

AIR DATA CONVERTER UNIT
DESIGN SPECIFICATION
MODEL: ADCU-500, P/N 02050001

SKYLIGHT AVIONICS
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Palmdale, Ca. 93550
(661) 265-0497

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DOC. # 02080002, REV: 4, Date: 09/08/03

i. OPERATING INSTRUCTIONS

The Model ADCU-500, P/N 02050001, ARINC-565 Air Data Computer to ARINC-429 digital bus converter. Being a data format converter only, has no independent operating instructions and should be considered transparent to the Air Data System. Being an integral part of the system, the operating instructions for that system will need to be followed.

The design of the ADCU-500 is such as to cause minimal degradation of the input signal and to convert the data in the fastest and most accurate means possible.

ii. EQUIPMENT LIMITATIONS

The ADCU-500, is limited to converting the ARINC-565/575, Synchro, AC Analog and DC Analog signals of the currently installed Air Data Computers into a digital ARINC-429 output. The unit will accept as discrete inputs (5) valid signals from the ARINC-565 source, to assist is determining system status and (1) label select.

The ADCU-500, as an integral component of the on board Air Data System, the accuracy is directly limited to the output driving it. In effect, it is a "Incomplete System" and therefore subjected to all inherent limitations of the Air Data Computer system. The conditions and test required for TSO C106 approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. If not within the TSO standards, the article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the administrator. System tolerances are shown in section (iii) INSTALLATION PROCEDURES, (5) POST INSTALLATION CHECK.

As "Essential Equipment" a hardware design assurance of "Level C" per RTCA DO-254 "Design Assurance Guidance for Airborne Electronic Hardware" will be applied to design verification, documentation and manufacturing.

Failure Condition Classification "Major"

Failure Condition Description "Failure conditions that would reduce the capability of the aircraft or the ability of the flight crew to cope with adverse operating conditions to the extent that there would be a significant reduction in safety margins or functional capabilities, a significant increase in flight crew workload or in conditions impairing flight crew efficiency, or discomfort to occupants, possibly including injuries.

Hardware Design Assurance Level Definition "C" Hardware functions whose failure or anomalous behavior, as shown by the hardware safety assessment, would cause a failure of system function resulting in a major failure condition for the aircraft".

The ADCU-500, is classified as "ON CONDITION" with no preventative maintenance required. No overhaul time limitations apply. No scheduled inspections to determine operational status are required however if the Air Data Computer is removed or replaced for maintenance section (iii) INSTALLATION PROCEDURES, (5) POST INSTALLATION CHECK must be completed and system accuracy verified to maintain TSO Qualification. In the event of a failure the operator or cognizant maintenance facility shall remove the appliance and return it to Skylight Avionics for the repair or replacement.

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iii. INSTALLATION PROCEDURES

1. INTRODUCTION

This section contains information relative to the installation of the ADCU-500, to assure satisfactory performance of the unit. (See Sections "iv" and "v" for detailed mechanical and wiring diagrams.)

2. UNPACKING AND INSPECTING EQUIPMENT

After unpacking the unit, make a visual inspection of the unit for evidence of damage incurred during shipment. If claim for damage is to be made, save the shipping container to substantiate the claim.

3. PREINSTALLATION CHECK

Perform a continuity and power check on the wiring harness before connecting equipment.

4. POWER REQUIREMENTS

The ADCU-500, operates from a standard 27.5 Volt DC aircraft power source. Provide circuit protection with an in line 1 AMP breaker on the 27.5 VDC. Aircraft AC is used for reference only.

5. POST INSTALLATION CHECK

Follow the manufactures check out procedures of the on board systems, to determine indications being driven by the ADCU-500, are accurate.

ARINC 429 Label 204/203 Altitude

System must met AS8002 Rev A Table 1 Altitude to qualify for TSO-C106,

Altitude Feet	Tolerance		Altitude Feet	Tolerance
0	25		11000	35
1000	25		14000	40
2000	25		17000	45
3000	25		20000	50
4000	25		30000	75
5000	25		40000	100
8000	30		50000	125

ARINC 429 Label 206 Calibrated Air Speed

System must met AS8002 Rev A Table 3 Calibrated Air Speed to qualify for TSO-C106,

Airspeed Knots	Tolerance		Airspeed Knots	Tolerance
50	5.0		250	2.4
80	3.5		300	2.8
100	2.0		350	3.2
120	2.0		400	3.6
150	2.0		450	4.0
200	2.0			

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iii. INSTALLATION PROCEDURES (Cont.)

ARINC 429 Label 205 Mach Number

System must met AS8002 Rev A Table 4 Mach Number to qualify for TSO-C106,

Altitude Feet	Mach	Tolerance		Altitude Feet	Mach	Tolerance
0	.3	.012		30,000	.6	.0075
	.4	.012			.7	.005
	.5	.012			.80	.005
	.6	.012			.90	.005
					.95	.0075
10,000	.4	.012				
	.5	.010		40,000	.70	.005
	.6	.0075			.80	.005
	.7	.005			.90	.005
					.95	.0075
20,000	.4	.012				
	.5	.010		50,000	.75	.005
	.6	.0075			.90	.005
	.7	.005			.95	.0075
					1.00	.015

ARINC 429 Label 212 Vertical Speed

System must met AS8002 Rev A Table 5 Vertical Speed to qualify for TSO-C106,

Vertical Speed	Tolerance		Vertical Speed	Tolerance
6,000	300		-6,000	300
4,000	200		-4,000	200
2,000	100		-2,000	100
1,000	50		-1,000	50
500	45		-500	45
200	45		-200	45
100	45		-100	45
50	45		-50	45
0	45			

There is no in-aircraft adjustment for the ADCU-500. All alignment and adjustment procedures are accomplished during bench maintenance.

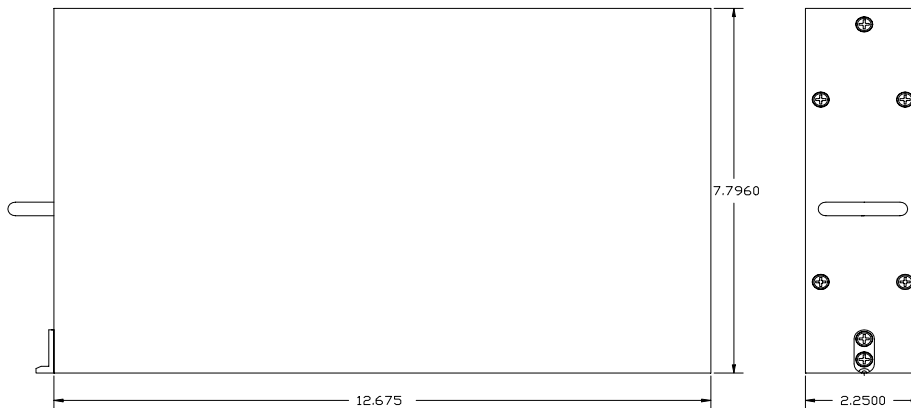
6. PREFLIGHT CHECK

Follow the manufactures check out procedures of the on board systems, to determine indications being driven by the ADCU-500, are accurate.

iv. INSTALLATION MECHANICAL DIAGRAMS

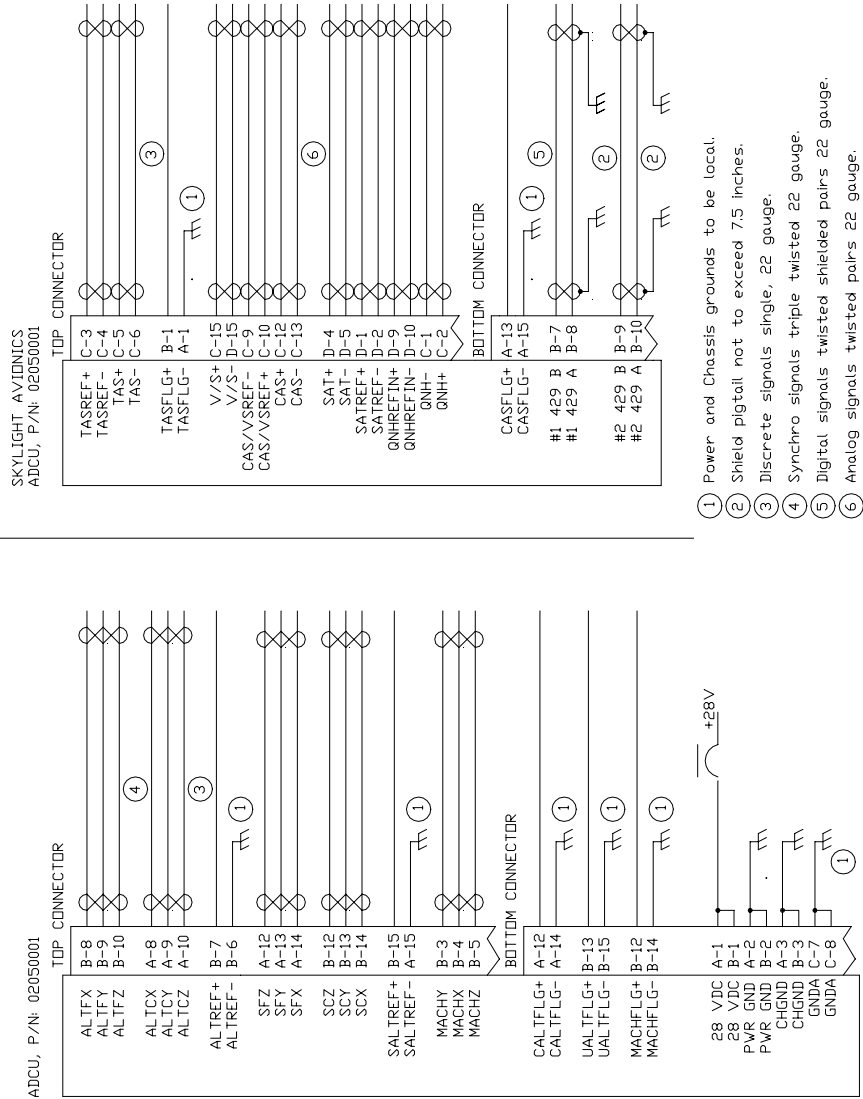
The ADCU-500, is designed following the standards for a 2 MCU enclosure, for mounting tray installation anywhere on board the aircraft, pressurized or non-pressurized compartments. The unit requires the appropriate 2 MCU tray to be properly installed.
(NOTE: Trays, connectors and miscellaneous hardware are NOT included with the ADCU.)

MECHANICAL DRAWING



Mechanical Drawing of ADCU-500, P/N 02050001
Illustration (iv-1)

v. INSTALLATION ELECTRICAL



Electrical interconnect of ADCU-500, P/N 02050001

vi. SPECIFICATIONS

SPECIFICATION	CHARACTERISTICS
Compliance	TSO C106
RTCA/DO-160D	D2/B/A/B/BB1R/X/X/X/X/X/Z/Z/A/Z/Z/RR/M/XXC3/X/X/A
Physical Dimensions	Height 7.796" Length 12.675" Width 2.330" Weight 4.0 Lbs.
Temperature Range	Operational -55 C to +70 C Storage -55 C to +85 C
Altitude	50,000'
Power Requirements	28 VDC @ .75 AMP Peak .3 AMP Normal
ARINC-565/575 Analog Inputs	Pressure Altitude, Source Fine/Coarse Synchro ARINC-565 No. 2 output Accuracy $\pm 0.5^\circ$ with respect to No. 1 Range -1000 to 50,000 ft. Index Reference 0 ft. Fine Scale Factor 360 degrees per 5000 ft. Coarse Scale Factor ratio 27:1. ADC Discrete Flag: 28VDC valid 2mA ADC 26VAC Reference Sel-Altitude, (Error) Source Fine/Coarse Synchro, Altitude Error Accuracy $\pm 0.5^\circ$ Range -50,000 to 50,000 ft. Index Reference 0 ft. Fine Scale Factor 360 degrees per 5000 ft. Coarse Scale Factor ratio 27:1. Preselector 26VAC Reference Mach, Source Synchro ARINC-565. Accuracy .005 Mach at 0.5 through 0.95 Mach, 0.01 all others. Range 0.1 to 1.0 Mach Index Reference 0.2 Mach Scale Factor 360° per Mach ADC 26VAC Reference common to Pressure Altitude

vi. SPECIFICATIONS (cont.)

ARINC-565/575 Inputs (cont.)

Computed Airspeed (CAS),
Source Analog AC Voltage ARINC-565 No. 3 output
Accuracy, ± 2 Knots (40mv) or 10% of output, whichever is greater with respect to Synchro No. 1 from 100 to 450 Knots.
Range 50 to 450 Knots
Index Reference 0VAC at 350 Knots with signal and reference voltages in phase at speeds in excess of the index reference and 180° at speeds below 350 Knots.
Scale Factor 20 millivolts per Knot with excitation of 26.000 VAC.
Impedance Transformer isolated, 10,000 ohms
ADC 26VAC reference common to Vertical Speed.

Vertical Speed

Source AC Tachometer (or equivalent)
Accuracy 5% of indicated best straight line, or 30 feet per minute, whichever is greater.
Range 0 to $\pm 20,000$ feet per minute.
Index Reference: in-phase for increasing altitude, out-of-phase for decreasing altitude.
Scale Factor 250 millivolts per 1,000 feet per minute of altitude rate into a load impedance of 5,000 ohms resistive.
ADC 26VAC Reference common to Computed Airspeed

Static Air Temperature

Source DC Amplifier having the circuit Lo side grounded with the reference voltage return input must be isolated to prevent ground loops.
Accuracy $\pm 1.0^\circ$ C
Range -99° C to $+ 50^\circ$ C
Scale Factor $E_{sat}/E_{ref} = 0.012087 * \sqrt{SAT}$, SAT in degrees Kelvin
Impedance 10,000 ohms
Reference Voltage 20 ± 2 VDC at 10,000 ohms

True Airspeed

Source AC Voltage Ratio, AC Transformer or equivalent.
ARINC-565 No. 1 output.
Accuracy ± 4 Knots or 2.5%
Range 100 Knots to 599 Knots
Index Reference 100 Knots
Scale Factor 46.6 Knots per Volt $\pm 1\%$
Impedance 10,000 Ohms
Reference Voltage 11.8 ± 10 VAC at 10,000 ohms

QNH

Source DC Voltage Ratio
Accuracy 1%
Range 0 to 100%
Index Reference 20V

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vi. SPECIFICATIONS (cont.)

Output Parameters

ARINC-429 Specification

Altitude: Label: 203-204 dependent on discrete select input

Rate: 65mSec max

Accuracy: 10 feet of the input

Range: -1000 feet to 50,000 feet min

Resolution: 4 feet

Significant Bits 16 binary data, 1 sign

Index: 2 feet

(Direct conversion from synchro input.)

Sel - Altitude: Label: 102 (can round to 100 foot)

Rate: 65mSec max

Accuracy: 10 feet of the input

Range: -1000 feet to 50,000 feet min

Resolution: 4 feet

Significant Bits 15 binary data, 1 sign

Index: 1 foot

(Pressure Altitude - Altitude error.)

Mach: Label: 205

Rate: 125mSec max

Accuracy: 0.001 Mach of the input

Range: 0.1 to 1 Mach

Significant Bits 16 binary data

Index: 0.0000625 Mach

(Direct conversion from synchro input.)

Computed Air Speed: Label: 206

Rate: 125mSec max

Accuracy: ± 2 of the input

Range: 50 Knots to 450 Knots

Significant Bits: 11 binary data

Index: 0.5 Knots

(Direct conversion from AC Analog input.)

Altitude Rate: Label: 212

Rate: 65mSec max

Accuracy:

± 32 ft/min. to 1000 ft/min, of the input

± 50 ft/min. at 2000 ft/min, of the input

± 150 ft/min. at 4000 ft/min, of the input

± 300 ft/min. at 6000 ft/min, of the input

Range: 0 feet to $\pm 6,000$ feet/min.

Significant Bits 11 binary data, 1 sign

Index: 16 feet/min.

(Direct conversion from AC Analog input.)

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vi. SPECIFICATIONS (cont)

ARINC-429 Output Specification (cont.)

True Air Speed: Label: 210
Rate: 125mSec max
Accuracy: ± 2 kts of the input
Range: 100 Knots to 599 Knots
Valid: NCD < 135 Knots
Significant Bits: 12 binary data
Index: 0.5 Knots
(Direct conversion from AC Analog input.)

Static Air Temperature: Label: 213
Rate: 500mSec max
Accuracy: $\pm 1^\circ$ C of the input
Range: -99° C to 50° C
Significant Bits: 9 binary data, 1 sign
Index: 1° C
(Direct conversion from DC Analog input.)

QNH Baro-Correction: Label: 215 (Not Used)
Rate: 125mSec max
Accuracy: 1%
Range: 0.0000 - 1.000
Valid: NCD, No input on current A/C
Significant Bits: 15 (Bit 28 = MSB)
(Designed to work with external or internal Reference,
conversion from DC Analog.)

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vii. MAJOR COMPONENT

Equipment Supplied:

1ea. Model ADCU-500, Part Number 02050001

Equipment Required But Not Supplied:

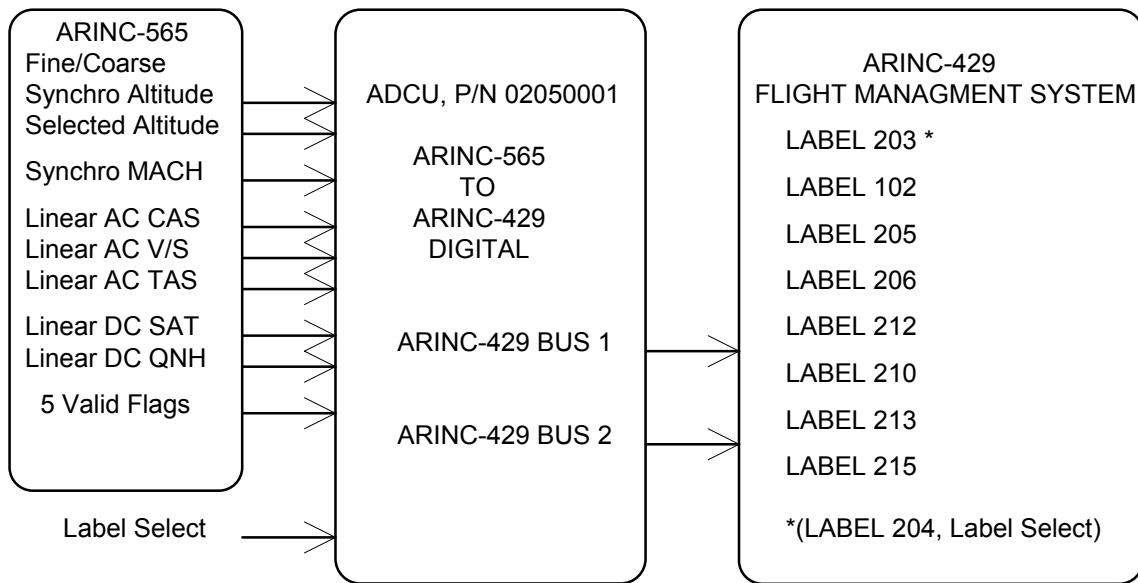
1 ea. 2 MCU Mounting Tray, AEI, P/N: A10000-102C.
 Connector: ARINC-600, P/N BKAE1-120-30001.
 Wiring Harness Interconnect cable as required.

Air Data Computers

BENDIX	HONEYWELL
3757183-1	193925-1
3757183-2	193925-2
3757183-3	193925-3
3757183-5	HG480C1 AND HG480C2

Flight Management Systems

CMA-900 P/N 100-601900-402



INTERCONNECT BLOCK DIAGRAM
 (Illustration vii-1)

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viii. ENVIRONMENTAL QUALIFICATION FORM

NOMENCLATURE: ARINC 565/575 TO ARINC 429

MODEL / PART NO: ADCU-500, P/N 02050001

MANUFACTURE'S SPECIFICATION; NONE

MANUFACTURE: SKYLIGHT AVIONICS

ADDRESS: 38629 6th STREET EAST, PALMDALE, CA. 93550-3717

RTCA/DO-160D, Change 2, Dated, June 12, 2001

DATE TESTED: TBD

Conditions	Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Category D2 Auxiliary air cooling not required.
Temperature Variation	5.0	Equipment tested to Category B
Humidity	6.0	Equipment tested to Category A
Operational Shock and Crash Safety	7.0	Equipment tested to Category B operational and crash safety
Vibration	8.0	Equipment tested Category T, Zone 2, Curves B,B1,R
Explosion	9.0	Category X no test required
Waterproofness	10.0	Category X no test required
Fluids Susceptibility	11.0	Category X no test required
Sand and Dust	12.0	Category X no test required
Fungus	13.0	Category X no test required
Salt Spray	14.0	Category X no test required
Magnetic Effect	15.0	Equipment tested to Category Z
Power Input	16.0	Equipment tested to Category Z
Voltage Spike	17.0	Equipment tested to Category A
Audio Frequency Susceptibility	18.0	Equipment tested to Category Z
Induced Signal Susceptibility	19.0	Equipment tested to Category Z
Radio Frequency Susceptibility	20.0	Equipment tested to Category RR
Radio Frequency Emission	21.0	Equipment tested to Category M
Lighting, Multiple Stroke & Multiple Burst	22.0	Equipment tested to Category XXE3 (M.S. 1MHZ) (M.B. 10MHZ)
Lighting Direct Effects	23.0	Category X no test required
Icing	24.0	Category X no test required
Electrostatic Discharge	25.0	Equipment tested to Category A

Remarks:

Compliance to FAR Part 25 demonstrated by component parts and material analysis.

Environmental tests will be conducted at:

ENVIRONMENT ASSOCIATES, INC

9604 VARIEL AVE.

CHATSWORTH, CA. 91311