

Operation Readiness Clearance (ORC)
of
SpinQuest (E1039) Microwave Motor Controlling system

Vibodha Bandara, Dustin Keller

Contents

1	The tasks of the Microwave motor controlling system	3
2	The components of the system	3
3	The Front panel of the box	3
4	Back panel of the box	4
5	Inside the box.....	5
6	Included safety features	5
7	Schematic and the PCB layout of the ADC board.....	6
8	Wiring diagram of the box.....	7
9	Specifications.....	8
9.1	Motor controller	8
9.2	Motor Driver	9
9.3	12 V Power Supply	9
9.4	Motor Power supply	10

1 The tasks of the Microwave motor controlling system

- Supply power and the control signals to the stepper motor of Microwave system
- Cutoff the motor rotation at the CW and CCW limits of the Microwave tube. CW/CCW limits can be adjusted by the potentiometers at the back panel
- Read the voltage of the rotary potentiometer that coupled with the motor
- RS232 interface for Motor controlling and 16bit ADC

2 The components of the system

Table 1 : The components of the system

Qty	Item	Model
1	Motor Driver	CVD524BR-K , Oriental motors
1	Motor Controller	SCX11, Oriental motors
1	12 V power Supply	LRS-50-12, MEAN WELL USA
1	16-Bit ADC and motor limiting circuitry	ADS1115
1	Motor Power supply	EDR-150-24, MEAN WELL USA

The first four items of the above table are placed in a rack mountable metallic box. The motor power supply will be placed on the din railing of the slow control rack

3 The Front panel of the box

- ON/OFF Switch
- Red LED : 110 V indicator
- Orange LED : 24 V indicator
- Green LED : 12 V indicator



Figure 1: Front panel of the lifter control box

4 Back panel of the box



Figure 2 : Back panel of the box

5 Inside the box

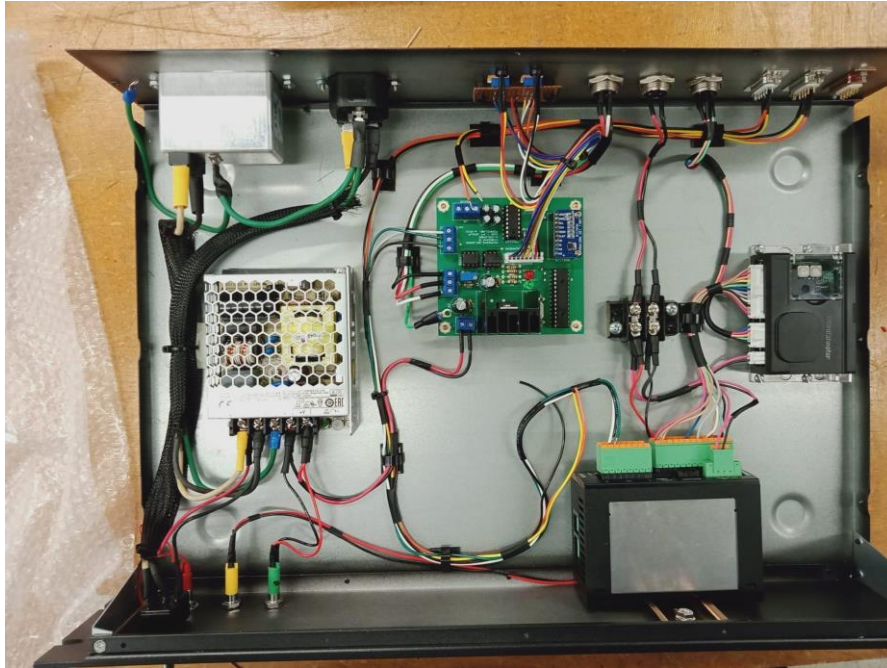


Figure 3 : components inside the box

6 Included safety features

- 110 V ON/OFF switch
- 110V/5A glass fuse
- All the high voltage wires (110V) and terminals are properly covered
- All the connecting points, cables and the LED indicators are properly labeled

7 Schematic and the PCB layout of the ADC board

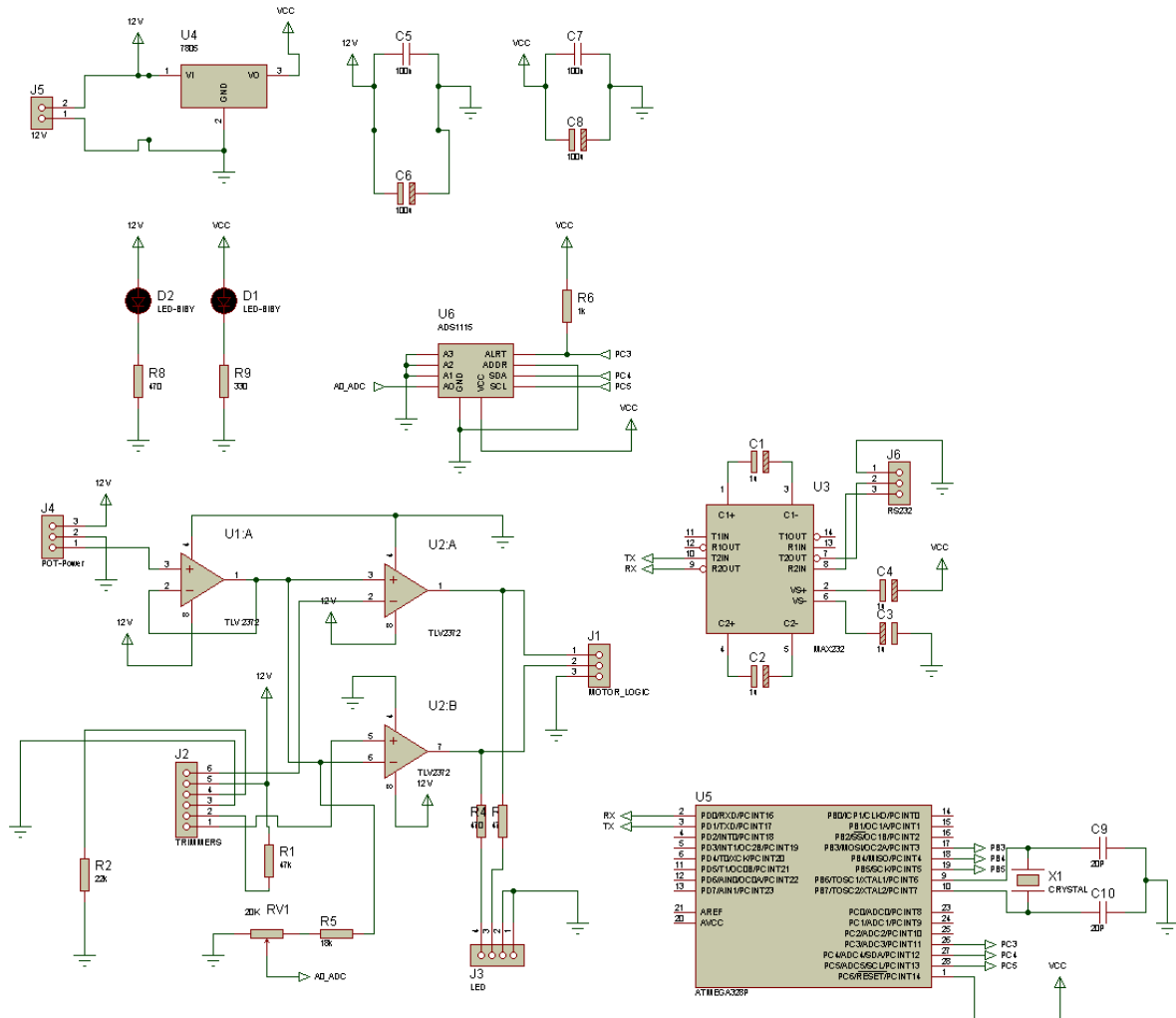


Figure 4 : Schimatic of the ADC board

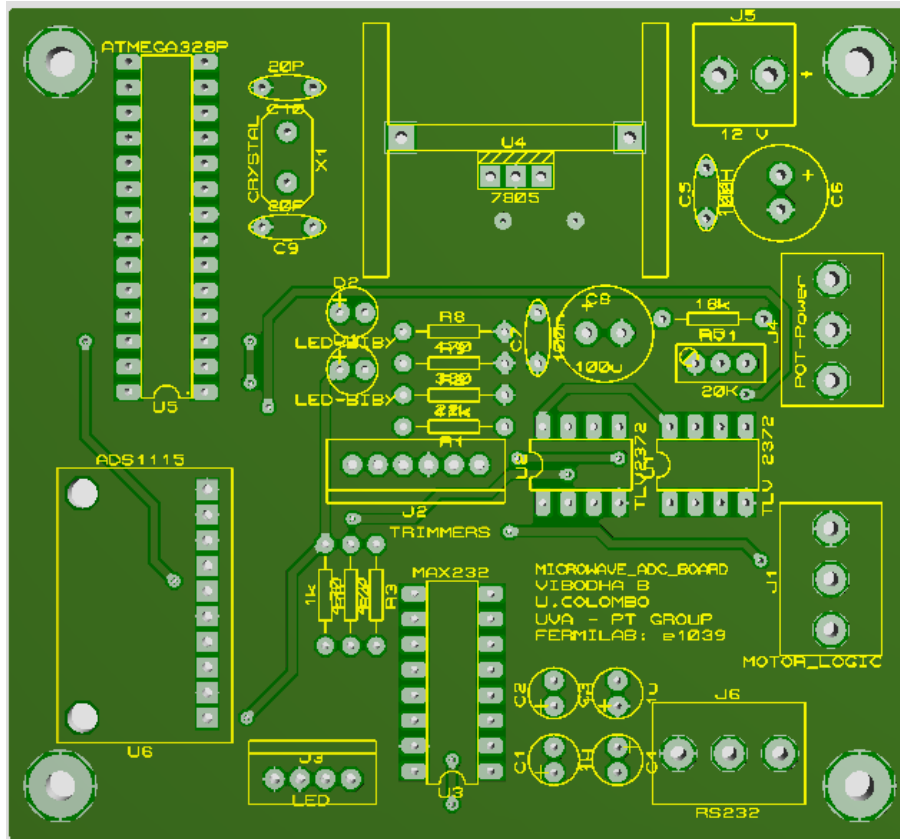


Figure 5 : The PCB layout

Input Voltage of the PCB: 12 V

PCB printed certification: IPC-A-600 Class II

Gerber file of the PCB is attached

8 Wiring diagram of the box

The complete wiring diagram of the box is attached separately

9 Specifications

9.1 Motor controller

Table 2 : Specifications of the Motor controller

Product Name		SCX11
Operation Mode		Immediate command / stored program
Sequence Programs		Max.100
Number of Sequence Programs		Max.100
Program Size		6 kB maximum for total compiled sequences, 6 kB maximum for 1 sequence (text data)
Programming Method		Immediate Motion Creator for CM/SCX Series [supplied software] or general terminal software
Function Example		Subroutines, math/logical operators, user variables
Number of Control Axis		Single axis
Control Modes		Positioning operation (INDEX operation) Return to mechanical home operation (HOME operation) Continuous operation (SCAN operation) 1-pulse operation (JOG operation)
Operating Mode		Incremental / absolute
Starting Velocity		0~1.24 MHz (1 Hz increments)
Speed Range		1 Hz~1.24 MHz (1 Hz increments)
Acceleration Time		0.001~500 sec (0.001 sec increments)
Position Range		-2,147,483,648~+2,147,483,647 pulses maximum
Mode for Mechanical Home Seeking		3 sensor mode, 2 sensor mode, 1 sensor mode (+LS, -LS, home, sensor, timing) Sensor-less mode (for ESMC controller)
Features		User unit, teaching positions, linked motion, multi axis operation, external encoder input, protective functions
Driver Interface		
Pulse Output		1 pulse mode/2 pulse mode Line driver output (line receiver input /photo-coupler input compatible)
Input		5 signals photo-coupler input Input voltage 4.25-26.4 VDC, input resistance 3 kΩ Built-in 5/24 VDC power supply sink logic/source logic compatible
Output		8 signals photo-coupler open-collector outputs 30 VDC 20 mA or less Built-in 5/24 VDC power supply sink logic/source logic compatible
Encoder Input		A-phase, B-phase, Index max. frequency 1 MHz
External Encoder Input		A-phase, B-phase, Index max. frequency 1 MHz Line-driver, open collector and TTL compatible Built-in 5 VDC power supply
I/O		
Input		9 signals (configurable) photo-coupler inputs, input voltage 4.25-26.4 VDC, input resistance 5.4 kΩ
Output		4 signals (configurable) photo-coupler open-collector outputs 30 VDC 20 mA or less
Serial Communications		
USB		USB2.0 compatible virtual COM port) mini USB terminal 9600, 19200, 38400, 57600, 115200 bps (9600 is default.)
RS-232C		Start-stop synchronous method, NRZ (non-return zero), full-duplex 8 bits, 1 stop bit, no parity 9600, 19200, 38400, 57600, 115200 bps (9600 is default.) daisy-chain compatible (up to 36 axis)
CANopen		CI A 301 ver4.02 compliant 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps
Power Input		
Voltage		24 VDC±10%
Current		0.26 A
Mass		0.18 kg (0.40 lb.)
Environmental Condition		
Ambient Temperature		0~50°C (+32~+122°F) (non-freezing)
Ambient Humidity		20~85% (non-condensing)

9.2 Motor Driver

Model Number: CVD524BR-K

Manual is attached separately

9.3 12 V Power Supply

Model Number: LRS-50-12

Table 3 : Specifications of the 12 V power supply

		MW MEAN WELL				50W Single Output Switching Power Supply			LRS-50 series		
SPECIFICATION											
MODEL		LRS-50-3.3	LRS-50-5	LRS-50-12	LRS-50-15	LRS-50-24	LRS-50-36	LRS-50-48			
OUTPUT	DC VOLTAGE	3.3V	5V	12V	15V	24V	36V	48V			
	RATED CURRENT	10A	10A	4.2A	3.4A	2.2A	1.45A	1.1A			
	CURRENT RANGE	0 ~ 10A	0 ~ 10A	0 ~ 4.2A	0 ~ 3.4A	0 ~ 2.2A	0 ~ 1.45A	0 ~ 1.1A			
	RATED POWER	33W	50W	50.4W	51W	52.8W	52.2W	52.8W			
	RIPPLE & NOISE (max.) Note.2	80mVp-p	80mVp-p	120mVp-p	120mVp-p	150mVp-p	200mVp-p	200mVp-p			
	VOLTAGE ADJ. RANGE	2.97 ~ 3.6V	4.5 ~ 5.5V	10.2 ~ 13.8V	13.5 ~ 18V	21.6 ~ 28.8V	32.4 ~ 39.6V	43.2 ~ 52.8V			
	VOLTAGE TOLERANCE Note.3	±3.0%	±2.0%	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%			
	LINE REGULATION Note.4	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%			
	LOAD REGULATION Note.5	±2.0%	±1.0%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%			
	SETUP, RISE TIME	1000ms, 30ms/230VAC 2000ms, 30ms/115VAC at full load									
HOLD UP TIME (Typ.)	30ms/230VAC 12ms/115VAC at full load										
INPUT	VOLTAGE RANGE	85 ~ 264VAC		120 ~ 373VDC							
	FREQUENCY RANGE	47 ~ 63Hz									
	EFFICIENCY (Typ.)	80%	83%	86%	88%	88%	89%	90%			
	AC CURRENT (Typ.)	0.95A/115VAC		0.56A/230VAC							
	INRUSH CURRENT (Typ.)	COLD START 45A/230VAC									
PROTECTION	LEAKAGE CURRENT	<0.75mA/ 240VAC									
	OVER LOAD	110 ~ 150% rated output power Protection type : Hiccup mode, recovers automatically after fault condition is removed									
	OVER VOLTAGE	3.8 ~ 4.45V	5.9 ~ 7.3V	13.8 ~ 16.2V	18.75 ~ 21.75V	28.8 ~ 33.6V	41.4 ~ 48.6V	55.2 ~ 64.8V			
ENVIRONMENT		Protection type : Shut down o/p voltage, re-power on to recover									
	WORKING TEMP.	-30 ~ +70°C (Refer to "Derating Curve")									
	WORKING HUMIDITY	20 ~ 90% RH non-condensing									
	STORAGE TEMP., HUMIDITY	-40 ~ +85°C, 10 ~ 95% RH non-condensing									
	TEMP. COEFFICIENT	± 0.03%/°C (0 ~ 50°C)									
SAFETY & EMC (Note 9)	VIBRATION	10 ~ 500Hz, 5G 10min./1cycle, 60min. each along X, Y, Z axes									
	OVER VOLTAGE CATEGORY	III; Compliance to BS EN/EN61558, BS EN/EN50178, BS EN/EN60664-1, BS EN/EN62477-1; altitude up to 2000 meters									
	SAFETY STANDARDS	UL62368-1, TUV BS EN/EN62368-1, BS EN/EN60335-1, BS EN/EN61558-1/2-16, CCC GB4943.1, BSMI CNS14336-1, EAC TP TC 004, AS/NZS 60950.1 (by CB), KC K80950-1 (for LRS-50-12/24 only), BIS IS13252 (Part1); 2010/IEC 60950-1: 2005 approved									
	WITHSTAND VOLTAGE	I/P-O/P:4KVAC	I/P-FG:2KVAC	O/P-FG:1.25KVAC							
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG: 100M Ohms / 500VDC / 25°C / 70% RH									
	EMC EMISSION	Compliance to BS EN/EN55032 (CISPR32) Class B, BS EN/EN55014, BS EN/EN61000-3-2,-3, GB/T 9254, BSMI CNS13438, EAC TP TC 020.KC KN32,KN35 (for LRS-50-12/24 only)									
	EMC IMMUNITY	Compliance to BS EN/EN61000-4-2,3,4,5,6,8,11, BS EN/EN61000-6-2 (BS EN/EN50082-2), heavy industry level, criteria A, EAC TP TC 020.KC KN32,KN35 (for LRS-50-12/24 only)									
	MTBF	645K hrs min. MIL-HDBK-217F (25°C)									
	OTHERS	DIMENSION	99*82*30mm (L*W*H)								
		PACKING	0.23Kg; 60pcs/14.8Kg/0.88CUFT								

9.4 Motor Power supply



Figure 6 : Stepper motor power supply

Table 4 : Specifications of the motor power supply

MODEL		PS150D24	
OUTPUT	DC VOLTAGE	24V	
	RATED CURRENT	6.5A / 230VAC	5.2A / 115VAC
	CURRENT RANGE	0 ~ 6.5A / 230VAC	0 ~ 5.2A / 115VAC
	RATED POWER	156W / 230VAC	125W / 115VAC
	RIPPLE & NOISE (max.) Note.2	150mVp-p	
	VOLTAGE ADJ. RANGE	24 ~ 28V	
	VOLTAGE TOLERANCE Note.3	± 1.0%	
	LINE REGULATION	± 0.5%	
	LOAD REGULATION	± 1.0%	
	SETUP, RISE TIME	1500ms, 60ms/230VAC 3000ms, 60ms/115VAC at full load	
HOLD UP TIME (Typ.)	16ms/230VAC 10ms/115VAC at full load		
INPUT	VOLTAGE RANGE Note.6	90 ~ 264VAC	127 ~ 370VDC [DC input operation possible by connecting AC/L(+), AC/N(-)]
	FREQUENCY RANGE	47 ~ 63Hz	
	EFFICIENCY (Typ.)	87%	
	AC CURRENT (Typ.)	2.6A/115VAC	1.7A/230VAC
	INRUSH CURRENT (Typ.)	20A/115VAC	35A/230VAC
	LEAKAGE CURRENT	<1mA / 240VAC	
PROTECTION	OVERLOAD Note.7	105 ~ 130% rated output power Protection type : Constant current limiting, recovers automatically after fault condition is removed / 230VAC	
		105 ~ 150% rated output power Protection type : Constant current limiting, recovers automatically after fault condition is removed / 115VAC	
	OVER VOLTAGE	29 ~ 33V	
		Protection type : Shut down o/p voltage, re-power on to recover	
OVER TEMPERATURE	Shut down o/p voltage, re-power on to recover		

END