
LRU	Line Replaceable Unit
PAL	Phase Alternate Lines
PWM	Pulse Width Modulation
RCU	Remote Control Unit
REC	Record
REW	Rewind
RTCA	Radio Technical Commission for Aeronautics
SAR	Search And Rescue
SPA	Switch Panel assembly
VCR	Video Cassette Recorder

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1 INTRODUCTION

1.1 Overview

The Airborne Digital Video Recorder (ADVR), Part Number: 400953 is a rugged video cassette recorder utilising the DVCAM digital recording format, which gives a 3 hour continuous recording capability. This method of recording achieves stable, high quality picture quality. Because the recording is digital, multi-generation digital dubbing can be performed with virtually no loss of quality.

The ADVR is based on the Commercial Off The Shelf (COTS) Sony DSR-11 DVCAM Digital Video Cassette Recorder (DVCR). This is housed in an airborne quality enclosure, which provides a standard interface to the host vehicle and enhanced environmental protection.

The front panel has a lockable door for access to the tape mechanism for the purpose of loading and unloading of tapes. When closed and secured, the door seats against an environmental seal to prevent the ingress of dirt and moisture. All external switches, indicators and connectors are similarly sealed against dirt and moisture

1.2 Purpose of this Document

This document together with the Interface Control Drawing (500967) provides the information necessary for aircraft installation.

1.3 Scope of this Document

This document details the electrical, and operator interfaces for the ADVR.

1.4 Applicable Documents

500967	Issue D	Interface Control Drawing for the ADVR
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2 USER INTERFACE

2.1 General Description

The ADVR is controlled by the operator using the front panel switches. The SONY DSR-11 DVCR incorporated within the ADVR determines the main functionality. Not all operating modes of the DSR-11 are made available to the ADVR. The user interfaces are selected to allow ease of operation in a high workload operational environment.

2.2 ADVR Control

The ADVR functional controls are situated on the front panel of the ADVR. With the exception of the power on/off switch, all other switch functions (and status indicators) are incorporated into a membrane type switch panel assembly (SPA). The power on/off switch is a two position rotary type, with on/off position indexing of 45 degrees.

Switch outlines and legends are illuminated using Electro-Luminance (EL) backlighting.

2.2.1 Front Panel Controls

Function	Description
ON/OFF	Turn to ON to apply power to the ADVR. Turn to OFF to remove power from the ADVR.
STOP / EJECT	Press briefly to stop the current tape operation. Press and hold for 3 seconds to eject tape. Tape ejection is only allowed if the tape load door is open.
REW / MENU -	When the on screen menu mode is not selected, press to rewind the tape. When menu mode selected, press to select the menu parameter / change data (down)
PLAY	Press to start playback. Playback is only allowed if the tape load door is closed.
FFWD / MENU +	When the on screen menu mode is not selected, press to fast forward the tape. When menu mode selected, press to select the menu parameter / change data (up)
PAUSE	Press to initiate pause mode. Press again to resume normal operation.
REC	Press while pressing the PLAY button to start recording. Recording is only allowed if the tape load door is closed.
MENU	Press to enter / exit on screen menu
SET	Press to set menu data, and return to the submenu.
DIM	Press to set brightness level of EL back lighting, and status LED's.

2.3 ADVR Status

System status is determined by status indicators on the ADVR, and by indications displayed on the monitor. All status indicators are of LED type, and are incorporated into the membrane switch panel assembly.

The brightness of the status indicator LED's and EL backlighting are controlled using the DIM switch on the front panel.

2.3.1 Status Indicators

Function	Colour	Description
ON	Green	Lit continuously when the power ON /OFF switch is set to ON, and the ADVR is in normal operating mode.
MENU	Green	Lit continuously when the on screen menu mode is selected. Extinguished on exit from the menu mode.
EOT	Amber	Flashes when 5 minutes recording time remain. Lit continuously when the tape has ended.
REW/MENU-	Green	When menu mode not selected, this indicator lights continuously during a tape rewind operation. When menu mode is selected, this indicator lights when a MENU + operation is requested.
PLAY	Green	Lit continuously during playback and record operations.
FFWD/MENU+	Green	When menu mode not selected, this indicator lights continuously during a tape fast forward operation. When menu mode is selected, this indicator lights when a MENU - operation is requested.
PAUSE	Green	Lit continuously during pause operation.
REC	Green	Lit continuously during record operation.
STOP/EJECT	Green	Lit continuously when a tape is loaded but no operating mode requested. Flashes when tape not loaded.
SET	Green	Lit during SET operations.
CAUTION	Amber	Flashes when the ADVR detects an error. Lit continuously when the tape load door is open.
DVCAM	Green	Lit continuously when the ADVR is playing back a tape recorded in DVCAM format.
NTSC	Green	Lit continuously when the ADVR is operating in NTSC mode.
PAL	Green	Lit continuously when the ADVR is operating in PAL mode.

The flash rate of indicators is approximately 2 times per second.

3 ELECTRICAL INTERFACES

The ADVR interfaces electrically to the host vehicle by D38999 type connectors located on its rear panel. An earth stud is provided for bonding.

3.1 ADVR Power Input

The ADVR derives all necessary power from the vehicles nominal 28V DC (24V DC Battery), negative earth supply. The power input is reverse voltage protected and conforms to the requirements of RTCA/DO160D as detailed in section 6.

To ensure that the integrity of the aircraft is not compromised in the event of an internal failure within the ADVR, the unit is fitted with a 3 A thermal circuit breaker.

A discrete input line is provided to allow a lamp test facility via an external remote switch in the aircraft.

3.1.1 Power Consumption

The total power consumption of the ADVR shall not exceed 52 Watts (1.86A at 28V).

3.1.2 Power Connector Pin Assignments

The following table details the connector type, pin-out and signal definition.

J1 (POWER)	Type	D38999/20WB98PN	
Signal	Pin	Definition	Signal Type
+28V DC	A	Aircraft +28V DC Supply to DO160D Section 16 and 17, Category B	Input
0V(28)	B	Aircraft +28V Return	
Chassis	C	Screen	
Reserved	D	Not used	
Reserved	E	Not used	
Lamp Test	F	Lamp Test Enable Connect to 28V Return to enter Lamp Test mode, during which all status LED's are lit continuously at the set brightness.	Input

3.2 Remote Interface

The Remote interface provides a RS422 bi-directional link. This allows the ADVR to be controlled from a Remote Control Unit (future upgrade). A RS232 Test Port interface is incorporated to allow a laptop computer to be connected to permit PC control, and BIT analysis, by test engineers.

3.2.1 Remote Connector pin Assignments

The following table details the connector type, pin-out and signal definition.

J2 (REMOTE)	Type	D38999/20WB35SN	
Signal Name	Pin	Definition	Signal Type
GND	1	Signal Ground	
RS422 TXD+	2	Transmitted Data +	Output
RS422 TXD-	3	Transmitted Data -	
RS422 RXD+	4	Received data +	Input
RS422 RXD-	5	Received data -	
Reserved	6	Do not connect	Input
RCU Power Ctrl	7	Not used	Input
RCU Power +	8	+28V	Power Output
RCU Power -	9	RTN(28V)	
Reserved	10	Do not connect	Input
RS232 TXD	11	Test port Tx	Output
RS232 RXD	12	Test port Rx	Input
EOT	13	End of Tape Discrete Output This output goes low to indicate an End of Tape condition (open collector output, capable of sinking 500 mA).	Output

3.3 Video and Audio Interface

Video signals can be presented to the ADVR in three different formats, Composite Video (PAL), S-Video or DV format. Standard video BNC connectors are used for the composite video signals and all other video and audio signals are incorporated in a single connector (J3).

Insulated style BNC sockets are used for J4 and J5 to prevent the creation of local earth loops within the ADVR. Differential input video buffer circuits are incorporated on the composite, S-video luminance, and S-video chrominance inputs to reduce system earth loops.

Video line drivers are incorporated on the composite, S-video luminance, and S-video chrominance outputs.

When the ADVR is not powered, total isolation of its internal audio circuitry from the aircraft audio systems is achieved using relays.

3.3.1 Video Connector pin Assignments

The following tables detail the connector type, pin-out and signal definition.

J3 (DV/S/AUDIO)	Type	D38999/20WC35SN	
Signal	Pin	Definition	Signal Type
NTPB	1	DV Video In	IEEE 1394-1995
TPB	2	DV Video In	
GND	3	DV Video In Return	
NTPA	4	DV Video Out (Playback)	IEEE 1394-1995
TPA	5	DV Video Out (Playback)	
GND	6	DV Video Out Return	

J3 (DV/S/AUDIO)	Type	D38999/20WC35SN	
S-VID IN (Y)	7	Luminance Video	1.0 V pk-pk, 75R ohms
S-VID IN (C)	8	Chrominance Video	0.3 V pk-pk, 75R ohms
S-VID IN (GND)	9	S-Video In Return	
S-VID OUT (Y)	10	Luminance Video	1.0 V pk-pk, 75R ohms
S-VID OUT (C)	11	Chrominance Video	0.3 V pk-pk, 75R ohms
S-VID OUT (GND)	12	S-Video Out Return	
Audio 1 In +	13	Audio 1 In +	0V to 5V (3.75V nom.)
Audio 1 In -	14	Audio 1 In -	300 ohms input impedance
Audio 1 GND	15	Audio 1 Return	
Audio 1 Out +	16	Audio 1 Out +	0V to 5V (3.75V nom.)
Audio 1 Out -	17	Audio 1 Out -	150 ohm drive capability
Audio 2 In +	18	Audio 2 In +	0V to 5V (3.75V nom.)
Audio 2 In -	19	Audio 2 In -	300 ohms input impedance
Audio 2 GND	20	Audio 2 Return	
Audio 2 Out +	21	Audio 2 Out +	0V to 5V (3.75V nom.)
Audio 2 Out -	22	Audio 2 Out -	150 ohm drive capability

J4 (VIDEO IN)	Type	BNC Socket (Insulated)	
Signal	Pin	Definition	
Video In (X)	Centre	Composite Video	1V pk-pk, CCIR, PAL
Video In (G)	Outer	Video Return	75R input impedance

J5 (VIDEO OUT)	Type	BNC Socket (Insulated)	
Signal	Pin	Definition	
Video Out (X)	Centre	Composite Video	1V pk-pk, CCIR, PAL
Video Out (G)	Outer	Video Return	75R output impedance

4 PHYSICAL INTERFACES

The ADVR comprises an ARINC style enclosure, and is fitted to the host vehicle using quick release fasteners. Mechanical interface information is defined in Interface Control drawing 500967.

4.1 Weight

The ADVR weighs less than 6.5Kg

4.2 Mounting

The ADVR is designed for mounting on an ARINC tray which incorporates anti-vibration mounts.

4.3 Cooling

The ADVR does not require any special cooling arrangements.

4.4 Flight Approvals

The ADVR is approved for aircraft use and has the following approvals:-

CA(PE) FORM 100A

5 MAINTAINABILITY

The ADVR has an externally visible part number (including a NATO Stock No, and barcode) on its rear cover. An ADVR is fully interchangeable and replaceable with units having the same part number, without the need for further system calibration.

5.1 Periodic Checks and Maintenance Procedures

The following periodic maintenance procedures are necessary to ensure trouble free operation of the ADVR.

5.1.1 Tape Path System Cleaning

Using a cleaning tape, the tape path system and recording head mechanism should be cleaned after every 500 hours use.

5.1.2 Desiccant Check / Recharge

The desiccant module in the ADVR should be checked regularly and recharged when its indicator turns pink.

To reduce the time required between recharging of the desiccant module, the tape load door should be closed after the insertion or removal of a tape.

5.2 Safety

5.2.1 User Hazards

None identified

5.2.2 Equipment Hazards

None identified

6 ENVIRONMENTAL REQUIREMENTS

With the tape access door securely closed, the system is designed to meet the requirements of RTCA/DO160D as defined in the following table.

DO-160D Section	Environmental Condition	ADVR
	Climatic Environment	
4	Temperature	Cat. A4 Storage: -20°C to +60°C Operating: -5°C to +50°C
4	Altitude	Cat. A4 Operating: 15K Feet
5	Temperature Variation	Cat. B: Operating: 5 deg/min min.
6	Humidity	Cat. A
	Electromagnetic Compatibility	
15	Magnetic Effect	Measured
18	Audio Frequency Conducted Susceptibility - Power Inputs	Cat. B
19	Induced Signal Susceptibility	Cat. A
20	Radio Frequency Susceptibility (Radiated and Conducted)	Cat. S
21	Emission of Radio Frequency Energy	Cat. L
25	Electrostatic Discharge (ESD)	Cat. A
	Power Supply	
16	Power Input	Cat. B
17	Voltage Spike	Cat. B (56V)
	Mechanical environment	
7	Operational Shocks & Crash Safety	Cat. B Operating : 6 g – 11 ms
8	Vibration	Cat. U

END OF DOCUMENT

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