7IA0 MANUAL

48 IN 24 OUT ISOLATED I/O CARD

V1.1

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GENERAL

DESCRIPTION

The 7IA0 is a 48 input, 24 output isolated I/O card. The 7IA0 provides 24 isolated 36VDC 2.5A output drivers and 48 isolated inputs.

All output drivers are low saturation voltage MOSFETs for low power dissipation. Each of the 24 output switches is isolated from the others, allowing high side, low side, push-pull and other output switch configurations. A built in watchdog timer turns all outputs off if the 7IA0 is not accessed within the watchdog timeout interval.

The 48 isolated inputs operate with 4V to 36V DC and can have a positive or negative common for sourcing or sinking input applications. 4 input commons are provided for mixed sourcing/sinking/voltage compatibility. All isolated input and outputs have LED status indicators. Eight of the isolated input pins can be used to support up to four quadrature output MPGs. Both 1x and 4x modes are selectable. Four eight bit analog inputs are also provided.

The RS-422 interface at 2.5 MBaud is compatible with HostMot2s SSLBP smart serial interface which can support as many as 32 7IA0 cards for a total of 2304 I/O points with real time update rates up to 10 KHz.

3.5 mm pluggable screw terminals are used for all isolated I/O. The 7IA0 can be cable powered or powered from a local 8VDC to 32VDC supply. The 7IA0 mounts in a standard 107mm DIN tray which is available from Mesa.

HARDWARE CONFIGURATION

GENERAL

Hardware setup jumper positions assume that the 7IA0 card is oriented so the card legend is right reading, with the RJ45 serial connector on the left hand side of the card

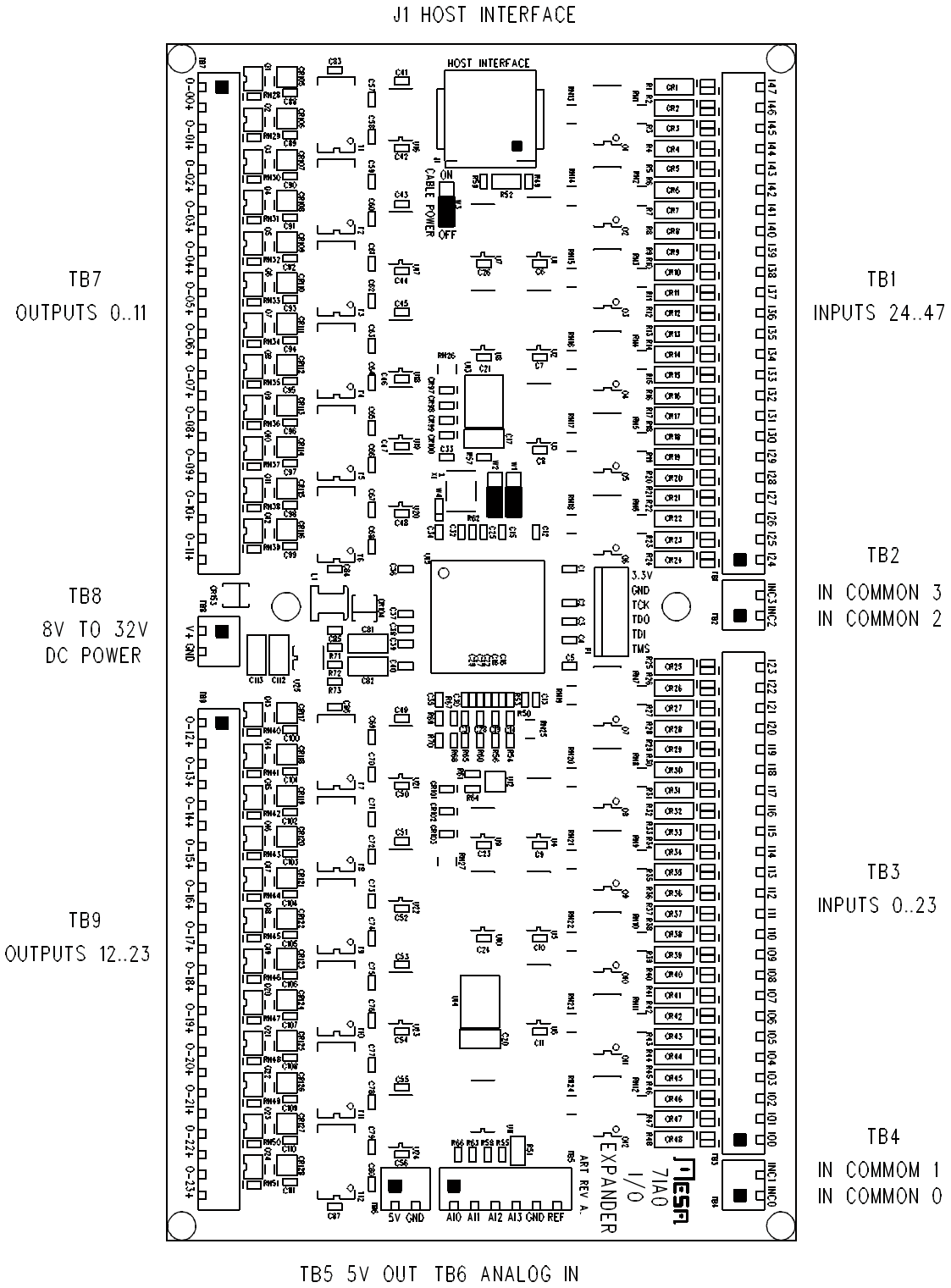
DEFAULT CONFIGURATION

JUMPER	FUNCTION	DEFAULT SETTING
W1,W2	OPTION	RIGHT,RIGHT
W3	CABLE POWER	RIGHT (NO CABLE POWER)

The option jumpers are not used with current 7IA0 firmware and are reserved for future expansion. .

CONNECTORS

CONNECTOR LOCATIONS AND DEFAULT JUMPER POSITIONS



CONNECTORS

TB3 INPUTS 00 THROUGH 23

TB3 is the connector for inputs 0 through 23. TB3 is a 24 pin 3.5 MM header normally populated with 3x8 pin screw terminal plugs.

PIN	FUNCTION	PIN	FUNCTION
1	IN-00	13	IN-12
2	IN-01	14	IN-13
3	IN-02	15	IN-14
4	IN-03	16	IN-15
5	IN-04	17	IN-16
6	IN-05	18	IN-17
7	IN-06	19	IN-18
8	IN-07	20	IN-19
9	IN-08	21	IN-20
10	IN-09	22	IN-21
11	IN-10	23	IN-22
12	IN-11	24	IN-23

TB4 INPUT COMMON 0 AND 1

TB4 is the input common connector for inputs 0..7 and 8..23.

PIN	FUNCTION
1	INPUT COMMON 0 FOR INPUTS 0..7
2	INPUT COMMON 1 FOR INPUTS 8..23

CONNECTORS

TB1 INPUTS 24 THROUGH 47

TB1 is the connector for inputs 24 through 47. TB1 is a 24 pin 3.5 MM header normally populated with 3x8 pin screw terminal plugs.

PIN	FUNCTION	PIN	FUNCTION
1	IN-24	13	IN-36
2	IN-25	14	IN-37
3	IN-26	15	IN-38
4	IN-27	16	IN-39
5	IN-28	17	IN-40
6	IN-29	18	IN-41
7	IN-30	19	IN-42
8	IN-31	20	IN-43
9	IN-32	21	IN-44
10	IN-33	22	IN-45
11	IN-34	23	IN-46
12	IN-35	24	IN-47

TB2 INPUT COMMON 0 AND 1

TB4 is the input common connector for inputs 24..31 and 32..47.

PIN	FUNCTION
1	INPUT COMMON 2 FOR INPUTS 24..31
2	INPUT COMMON 3 FOR INPUTS 32..47

CONNECTORS

TB7 OUTPUTS 00 THROUGH 11

TB7 is the connector for outputs 0 through 11.TB7 is a 24 pin 3.5 MM header normally populated with 3x8 pin screw terminal plugs.

PIN	FUNCTION	PIN	FUNCTION
1	OUT-00-	13	OUT-06-
2	OUT-00+	14	OUT-06+
3	OUT-01-	15	OUT-07-
4	OUT-01+	16	OUT-07+
5	OUT-02-	17	OUT-08-
6	OUT-02+	18	OUT-08+
7	OUT-03-	19	OUT-09-
8	OUT-03+	20	OUT-09+
9	OUT-04-	21	OUT-10-
10	OUT-04+	22	OUT-10+
11	OUT-05-	23	OUT-11-
12	OUT-05+	24	OUT-11+

CONNECTORS

TB9 OUTPUTS 12 THROUGH 23

TB9 is the connector for outputs 12 through 23.TB9 is a 24 pin 3.5 MM header normally populated with 3x8 pin screw terminal plugs.

PIN	FUNCTION	PIN	FUNCTION
1	OUT-12-	13	OUT-18-
2	OUT-12+	14	OUT-18+
3	OUT-13-	15	OUT-19-
4	OUT-13+	16	OUT-19+
5	OUT-14-	17	OUT-20-
6	OUT-14+	18	OUT-20+
7	OUT-15-	19	OUT-21-
8	OUT-15+	20	OUT-21+
9	OUT-16-	21	OUT-22-
10	OUT-17+	22	OUT-22+
11	OUT-17-	23	OUT-23-
12	OUT-17+	24	OUT-23+

CONNECTORS

TB8 UNREGULATED POWER INPUT

Orange connector TB8 is the unregulated power input. Unregulated power is 8 to 32 VDC.

PIN	FUNCTION
1	V+ +8VDC TO +32VDC
2	GND

TB6 5V AUX OUTPUT

TB6 is a 5 VDC output for MPGs and other low current uses. Maximum load current is 150 mA.

PIN	FUNCTION
1	+5V
2	GND

TB5 ANALOG INPUT

TB5 is the analog input connector. TB5 is a 6 pin 3.5mm header with a 6 pin screw terminal plug.

PIN	FUNCTION
1	ANALOG INPUT 0
2	ANALOG INPUT 1
3	ANALOG INPUT 2
4	ANALOG INPUT 3
5	GND
6	VREF (3.3V)

CONNECTORS

J1 HOST INTERFACE CONNECTOR

The 7IA0 uses a RJ-45 (J1) connector for its RS-422 serial interface. Normal Ethernet type CAT5 cables should be used for the serial interface. The serial interface cable can also supply power to the 7IA0 as long as the cable length does not exceed 5 feet. J1 pinout is as follows:

PIN	FUNCTION	DIRECTION
1	RX-	TO 7IA0
2	RX+-	TO 7IA0
3	TX-	FROM 7IA0
4	GND	TO 7IA0
5	GND	TO 7IA0
6	TX+	FROM 7IA0
7	+5V	TO 7IA0
8	+5V	TO 7IA0

OPERATION

ISOLATED INPUTS

The 7IA0's 48 isolated inputs can accept voltages from 4V to 32V. The Inputs are divided into 4 groups that have independent common pins to allow mixes of operating voltages and sinking or sourcing connections. Input threshold is approximately 3.5V.

The 7IA0 inputs must not be used for line voltage isolation.

Input common connections:

INPUT COMMON 0 (TB4 PIN1) Common for inputs 00..07

INPUT COMMON 1 (TB4 PIN2) Common for inputs 08..23

INPUT COMMON 2 (TB3 PIN1) Common for inputs 24..31

INPUT COMMON 3 (TB3 PIN2) Common for inputs 32..47

For NPN type sensors or switches with a common ground, the input common terminal for the associated input set is tied to the positive power supply lead and the input pins are grounded to activate the inputs (connected to the power supply common negative).

For PNP type sensors or switches with a common positive, the input common for the associated input set is connected to ground (power supply negative) and the inputs are connected to the positive power supply lead to activate.

All inputs have LED status indicators.

INPUT FILTERING

All 48 inputs have digital filtering. Each input can choose a slow or fast preset filter time constant. The slow and fast time constants presets are settable via HAL parameters. Default digital filter settings are 200 microseconds on inputs 00 through 07 and and 2 milliseconds on inputs 08 through 47.

FILTER SETUP PARAMETERS

The 7IA0 has eight parameters that allow the input filtering to be adjusted. These parameters can be set in the hal file with setp commands. Note that these are only set at startup by placing them in the hal file and can not be adjusted dynamically. The actual parameter names will start with the host interface card name and the P anc C in the table will be replaced by the actual SSerial Port and Channel numbers, for example: "hm2_7i96.0.7ia0.0.0.in-00-23-fast-filter"

OPERATION

FILTER SETUP PARAMETERS

PARAMETER	RANGE	DEFAULT VALUE
7ia0.P.C.in-00-23-sample-time	1 to 1024	52 (50 usec)
7ia0.P.C.in-00-23-fast-filt	0 to 63	4 (4x50 usec = 200 usec)
7ia0.P.C.in-00-23-slow-filt	0 to 1023	40 (= 40x50 usec = 2 ms)
7ia0.P.C.in-00-23-slow-mask	0 to 0xFFFFFF	0xFFFF00
7ia0.P.C.in-24-47-fast-filt	1 to 1024	52 (50 usec)
7ia0.P.C.in-24-47-sample-time	0 to 63	4 (4x50 usec = 200 usec)
7ia0.P.C.in-24-47-slow-filt	0 to 1023	40 (40x50 usec = 2 ms)
7ia0.P.C.in-24-47-slow-mask	0 to 0xFFFFFF	0xFFFFFF

There are 2 sets of setup parameters, one for input 00 through 23 on TB3 and the other set for inputs 24 through 47 on TB1.

The sample-time parameter sets the input sample period in units of 0.960 usec. The default value of 52 sets the sample period to 50 usec.

The fast-filt parameter sets the filter time constant for fast channels (in units of sample-time). With the default 50 usec sample period, the fast time constant can be set from 50 usec to 3.15 ms.

The slow-filt parameter sets the filter time constant for low channels (in units of sample-time). With the default 50 usec sample period, the slow time constant can be set from 50 usec to 51.15 ms.

The slow-mask parameter determines if the slow or fast filter time constant will be used. The slow-mask parameter is a bit mask where each bit determines if the fast or slow filter time constant will be used for a specific input pin.

A ‘1' bit selects the slow time constant. For example, a 00-23-slow-mask parameter of 0x000001 would select the slow time constant on input 00 and the fast time constant for inputs 01 through 23. A 24-47-slow-mask parameter of 0x000001 would select the slow time constant for input 24 and fast time constant for inputs 25 through 47.

The default 0xFFFF00 00-23-slow-mask selects a fast time constant for input 00 through 07 as a slow time constant for inputs 8 through 23 to accomodate MPG use on the first 8 inputs.

OPERATION

MPG ENCODER INPUTS

In addition to normal isolated input use, inputs 00 through 07 can be used as quadrature counter inputs for MPG encoder use.

TB3 PIN	INPUT	ALTERNATE FUNCTION
1	00	ENC0-A
2	01	ENC0-B
3	02	ENC1-A
4	03	ENC1-B
5	04	ENC2-A
6	05	ENC2-B
7	06	ENC3-A
8	07	ENC3-B

MPG encoder inputs are limited to an approximately 5 KHz count rate by the opto-coupler delays so they are best suited to normal 100 PPR MPG encoders rather than high resolution motion feedback type encoders.

Both 1X and 4X modes are supported by setting hal parameters. Typically MPGs use 1X modes so that the detent count reflects the number of increments moved.

The MPG encoder inputs are filtered by the same digital filter that conditions the inputs so these should typically be set to the "fast" time constant. This is the default.

Due to the relatively high isolated input threshold of 3.5V, it is suggested that for TTL level MPGs, inputs 00 through 07 be wired for sourcing use with the input common (input common 0, TB4 pin 1) wired to +5V

OUTPUTS

The 7IA0 has 24 outputs. These are transformer driven MOSFET type outputs with a rating of 36 VDC and 2.5A max. Note that the outputs do not supply power, they are simply switches or solid state relays (SSRs). Outputs are DC only so polarity must be observed. Reverse connected outputs will appear to be stuck on.

OPERATION

OUTPUTS

All outputs are isolated switches so can be used in sourcing and sinking applications with mixed voltages. All outputs have LED status indicators. AC loads can be switched by pairs of switches connected in series + to + and - to -. Inductive loads must have flyback diodes installed. Outputs have no short circuit protection so power should come from a current limited power supply or fuses should be used.

Note that the output isolation is for low voltage use, it must not be used for line voltage isolation.

WATCHDOG

As a safety feature, the 7IA0 incorporates a watchdog circuit to disable the outputs (all outputs off) if host communications are absent for a preset time interval. The outputs are turned off at power up and when host communications have been idle for 50 ms. When the watchdog bites, red LED CR101 will be illuminated.

7IA0 POWER

The 7IA0 can be powered via its unregulated power input (TB8) or via the serial cable. If powered by the serial cable, W3 should be in the left hand position and TB8 should be left unconnected. If unregulated power input is used, W3 should be in the right hand position. If cable power is used, it is suggested that the serial cable be 5 feet or less in length due to voltage drop considerations.

AUX 5V OUTPUT

The 7IA0 provides a small amount (150 mA) of 5V power for MPGs and other accessories. It is suggested that unregulated power be used rather than serial cable power if the 5V AUX output is used, due to the voltage drop in the serial cable.

ANALOG INPUTS

The 7IA0 has 4 analog inputs with 8 bit resolution and a 0 to +3.3V input range. These can be use for reading potentiometers and other low speed applications. A 3.3VDC output is provided for potentiometer use. Analog inputs are high impedance and protected against input overvoltages to +-24V

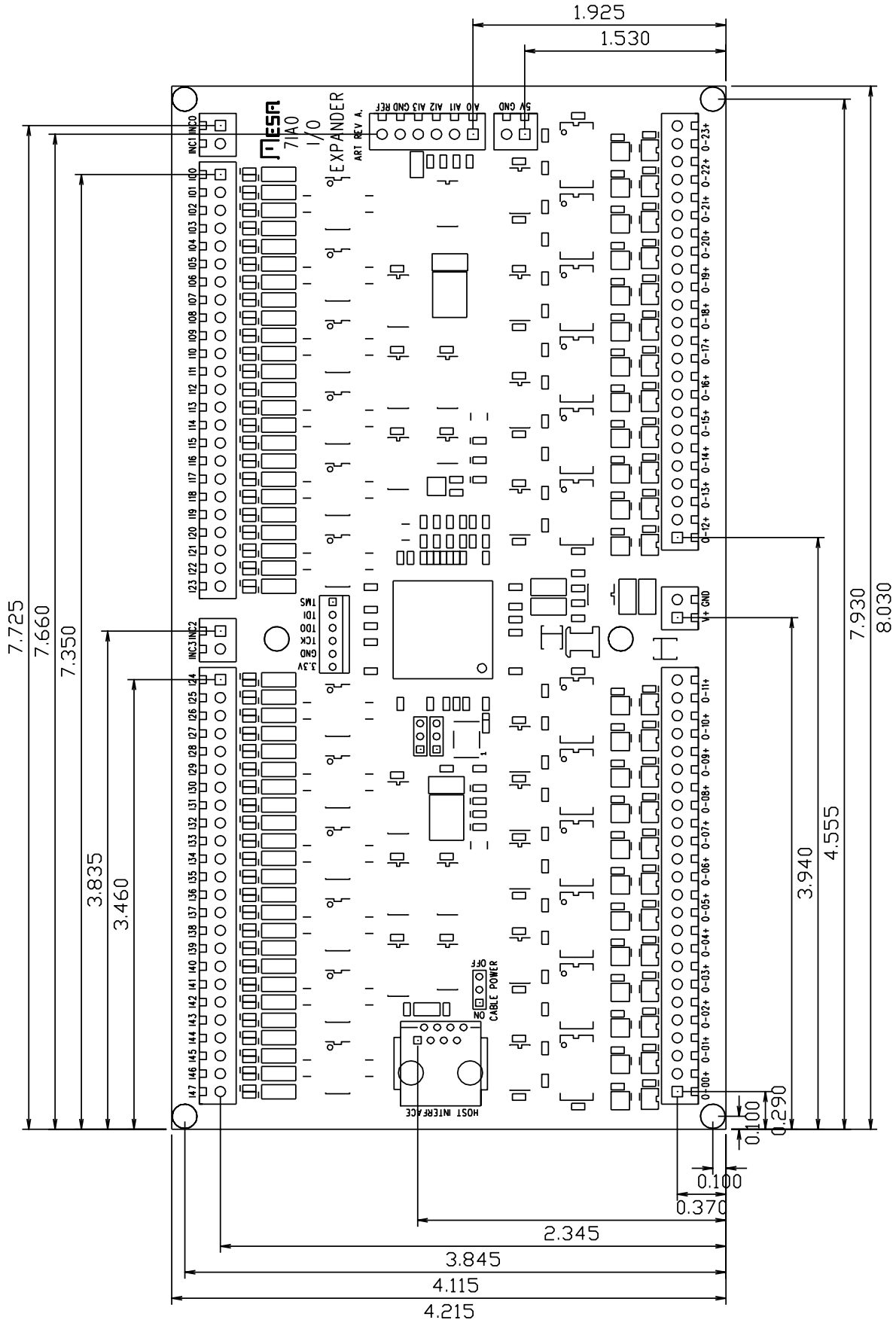
SERIAL INTERFACE

The 7IA0s serial interface is a RS-422 link that supports the LBP protocol at 2.5 M baud. This is directly supported by Mesa SSerial host expansion interfaces.

SPECIFICATIONS

	MIN	MAX	UNITS
5V CABLE POWER SUPPLY	+4.5	+5.25	VDC
5V CABLE POWER CONSUMPTION	----	250	mA
UNREGULATED POWER INPUT	+8	+32	VDC
ISOLATED OUTPUT SWITCH CURRENT	----	2.5	A
ISOLATED OUTPUT SWITCH VOLTAGE	----	36	VDC
ISOLATED OUTPUT ISOLATION VOLTAGE	----	100	VDC
ISOLATED INPUT SENSE VOLTAGE	+-4	+-32	VDC
ISOLATED INPUT ISOLATION VOLTAGE	----	100	VDC
ANALOG INPUT VOLTAGE ACCURACY	----	3	%
ANALOG INPUT RESOLUTION	----	8	BITS
ANALOG INPUT RANGE	0	3.3	VDC
AUX 5V OUTPUT CURRENT	0	150	mA
OPERATING TEMP.	0	+70	^{o}C
OPERATING TEMP. (-I version)	-40	+85	^{o}C
OPERATION HUMIDITY	0	95%	NON-COND

DRAWINGS


1.925
1.530
7.725
7.660
7.350
3.835
3.460
7.930
8.030
3.940
4.555
0.100
0.290
0.100
0.370
2.345
3.845
4.115
4.215
MESA
7IA0
I/O EXPANDER
ART REV A.
HOST INTERFACE
CABLE POWER
ON
OFF