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# CubeSat Kit™

## ADACS Interface Module

Hardware Revision: A

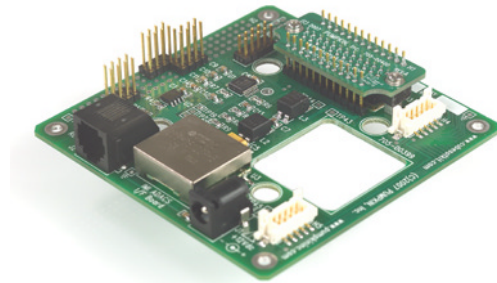
### CubeSat Kit Interface Module for MAI-100 & MAI-200 ADACS

#### Applications

- CubeSat Kits using MAI-100 & MAI-200 ADACS

#### Features

- Plug-and-play CubeSat Kit interface module for MAI-100 & MAI-200 ADACS
- +12V for ADACS from CubeSat Kit Bus
- Micropower RS-232 interface to ADACS
- Auto-reset overcurrent trip protection
- Direct connection to ADACS via subminiature 25-pin connector
- Separate connectors for Magnetometer & Sun Sensor
- I2C interface for control of +12V power and RS-232 interface
- Wiring-free module interconnect scheme
- External +12 Vdc power jack and RS-232 header for direct-to-PC operation
- ICSP connector for field reprogramming of MAI-100
- 2-layer blue-soldermask PCB



prototype shown

#### ORDERING INFORMATION

Pumpkin P/N 711-00408

Option Code	Configuration
/00 (standard)	standard
/01	J1, J2, H6 not fitted

Contact factory for availability of optional configurations.  
Option code /00 shown.



#### CAUTION

Electrostatic Sensitive Devices

Handle with Care



The ADACS Interface Module is supplied as part of the Pumpkin MAI-100 ADACS Kit (P/N 711-00416) or Pumpkin MAI-200 ADACS Kit (P/N 711-00700), which consist of the following items:

Qty	Pumpkin P/N	Description
1	634-00412 or 634-00458	MAI-100 ADACS & external magnetometer or MAI-200 ADACS & external magnetometer
2	703-00398	CubeSat Kit Payload Adapter Plate
1	703-00397	CubeSat Kit ADACS Payload Walls
1	711-00408	CubeSat Kit ADACS Interface Module
1	709-00417	CubeSat Kit ADACS Software

**CHANGELOG**

Rev.	Date	Author	Comments
A	20101111	AEK	Changed name references from IMI to MAI. Updated PCB color to reflect the transition from prototype to production status (in 2009).

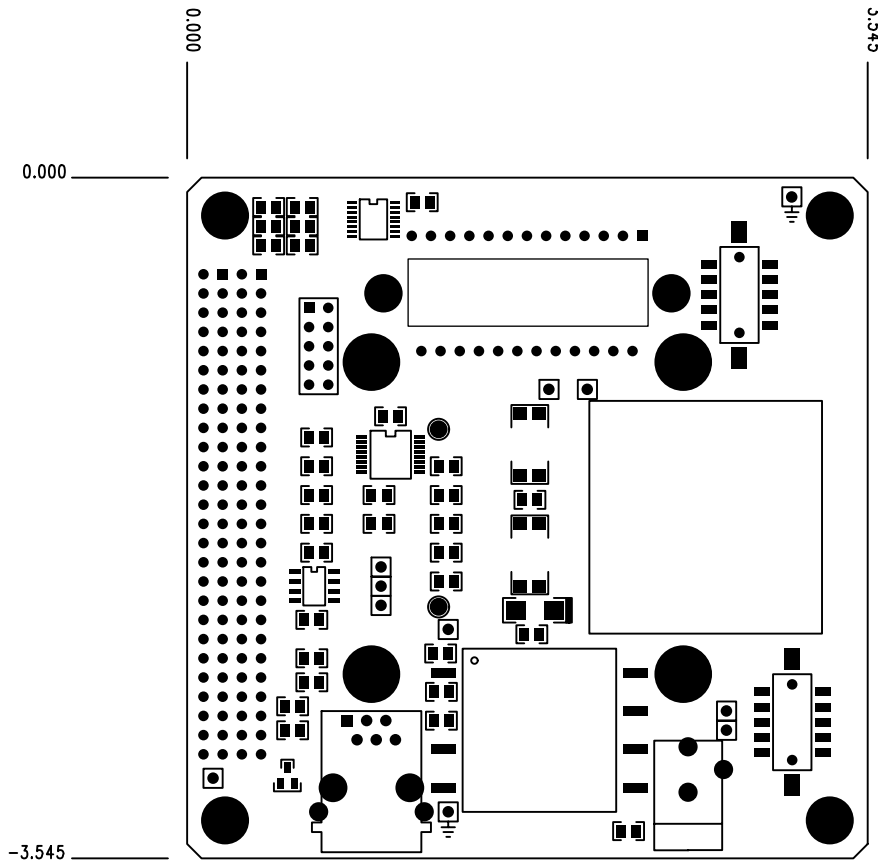
**ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Value	Units
Operating temperature	$T_A$	-40 to +85	°C
Voltage from +5V_SYS		9	Vdc
Voltage on J1 (external +12 Vdc input)		15	Vdc

**PHYSICAL CHARACTERISTICS**

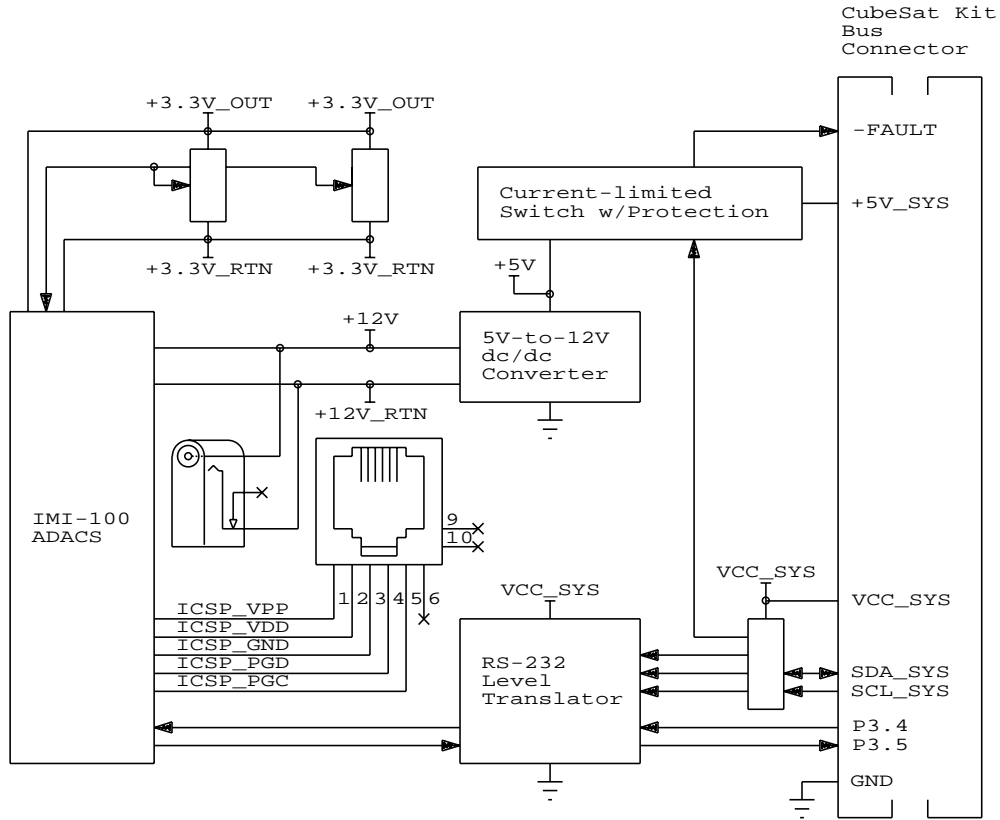
Parameter	Conditions / Notes	Symbol	Min	Typ	Max	Units
Mass	With J1, J2 & H6 fitted			49		g
Height of components above PCB	Mounted to Payload Adapter plate, with magnetometer				14	mm
Height of components below PCB					1	mm
PCB width	Corner hole pattern matches PC/104			90		mm
PCB length				90		mm
PCB thickness				1.6		mm

**SIMPLIFIED MECHANICAL LAYOUT <sup>1</sup>**



<sup>1</sup> Dimensions in inches.

BLOCK DIAGRAM



## 25-pin MAI-100 Connector PIN DESCRIPTIONS

The ADACS Interface module passes power and signals to and from the ADACS via an ITT Cannon MDM-25PBS male (plug) connector. The MDM-25PBS mounts on a riser PCB, which is in turn attached to the ADACS Interface Module via connector H3.

Name	Pin	I/O	Description
+12V_IN	1	–	+12V power into ADACS.
+12V_IN	2	–	+12V power into ADACS.
	3		Not used.
+3.3V_OUT	4	–	+3.3V power out of ADACS. Powers external ADACS peripherals (e.g. magnetometer).
RS232_GND	5	–	Ground reference for RS-232
+3.3V_RTN	6	–	+3.3V return into ADACS.
ICSP_VDD	7	–	VDD power out of ADACS. For In-Circuit Serial Programming.
ICSP_GND	8	–	Ground return into of ADACS. For In-Circuit Serial Programming.
MISO	9	O	SPI Master In Slave Out. Into ADACS SPI Master.
MOSI	10	I	SPI Master Out Slave In. From ADACS SPI Master.
SCLK	11	I	SPI Clock. From ADACS SPI Master.
SSNOT	12	I	SPI Slave Select (active Low). From ADACS.
RESET	13	I	Reset signal for external ADACS peripherals. From ADACS.
+12V_RTN	14	–	+12V return out of ADACS.
+12V_RTN	15	–	+12V return out of ADACS.
DRDY	16	O	Data Ready signal from external ADACS peripherals. Into ADACS.
RS232_OUT	17	I	RS-232 Tx Data. From ADACS to Host.
RS232_IN	18	O	TS-232 Rx Data. From Host to ADACS.
ICSP_PGC	19	O	In-Circuit Serial Programming Pin.
ICSP_VPP	20	O	In-Circuit Serial Programming Pin.
ICSP_PGD	21	I/O	In-Circuit Serial Programming Pin.
SSCS	22	I	Sun Sensor Chip Select. From ADACS.
	23		Reserved.
	24		Reserved.
	25		Reserved.

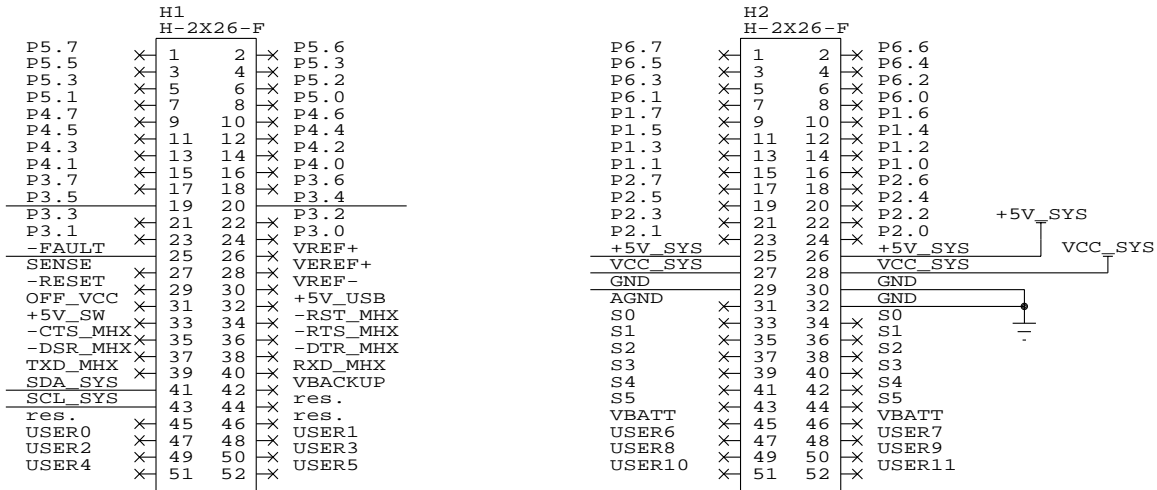
## 10-pin Magnetometer / Sun Sensor PIN DESCRIPTIONS

The ADACS Interface module provides two connectors (H4, H5) with identical pinouts for the ADACS' external magnetometer and any sun sensors fitted. The connectors on the PCB are 2mm pitch Hirose DF11G-10DP-2V (male/plug), and they mate to Hirose DF11010DS-2C (female/socket) using Hirose DF11-2428SCA crimp sockets (24-28 AWG).

Name	Pin	I/O	Description
+3.3V_OUT	1	–	+3.3V Power to external Magnetometer, Sun Sensor, etc.
SSCS	2	O	Sun Sensor Chip Select. From ADACS.
MISO	3	I	SPI Master In Slave Out. Into ADACS SPI Master.
DRDY	4	I	Data Ready signal from external ADACS peripherals. Into ADACS.
MOSI	5	O	SPI Master Out Slave In. From ADACS SPI Master.
RESET	6	O	Reset signal for external ADACS peripherals. From ADACS.
SCLK	7	O	SPI Clock. From ADACS SPI Master.
SSNOT	8	O	SPI Slave Select (active Low). From ADACS.
+3.3V_RTN	9	–	+3.3V return into ADACS.
+3.3V_RTN	10	–	+3.3V return into ADACS.

CubeSat Kit Bus PIN DESCRIPTIONS

CubeSat System Bus



CubeSat Kit Bus PIN DESCRIPTIONS – MSP430 I/O Port 1

Name	Pin	I/O	Description
P1.0	H2.16		Not used.
P1.1	H2.15		Not used.
P1.2	H2.14		Not used.
P1.3	H2.13		Not used.
P1.4	H2.12		Not used.
P1.5	H2.11		Not used.
P1.6	H2.10		Not used.
P1.7	H2.9		Not used.

CubeSat Kit Bus PIN DESCRIPTIONS – MSP430 I/O Port 2

Name	Pin	I/O	Description
P2.0	H2.24		Not used.
P2.1	H2.23		Not used.
P2.2	H2.22		Not used.
P2.3	H2.21		Not used.
P2.4	H2.20		Not used.
P2.5	H2.19		Not used.
P2.6	H2.18		Not used.
P2.7	H2.17		Not used.

**CubeSat Kit Bus PIN DESCRIPTIONS – MSP430 I/O Port 3**

Name	Pin	I/O	Description
P3.0	H1.24		Not used.
P3.1	H1.23		Not used.
P3.2	H1.22		Not used.
P3.3	H1.21		Not used.
P3.4	H1.20	I	Tx data from Flight Module to ADACS.
P3.5	H1.19	O	Rx data from ADACS to Flight Module.
P3.6	H1.18		Not used.
P3.7	H1.17		Not used.

**CubeSat Kit Bus PIN DESCRIPTIONS – MSP430 I/O Port 4**

Name	Pin	I/O	Description
P4.0	H1.16		Not used.
P4.1	H1.15		Not used.
P4.2	H1.14		Not used.
P4.3	H1.13		Not used.
P4.4	H1.12		Not used.
P4.5	H1.11		Not used.
P4.6	H1.10		Not used.
P4.7	H1.9		Not used.

**CubeSat Kit Bus PIN DESCRIPTIONS – MSP430 I/O Port 5**

Name	Pin	I/O	Description
P5.0	H1.8		Not used.
P5.1	H1.7		Not used.
P5.2	H1.6		Not used.
P5.3	H1.5		Not used.
P5.4	H1.4		Not used.
P5.5	H1.3		Not used.
P5.6	H1.2		Not used.
P5.7	H1.1		Not used.

**CubeSat Kit Bus PIN DESCRIPTIONS – MSP430 I/O Port 6**

Name	Pin	I/O	Description
P6.0	H2.8		Not used.
P6.1	H2.7		Not used.
P6.2	H2.6		Not used.
P6.3	H2.5		Not used.
P6.4	H2.4		Not used.
P6.5	H2.3		Not used.
P6.6	H2.2		Not used.
P6.7	H2.1		Not used.

**CubeSat Kit Bus PIN DESCRIPTIONS – Analog References**

Name	Pin	I/O	Description
VREF+	H1.26		Not used.
VREF-	H1.30		Not used.
VEREF+	H1.28		Not used.

**CubeSat Kit Bus PIN DESCRIPTIONS – I2C Bus**

Name	Pin	I/O	Description
SDA_SYS	H1.41	I	I2C data.
SCL_SYS	H1.43	I	I2C clock.

**CubeSat Kit Bus PIN DESCRIPTIONS – Control & Status**

Name	Pin	I/O	Description
-FAULT	H1.25	O	Open-Collector output. Active LOW. Active when an overcurrent fault condition is detected by the Interface Module's latchup prevention overcurrent switch. With series 4.7kΩ resistor. Normally pulled up externally to vcc_sys or +5v_sys.
SENSE	H1.27		Not used.
-RESET	H1.29		Not used.
OFF_VCC	H1.31		Not used.

**CubeSat Kit Bus PIN DESCRIPTIONS – RBF and Launch Switches**

Name	Pin	I/O	Description
s0	H2.33 H2.34	–	Not used.
s1	H2.35 H2.36	–	Not used.
s2	H2.37 H2.38	–	Not used.
s3	H2.39 H2.40	–	Not used.
s4	H2.41 H2.42	–	Not used.
s5	H2.43 H2.44	–	Not used.



**CubeSat Kit Bus PIN DESCRIPTIONS – Power**

Name	Pin	I/O	Description
VBATT	H2.45 H2.46		Not used.
+5V_USB	H1.32		Not used.
+5V_SYS	H2.25 H2.26		+5V system power. From EPS. +12V is generated locally from +5V_SYS.
+5V_SW	H1.33		Not used.
VBACKUP	H1.42		Not used.
VCC_SYS	H2.27 H2.28		+3.3V system power. Normally generated by EPS. Supplies local +3.3V for interface electronics.
AGND	H2.31		Not used.
GND	H2.29 H2.30 H2.32	–	Digital ground.

**CubeSat Kit Bus PIN DESCRIPTIONS – Transceiver Interface**

Name	Pin	I/O	Description
-RST_MHX	H1.34		Not used.
-CTS_MHX	H1.35		Not used.
-RTS_MHX	H1.36		Not used.
-DSR_MHX	H1.37		Not used.
-DTR_MHX	H1.38		Not used.
TXD_MHX	H1.39		Not used.
RXD_MHX	H1.40		Not used.

**CubeSat Kit Bus PIN DESCRIPTIONS – User-defined**

Name	Pin	I/O	Description
USER0	H1.47		Not used.
USER1	H1.48		Not used.
USER2	H1.49		Not used.
USER3	H1.50		Not used.
USER4	H1.51		Not used.
USER5	H1.52		Not used.
USER6	H2.47		Not used.
USER7	H2.48		Not used.
USER8	H2.49		Not used.
USER9	H2.50		Not used.
USER10	H2.51		Not used.
USER11	H2.52		Not used.

**CubeSat Kit Bus PIN DESCRIPTIONS – Reserved**

Name	Pin	I/O	Description
res.	H1.44	–	Reserved for future use.
res.	H1.45	–	Reserved for future use.
res.	H1.46	–	Reserved for future use.

Because of the small number of CubeSat Kit Bus connector pins used by the ADACS Interface Module, and because its connector is not a stackthrough type, only a very limited number of pins are populated. This keeps the mass of the ADACS Interface Module to a minimum.

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