



RT-14 & MILO  
ELECTRONICS  
MANUAL



RT-14 CONNECTORS

=====

Serial Out connector

-----

(Female on RT-14)

- |         |          |
|---------|----------|
| 1 - N/C | 6 - GND  |
| 2 - N/C | 7 - N/C  |
| 3 - RX  | 8 - N/C  |
| 4 - TX  | 9 - N/C  |
| 5 - N/C | 10 - N/C |

HHB connector

-----

9-way D-type Male on RT-14

- |          |            |
|----------|------------|
| 1 - +12V | 6 - N/C    |
| 2 - RX   | 7 - E-Stop |
| 3 - TX   | 8 - E-Stop |
| 4 - N/C  | 9 - N/C    |
| 5 - GND  |            |

MIMIC 1 connector

-----

25-way D-type Female on RT-14

- |  |           |
|--|-----------|
| 1 - A1+                                  | LED       |
| 2 - B1+                                  | 13 - +12V |
| 3 - A2+                                  | 14 - A1-  |
| 4 - B2+                                  | 15 - B1-  |
| 5 - A3+                                  | 16 - A2-  |
| 6 - B3+                                  | 17 - B2-  |
| 7 - A4+                                  | 18 - A3-  |
| 8 - B4+                                  | 19 - B3-  |
| 9 - Mimic GPO 1 (Open collector)<br>LED  | 20 - A4-  |
| 10 - Mimic GPO 2 (Open collector)<br>LED | 21 - B4-  |
| 11 - Mimic GPO 3 (Open collector)<br>LED | 22 - +5V  |
| 12 - Mimic GPO 4 (Open collector)        | 23 - GND  |
|  | 24 - GND  |
|  | 25 - GND  |

MIMIC 2 connector

-----

25-way D-type Female

- |  |           |
|--|-----------|
| 1 - A5+                                  | LED       |
| 2 - B5+                                  | 13 - +12V |
| 3 - A6+                                  | 14 - A5-  |
| 4 - B6+                                  | 15 - B5-  |
| 5 - A7+                                  | 16 - A6-  |
| 6 - B7+                                  | 17 - B6-  |
| 7 - A8+                                  | 18 - A7-  |
| 8 - B8+                                  | 19 - B7-  |
| 9 - Mimic GPO 5 (Open collector)<br>LED  | 20 - A8-  |
| 10 - Mimic GPO 6 (Open collector)<br>LED | 21 - B8-  |
| 11 - Mimic GPO 7 (Open collector)<br>LED | 22 - +5V  |
| 12 - Mimic GPO 8 (Open collector)        | 23 - GND  |
|  | 24 - GND  |
|  | 25 - GND  |



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#### Video In connector

-----  
BNC Female. The RT-14 can synchronize on the incoming analogue video signal through this port.

- 1 - Video In (HD or SD) (Center)
- 2 - GND

#### Rig/Heads connector

-----  
9-way D-type Female

- |               |               |
|---------------|---------------|
| 1 - Watchdog- | 6 - Watchdog+ |
| 2 - Data Out- | 7 - Data Out+ |
| 3 - Data In-  | 8 - Data In+  |
| 4 - E-Stop+   | 9 - E-Stop-   |
| 5 - N/C       |               |

#### Triggers connector

-----  
37-way D-type Female

- 1 - OUT1+ (Reserved: Camera start/stop control)
- 2 - OUT2+ (Trigger 1 Out +)
- 3 - OUT3+ (Trigger 2 Out +)
- 4 - OUT4+ (Trigger 3 Out +)
- 5 - OUT5+ (Trigger 4 Out +)
- 6 - OUT6+ (Trigger 5 Out +)
- 7 - OUT7+ (Trigger 6 Out +)
- 8 - OUT8+ (Trigger 7 Out +)
- 9 - OUT9+ (Trigger 8 Out +)
- 10 - OUT10+ (Trigger 9 Out +)
- 11 - OUT11+ (Trigger 10 Out +)
- 12 - 0V
- 13 - IN1+ (Reserved: Sync Input)
- 14 - IN2+ (Trigger 1 In +)
- 15 - IN3+ (Trigger 2 In +)
- 16 - IN4+ (Trigger 3 In +)
- 17 - IN5+ (Not used)
- 18 - IN6+ (Not used)
- 19 - +12V
- 20 - OUT1- (Reserved: Camera start/stop control)
- 21 - OUT2- (Trigger 1 Out -)
- 22 - OUT3- (Trigger 2 Out -)
- 23 - OUT4- (Trigger 3 Out -)
- 24 - OUT5- (Trigger 4 Out -)
- 25 - OUT6- (Trigger 5 Out -)
- 26 - OUT7- (Trigger 6 Out -)
- 27 - OUT8- (Trigger 7 Out -)
- 28 - OUT9- (Trigger 8 Out -)
- 29 - OUT10- (Trigger 9 Out -)
- 30 - OUT 11- (Trigger 10 Out -)
- 31 - 0V
- 32 - IN1- (Reserved: Sync Input)
- 33 - IN2- (Trigger 1 In -)
- 34 - IN3- (Trigger 2 In -)
- 35 - IN4- (Trigger 3 In -)
- 36 - IN5- (Not used)
- 37 - IN6- (Not used)



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LTC In connector

- 3.5 mm Stereo Female Jack  
1 - N/C  
2 - LTC In Tip Ring  
3 - Sleeve

LTC Out connector

- 3.5 mm Stereo Female Jack  
1 - N/C  
2 - LTC Out Tip Ring  
3 - Sleeve

E-Stop bolt connector

- 9-way D-type Female  
1 - Rig E-Stop 2  
2 - Rig E-Stop 3  
3 - N/C  
4 - Rig E-Stop 3  
5 - Rig E-Stop 2  
6 - N/C  
7 - N/C  
8 - N/C  
9 - N/C

E-Stop connector

- 9-way D-type Female  
  
1 - Rig E-Stop  
2 - +12V  
3 - Override switch  
4 - GND  
5 - Rig E-Stop  
6 - Model Mover E-stop  
7 - N/C  
8 - N/C  
9 - Model Mover E-Stop

24V In connector

- 3-pin XLR Male  
  
1 - GND  
2 - +24V  
3 - N/C



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Trigger Box PCB connectors

J2

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- |                      |                            |
|----------------------|----------------------------|
| 1 - +12V Fused       | 1 - Timing Capacitor 1     |
| 2 - 555 Timer Output | 2 - Timing Capacitor 2     |
| 3 - Sync In+         | 3 - Timing Capacitor 3     |
| 4 - Sync In-         | 4 - Timing Capacitor 4     |
| 5 - Ext Sync+        | 5 - Timing Capacitor 5     |
| 6 - Ext Sync-        | 6 - Timing Capacitor 6     |
| 7 - 555 Timer On/Off | 7 - GND                    |
| 8 - GND              | 8 - Timing Common          |
| 9 - Out1+            | 9 - Timing Common          |
| 10 - Out1-           | 10 - Timing Common         |
| 11 - Camera On/Off+  | 11 - Output LED1 (Cathode) |
| 12 - Camera On/Off-  | 12 - Variable Resistor     |
| 13 - Switch (on/off) | 13 - Output LED2           |
| 14 - Switch (on/off) | 14 - N.C.                  |
| 15 - Push SW 1 (In2) | 15 - Output LED3           |
| 16 - Push SW 1 (In2) | 16 - Frequency LED         |
| 17 - Push SW 2 (In3) | 17 - Output LED4           |
| 18 - Push SW 2 (In3) | 18 - Camera On LED         |
| 19 - Push SW 3 (In4) | 19 - Output LED5           |
| 20 - Push SW 3 (In4) | 20 - +12V Fused            |

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TRIGGER INPUT & OUTPUT CONNECTOR (37-WAY D-TYPE)

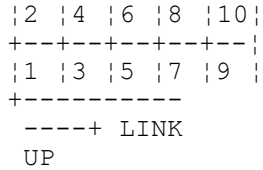
-----  
(FEMALE ON ROOT BOX)  
1 OUT1+                    20 OUT1-    (RESERVED:CAMERA  
CONTROL) 2 OUT2+    21 OUT2-  
3 OUT3+                    22 OUT3-  
4 OUT4+                    23 OUT4-  
5 OUT5+                    24 OUT5-  
6 OUT6+                    25 OUT6-  
7 OUT7+                    26 OUT7-  
8 OUT8+                    27 OUT8-  
9 OUT9+                    28 OUT9-  
10 OUT10+                  29 OUT10-  
11 OUT11+                  30 OUT11-  
12 0V                        31 0V  
13 IN1+                    32 IN1-    (RESERVED:SYNC INPUT)  
14 IN2+                    33 IN2-  
15 IN3+                    34 IN3-  
16 IN4+                    35 IN4-    (NOT USED)  
17 IN5+                    36 IN5-    (NOT USED)  
18 IN6+                    37 IN6-    (NOT  
USED) 19 +12V



MILO DRIVER BOX (AXIS MOTHERBOARD CONNECTIONS)

NOTE:

RIBBON CONNECTOR PINS ON THE BOARDS ARE LABELLED AS FOLLOWS, e.g. +----+



UP LINK  
-----

- 1 - WATCHDOG-
- 2 - WATCHDOG+
- 3 - LINK1IN-
- 4 - LINK1IN+
- 5 - LINK1OUT-
- 6 - LINK1OUT+

AXIS DOWN  
-----

- WATCHDOG-
- WATCHDOG+
- LINK2OUT-
- LINK2OUT+
- LINK2IN-
- LINK2IN+

AXIS (number)  
-----

- 1 - GND (shield)
- 2 - GND (shield)
- 3 - D2A OUTPUT-
- 4 - D2A OUTPUT+
- 5 - BRAKE
- 6 - ENABLE
- 7 - LIMIT3
- 8 - (no connection) ISSUE 4 NOW HAS TACHO SIGNAL
- 9 - LIMIT1
- 10 - LIMIT2
- 11 - ZM-
- 12 - ZM+
- 13 - B-
- 15 - A-
- 16 - A+

TACHO

- 
- |                 |           |
|-----------------|-----------|
| 1 - TACHO AXIS1 | 2 - GND   |
| 3 - TACHO AXIS1 | 2 - GND   |
| 5 - TACHO AXIS1 | 2 - GND   |
| 7 - TACHO AXIS1 | 2 - GND   |
| 9 - N.C.        | 10 - N.C. |

D-TYPE CONNECTORS  
POWER

-----

- 1 - GND
- 2 - GND
- 3 - +24V SWITCHED (ENABLES)
- 4 - +24V UNSWITCHED
- 5 - +24V UNSWITCHED

- 6 - +5V
- 7 - +5V
- 8 -
- 9 -



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AXIS MOTHERBOARD (CONT.)

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TAKE-UPS

-----

- 1 - COMMON RELAY 3
- 2 - N.O. RELAY 3
- 3 - COMMON RELAY 4
- 4 - N.C. RELAY 4
- 5 - N.O. RELAY 4
- 6 - AXIS 4 DAC+

SPARE LINK

-----

- 1 - LINKOUT-
- 2 - LINKOUT+
- 3 - LINKIN+
- 4 - LINKIN-
- 5 - GND (RESET)
- 6 - (no connection)
- 7 - +5V
- 8 - GND

G/P OUTPUTS

-----

- |                         |                                |
|-------------------------|--------------------------------|
| 1 - EXTERNAL VOLTS IN 1 | 14 - N.O. OUTPUT 1             |
| 2 - N.C. OUTPUT 1       | 15 - GND (INTERNAL 24V RETURN) |
| 3 - EXTERNAL VOLTS IN 2 | 16 - N.O. OUTPUT 2             |
| 4 - N.C. OUTPUT 2       | 17 - GND (INTERNAL 24V RETURN) |
| 5 - EXTERNAL VOLTS IN 3 | 18 - N.O. OUTPUT 3             |
| 6 - N.C. OUTPUT 3       | 19 - GND (INTERNAL 24V RETURN) |
| 7 - EXTERNAL VOLTS IN 4 | 20 - N.O. OUTPUT 4             |
| 8 - N.C. OUTPUT 4       | 21 - GND (INTERNAL 24V RETURN) |
| 9 -                     | 22 -                           |
- ETC.





Axis Board Socket Connections:

=====

	a	b	c
1	Link 3 in-	Watchdog+	Watchdog-
2	Link 3 in+	Link 1 out+	Link 1 out-
3	Link 2 in-	Link 2 out+	Link 2 out-
4	Link 2 in+	Link 3 out+	Link 3 out-
5	Link 1 in-	DAC1-	DAC1+
6	Link 1 in+	DAC3-	DAC3+
7	G/P1 out+	DAC2-	DAC2+
8	G/P1 out-	DAC4-	DAC4+
9	G/P2 out+	Enable 4-	Enable 4+
10	G/P2 out-	Enable 3-	Enable 3+
11	G/P3 out+	Enable 2-	Enable 2+
12	G/P3 out-	Enable 1-	Enable 1+
13	G/P4 out-	Brake 4-	Brake 4+
14	G/P4 out+	Brake 3-	Brake 3+
15	-----	Brake 2-	Brake 2+
16	+5V	Brake 1-	Brake 1+
17	+5V	Enc 4B+	Enc 4B-
18	GND	Enc 3B-	Enc 3B+
19	GND	Enc 4A+	Enc 4A-
20	GND	Enc 3A-	Enc 3A+
21	Step 1-	Enc 2B+	Enc 2B-
22	Dir 1-	Enc 1B-	Enc 1B+
23	Step 2-	Enc 2A+	Enc 2A-
24	Dir 2-	Enc 1A+	Enc 1A-
25	Step 3-	ZM 4+	ZM 4-
26	Dir 3-	ZM 2+	ZM 2-
27	Step 4-	ZM 3+	ZM 3-
28	Dir 4-	ZM 1+	ZM 1-
29	Limit 1- (End1)	Limit 5- (Dtm2)	Limit 9-
30	Limit 2- (Dtm1)	Limit 6- (etc.)	Limit 10-
31	Limit 3- (End1)	Limit 7-	Limit 11-
32	Limit 4- (End2)	Limit 8-	Limit 12-

Note: Standard axis boards have no connection on the Step and Dir pins, while standard Stepper axis boards have no connection on DAC pins. Also the stepper boards have currently (4/97) no encoder inputs.



DRIVER MOTHERBOARD CONNECTIONS

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25-WAY D-TYPE TO MOTOR

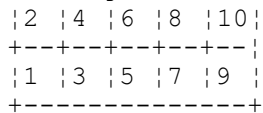
1	A-	14	A+
2	B-	15	B+
3	Z-	16	Z+
4	ENC GND & SCREEN	17	+5V
5	-5V	18	LIMITS RETURN (GND)
6	LIMIT1 (END)	19	LIMIT2 (DATUM)
7	LIMIT3 (END)	20	BRAKE RETURN
8	BRAKE	21	TACHO SCREEN (GND)
9	TACHO+	22	TACHO- (GND)
10	MOTOR SCREEN (GND)	23	MOTOR-
11	MOTOR+	24	MOTOR-
12	MOTOR+	25	MOTOR-
13	MOTOR+		

15-WAY D-TYPE FOR POWER

1	MOTOR POWER-	9	NO CONNECTION
2	MOTOR POWER-	10	+5V
3	MOTOR POWER-	11	+24V (BRAKE)
4	MOTOR POWER-	12	GND
5	MOTOR POWER+	13	GND
6	MOTOR POWER+	14	-5V
7	MOTOR POWER+	15	MOTOR SCREEN (GND)
8	MOTOR POWER+		

NOTE:

RIBBON CONNECTOR PINS ON THE BOARDS ARE LABELLED AS FOLLOWS, e.g. + ---- +



J2

--

- 1 - GND (shield)
- 2 - GND (shield)
- 3 - D2A OUTPUT-
- 4 - D2A OUTPUT+
- 5 - BRAKE
- 6 - ENABLE
- 7 - LIMIT3
- 8 - (no connection) ISSUE 2 WILL NOW CONTAIN TACHO SIGNAL
- 9 - LIMIT1
- 10 - LIMIT2
- 11 - ZM-
- 12 - ZM+
- 13 - B-
- 14 - B+
- 15 - A-
- 16 - A+

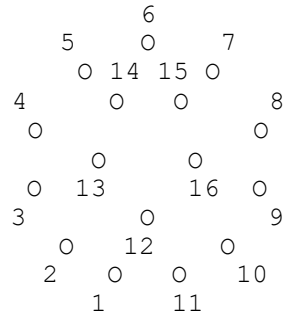


TEST SOCKET PINOUTS

=====

(FEMALE ON DRIVER  
CABINET)

- 1 GROUND
- 2 +12V
- 3 -12V
- 4 +24V ENABLES
- 5 +30V UNSWITCHED
- 6 +30V MOTORS
- 7 LOW VOLTS MOTOR
- 8 HIGH VOLTS MOTOR
- 9 N.C.
- 10 N.C.
- 11 +5V AXISBOARDS
- 12 +5V ENCODER BOARDS
- 13 -5V ENCODER BOARDS
- 14 +12V VIDEO
- 15 +24V BRAKES
- 16 +24V FANS (UNSWITCHED)



VIDEO/AUX POWER SOCKET

=====

(FEMALE ON DRIVER CABINET)

(1 AMP)

- 1 - +12V
- 5 - GROUND



MILO MOTOR QM PLUG/SOCKET CONNECTIONS (OBSOLETE)

1/8/94

=====

A ENC A-  
B MOTOR+  
C MOTOR-  
D ENC B-  
E MOTOR SCREEN (GND)  
F LIMIT1 (END)  
G LIMIT2 (DATUM)  
H LIMIT3 (END)  
J ENC GND  
K ENC A+  
L ENC B+  
M ENC Z+  
N ENC Z-  
P +5V  
R -5V  
S BRAKE  
T BRAKE RETURN  
U SCREEN (GND)  
V LIMIT RETURN

MILO MOTOR 26 WAY MILITARY CONNECTIONS

=====

A MOTOR+  
B MOTOR+  
C MOTOR-  
D MOTOR-  
E MOTOR SCREEN  
F LIMIT1  
G LIMIT2 (DATUM)  
H LIMIT3  
J OV  
K ENC A+  
L ENC B+  
M ENC Z+  
N ENC Z-  
P +5V  
R -5V  
S BRAKE-  
T BRAKE+  
U CABLE SCREEN  
V LIMIT RETURN  
W ENCODER A-  
X ENCODER B-  
Y CABLE SCREEN  
a CABLE SCREEN  
b TACHO+  
c TACHO END



AXOR MINISPEED TYPE CONFIGURATION NOTES

=====

ON RECEIPT OF A NEW DRIVER FOR THE FLAIR SYSTEM, THE FOLLOWING CONFIGURATIONS ARE DONE:

1) JUMPER SETTINGS.

A NUMBER OF SOLDER BRIDGES EXIST ON TOP OF THE DRIVER WHICH NEED TO BE REMOVED TO PUT THE AMPLIFIER INTO WHAT'S CALLED 'TORQUE MODE' OR 'CURRENT MODE'.

THE FINAL JUMPER SETTING SHOULD LOOK LIKE THIS:

<|> JP1  
< > JP2  
<|> JP3  
<|> JP4  
< > JP5  
< > JP6  
<|> JP7  
< > JP8  
< > JP9  
< > JP10

2) CURRENT LIMITS

A PERSONALITY HEADER (14-PIN COMPONENT HOLDER FOR RESISTORS) EXISTS ON ONE OF THE CIRCUIT BOARDS WHICH CAN BE REMOVED AND SOLDERED ONTO. WITH THIS THE CURRENT LIMITS CAN BE SET ACCORDING TO THE TABLES GIVEN IN THE MINISPEED MANUAL. ALSO, A RESISTOR IS NORMALLY PRESENT BETWEEN PINS 1 AND 14 FOR THE TACHO FEEDBACK. IN THE RIGS SUPPLIED FOR THE FLAIR SYSTEM THERE IS NO TACHO FEEDBACK BUT IF ONE IS USING THIS WITH AN OLDER RIG WHICH STILL HAS THE TACHO WIRED IN, THIS RESISTOR SHOULD BE REMOVED AS IT WILL AFFECT THE TUNING.

TWO CURRENT LIMITS ARE SET, THE RATED (NOMINAL) AND THE PEAK CURRENTS, FOR EXAMPLE TO SET A RATED CURRENT OF 5 AMPS AND A PEAK OF 8 AMPS ON AN 8/16 AMPLIFIER ONE WOULD CONNECT A 2.2K RESISTOR BETWEEN PINS 4 AND 11 AND A 18K BETWEEN PINS 5 AND 10.

NOTE: A 4/8 AMPLIFIER MAY SOMETIMES BE REDUCED TO A 2/4 AMPLIFIER WHERE THE CURRENT LIMITS NEED TO BE VERY LOW, E.G. FOCUS. THIS IS DONE BY MAKING R80, R89 AND R91 ALL 0.22 OHMS. THE 4/8 TABLES STILL APPLY TO THE 2/4 BUT ALL CURRENT RATINGS ARE HALVED.

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Filename: MULTIPIN.DOC

MILO Head Multiplexer/Demultiplexer Pinouts

=====

(Brackets show how they are used in the current Pan sliprings)

16-Way IDC connector

=====

Pin 1 - Limit1 (Pan L2 4KK)	Pin 2 - Limit2 (Tilt L2
4MM) Pin 3	- Limit3 (Roll L2 4PP)
Pin 4	- Serial Data
Pin 5 - GND	Pin 6 - GND
Pin 7 - +5V	Pin 8 - +5V
Pin 9 - Limit4 (Pan L1 3NN)	Pin 10 - Limit5 (Focus L1
3RR) Pin 11 - Limit6 (Tilt L1 4LL)	Pin 12 - Limit7 (Zoom
L1 3SS) Pin 13 - Limit8 (Roll L1 3PP)	Pin 14 - Limit9
(Iris L1 3TT) Pin 15 - Limit10 (Cam L1 4RR)	Pin 16 -
Limit11 (FDX L1 4NN)	



Guinness Breakout Motherboard (Cyclops)

=====

Encoder

- 
- 1 - A-
- 2 - A+
- 3 - B-
- 4 - B+
- 5 - ZM-
- 6 - ZM+
- 7 - +5V
- 8 - -5V
- 9 - GND
- 10 - GND

Link In

- 
- 1 - Watchdog-
- 2 - Watchdog+
- 3 - Link1In-
- 4 - Link1In+
- 5 - Link1Out-
- 6 - Link1Out+
- 7 -
- 8 - GND

Drive

- 
- 1 - Inhibit/Enable
- 2 - D/A-
- 3 - D/A+
- 4 - GND

Link Out

- 
- 1 - Watchdog-
- 2 - Watchdog+
- 3 - Link2Out-
- 4 - Link2Out+
- 5 - Link2In-
- 6 - Link2In+
- 7 -
- 8 - GND

Brake

- 
- 1 - Brake+
- 2 - Brake-
- 3 - GND

Power

Limit

- 
- 1 - Limit1
- 2 - Limit2
- 3 - Limit3
- 4 - GND

- 
- 1 - GND
- 2 - GND
- 3 - GND
- 4 - +5V
- 5 - +5V
- 6 - -5V
- 7 - +24V
- 8 - +24V

G/P Outputs

- 
- 1
- 
- G/P1+
- 2 - G/P1-
- 3 - G/P2+
- 4 - G/P2-
- 5 - G/P3+
- 6 - G/P3-
- 7 - G/P4+
- 8 - G/P4-



MIMIC CONNECTORS

=====

25-WAY D-TYPE

-----

1 - 1A+	14 - 1A-	
2 - 1B+	15 - 1B-	
3 - 2A+	16 - 2A-	FEMALE ON ROOT BOX
4 - 2B+	17 - 2B-	MALE IN MIMIC BOX
5 - 3A+	18 - 3A-	
6 - 3B+	19 - 3B-	
7 - 4A+	20 - 4A-	
8 - 4B+	21 - 4B-	
9 -	22 -	
10 -	23 - GND (SHIELD FOR 1 & 2)	
11 -	24 - GND (SHIELD FOR 3 & 4)	
12 -	25 - 0V	
13 - +12V		

9-WAY D-TYPE

-----

1 A+	6 A-	FEMALE ON MIMIC BOX
2 B+	7 B-	MALE ON ENCODER
3 Z+	8 Z-	
4 SHIELD/-5V	9 0V	
5 +5V		