

# **7I32 MANUAL**

**Dual Microstepping Stepper motor driver**

V1.0

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# GENERAL

## DESCRIPTION

The 7I32 is a low cost 2 Axis H-bridge card for driving stepper motors with Mesa motion control cards. The 7I32 has a maximum per axis current rating of 3 Amps and a voltage rating of 48V. Full scale currents of 1.5 Amp and 3 Amp are user selectable.

The 7I32 is designed to drive 2 phase bipolar (4 wire) steppers. When used with the SoftDMCS controller, 64 uStep/Step microstepping is possible. The SoftDMCS controller also allows precise setting of stepper winding full scale currents and winding/winding balance.

The H-bridge chips on the 7I32 (Allegro A3959) use DMOS transistors and synchronous rectification for high efficiency and low power dissipation. Encoder inputs are provided for systems with encoder feedback. Encoder and index inputs are conditioned with RC filters and Schmitt triggers for high noise rejection.

The controller connection is a 50 pin header that matches the pinout of the Mesa 4I34M, 4I65, 5I20 and 7I60 motion controllers. 2 latching Mini Mate-N-Loc connectors are used for motor/encoder connections.

# HARDWARE CONFIGURATION

## GENERAL

Hardware setup jumper positions assume that the 7I32 card is oriented in an upright position, that is, with the 50 pin controller connector is on the left hand side, and the 4 (2 in the 7I32-2 case) motor connectors are on the right side.

## DEFAULT CONFIGURATION

JUMPER	FUNCTION	DEFAULT SETTING
W4,W8	MOTOR1 CURRENT	RIGHT = 1.5A
W12,W16	MOTOR0 CURRENT	RIGHT = 1.5A

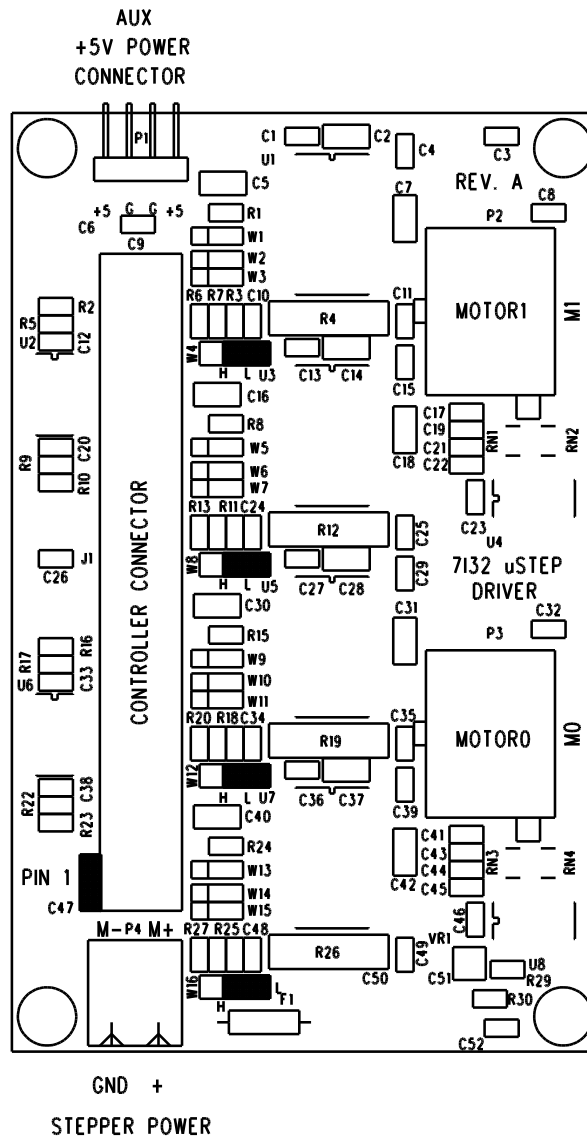
## FULL SCALE CURRENT

Each 7I32 Hbridge channel has a selectable 1.5A or 3A full scale current. The full scale current setting is selected with jumper W12 and W16 for motor 0 and W4 and W8 for motor 1. When the jumpers are in the LEFT position (marked 'H' on the card) the current limit is 3A. When the jumpers are in the RIGHT position (marked 'L' on the card) the current limit is 1.5A. Jumpers must be moved in pairs (W4 and W8 for Motor1, W12 and W16 for motor0)

For more information on current limit, see the OPERATION section of the manual.

# CONNECTORS

## CONNECTOR LOCATIONS AND DEFAULT JUMPER POSITIONS



# CONNECTORS

## CONTROLLER CONNECTOR

50 pin header connector J1 connects to the motion controller. This can be a male 50 pin header on the top of the 7I32 card or a female 50 conductor header on the bottom side of the 7I32 depending on 7I32 model. The controller connector pinout matches the 4I27 (2 axis 7I32-2 only), 4I34M, 7I60, 5I20 (2 or 4 axis) pinouts. Controller connector pinout is as follows:

PIN	FUNCTION	DIRECTION	PIN	FUNCTION	DIRECTION
1	QB1	FROM 7I32	25	QB3	FROM 7I32
3	QA1	FROM 7I32	27	QA3	FROM 7I32
5	QB0	FROM 7I32	29	QB2	FROM 7I32
7	QA0	FROM 7I32	31	QA2	FROM 7I32
9	IDX1	FROM 7I32	33	IDX3	FROM 7I32
11	IDX0	FROM 7I32	35	IDX2	FROM 7I32
13	PWM1	TO 7I32	37	PWM3	TO 7I32
15	PWM0	TO 7I32	39	PWM2	TO 7I32
17	DIR1	TO 7I32	41	DIR3	TO 7I32
19	DIR0	TO 7I32	43	DIR2	TO 7I32
21	/ENA1	TO 7I32	45	/ENA3	TO 7I32
23	/ENA0	TO 7I32	47	/ENA2	TO 7I32
			49	+5V PWR	TO 7I32

Note: all even pins are grounded.

## AUX 5V POWER

Four pin header P1 can be used to supply 5V power to the 7I32 if the controller cable is too long and +5V voltage drop too high. P1 has the following pinout:

PIN	FUNCTION
1	5V
2	GND
3	GND
4	5V

# CONNECTORS

## MOTOR CONNECTORS

The two 12 pin motor connectors are AMP MINI-MATE-N-LOCK style connectors. The mating part# is 794200-1. Motor connector pinout is as follows:

<b>PIN</b>	<b>FUNCTION</b>	<b>DIRECTION</b>	
1	A	FROM 7132	(Motor winding A,S)
2	NOT_A	FROM 7132	(Motor winding A,F)
3	B	FROM 7132	(Motor winding B,S)
4	NOT_B	FROM 7132	(Motor winding B,F)
5	GND		
6	GND		
7	GND		
8	ENCODER VCC	FROM 7132	
9	ENCODER A	TO 7132	
10	ENCODER B	TO 7132	
11	ENCODER IDX0	TO 7132	
12	ENCODER IDX1	TO 7132	



# OPERATION

## PWM RATE

The 7I32 sets the stepper motor phase currents based on the PWM inputs. These inputs are filtered on the 7I32 card to provide a reference voltage for setting the current. Acceptable PWM rates are from 50 KHz to 200 Khz. Higher PWM rates will result in less ripple in the stepper current. If used with the SoftDMCS controller, the PWM rate should be set at maximum.

## FULL SCALE CURRENT

Each 7I32 output channel can have its full scale current set to 1.5A +-15% or 3A +- 10%. This is the current supplied to one stepper phase when the PWM input for that phase is at maximum.

## ENCODER INPUT CIRCUIT

The input circuit on the encoder A,B, and index inputs consists of a RC filter followed by a Schmitt trigger. This helps to reject spike noise on the encoder lines. The input circuit inverts the signals, so, for example, an active high index signal will be active low at the controller interface.

## MAXIMUM COUNT RATE

The input RC filter limits the maximum encoder input frequency to approximately 1 MHz. This corresponds to 4 million counts per second with most quadrature counters (4X mode). The maximum input frequency may be lower with encoders that have high value (>1K Ohm) pullup resistors on open collector outputs.

## 5V POWER

The 7I32 requires ~30 mA of 5V power for operation. Encoder power is also supplied from the 7I32's 5V source. The Hbridge chips have a logic voltage detector that disables operation when the 5V supply is less than ~4.2V. Power for the 7I32 is normally supplied from pin 49 of the 50 conductor controller cable, but can also be supplied via P1.

# OPERATION

## STEPPER MOTOR POWER

Stepper motor power is supplied via terminal block P4. Positive motor power is on the right hand side of the terminal block, negative power on the left. The negative motor power is connected to ground on the 7132 card.

Minimum motor voltage is 10 VDC, maximum voltage is 48VDC. Note that the absolute maximum motor voltage is 50 VDC which cannot be exceeded without possible component damage. Stepper performance will be better at higher supply voltages, as these reduce the inductive time constant of the stepper windings

To prevent the motor voltage from exceeding 50VDC during load-dump conditions, it is suggested that the power supply have a large output capacitor to absorb the inductive energy stored in the loads. The on card motor power capacitance (150 uF) is sufficient to protect the 7132 running at 24 VDC from a load dump of 4 motors at 3A with 2.5 mH of inductance per motor. Motor power (or motor connectors) should not be disconnected when load current is flowing.

The total motor current supplied to both axis should be limited to 8 Amps continuous to prevent thermal overload. A 10A replaceable fuse is located next to the motor power terminal block.

# OPERATION

## ENABLE INPUT

Each Hbridge circuit has an active low enable input. When this input is high, the Hbridge is disabled regardless of the state of the PWM and direction inputs. When disabled, each Hbridge draws only leakage current from the motor power (< 1mA total when all channels disabled) and the logic power is reduced to less than 2mA (<10 mA total when all channels are disabled) A pullup resistor keeps the enable input high if the controller connection is lost.

## MOTOR/ENCODER WIRING

The motor wires carry high voltage signals with fast rise times. These signals can easily couple into the low voltage encoder inputs, causing position counting errors. One or more of the following methods should be used to reduce this coupling:

1. Twist motor leads
2. Shield motor leads
3. Route motor leads away from encoder leads (do not bundle together)
4. Shield encoder leads.

Longer wiring runs may require all of these methods to be used together.

# SPECIFICATIONS

	MIN	MAX	UNITS
5V POWER SUPPLY	4.5V	5.5V	VDC
5V POWER CONSUMPTION	---	50	mA
SLEEP MODE 5V POWER CONSUMPTION	---	10	mA
MOTOR SUPPLY VOLTAGE	10	48	V
IDLE MOTOR SUPPLY CURRENT	---	30	mA
SLEEP MODE MOTOR SUPPLY CURRENT	---	1	mA
PER MOTOR CURRENT	---	3	A
TOTAL CONTINUOUS CURRENT	---	8	A
ENCODER FREQUENCY	DC	1	MHz
OPERATING TEMP.	0	+70	°C
OPERATING TEMP. (-I version)	-40	+85	°C
OPERATION HUMIDITY	0	95%	NON-COND

Note: Sleep mode means all /enable inputs are at a logic high level