

Operation Readiness Clearance (ORC)
of
SpinQuest (E1039) Target lifter control system

Vibodha Bandara, Darshana Perera, Dustin Keller

Contents

1	The block diagram of the complete target lifter system	1
2	Lifter control system.....	2
3	The tasks of the Lifter control system	2
4	The components of the system	2
5	The Front panel of the box	3
6	Back panel of the box	3
7	Inside the box.....	4
8	The placement of the control box in the slow control rack	4
9	Placement of the motor power supply on the din rail of the slow control rack.....	5
10	Included safety features	5
11	Specifications.....	6
11.1	4 Channel Relay Module.....	6
11.2	Motor controller	7
11.3	Regeneration Clamp.....	8
11.4	12 V Power Supply	9
11.5	Motor Power supply.....	10

1 The block diagram of the complete target lifter system

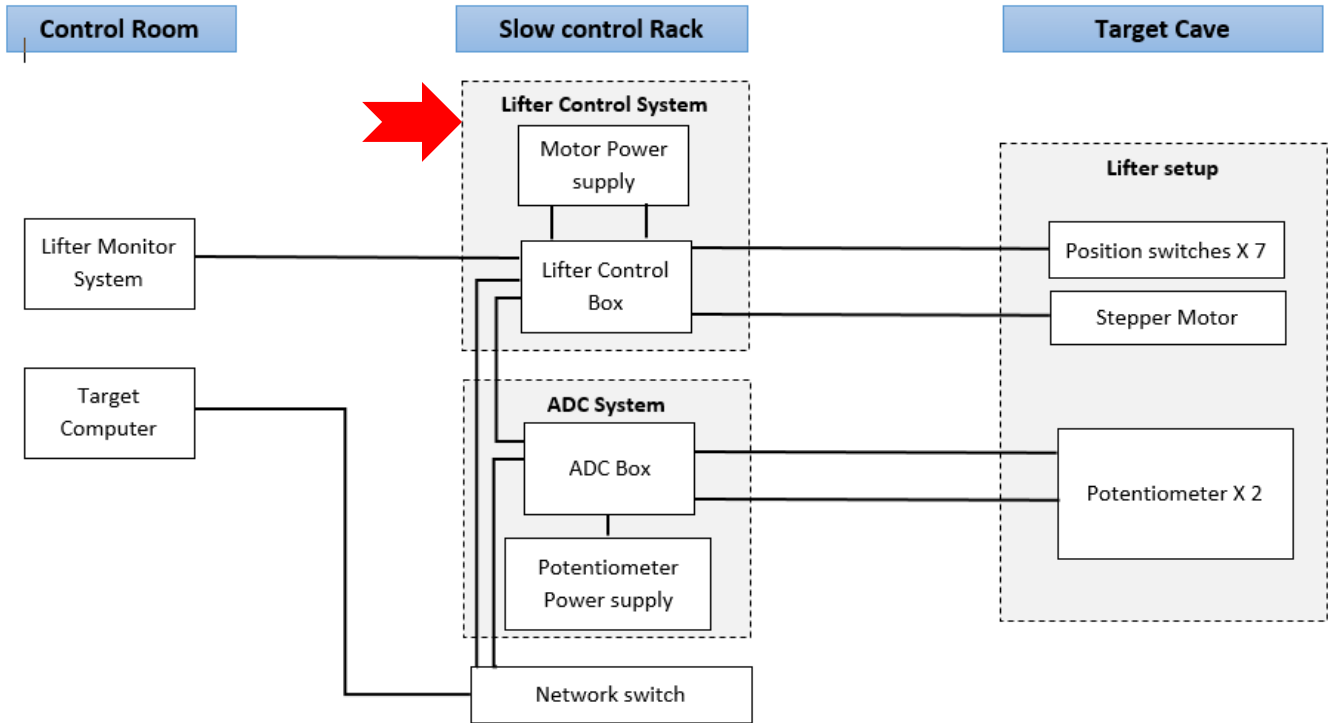


Figure 1 : The block diagram of the target lifter system

This ORC document discusses the lifter control system on the slow control rack

2 Lifter control system

The lifter control system consists of the motor control and power source electronics for the lifter setup. The setup is planned to place on the slow control rack.

3 The tasks of the Lifter control system

- Supply power and the control signals to the stepper motor of the target lifter system
- Connect the position switches of the lifter with the motor controller
- Send the status of the position switches to the lifter monitor system which is placed in the control room
- Power cycle the motor controller when required. The power cycle command will issue from the control room.

4 The components of the system

Table 1 : The components of the lifter control system

Qty	Item	Model
1	Moto controller	Applied Motion, STF-03D
1	Regenerating clamp	Applied Motion, RC880
2	4-Channel relay module	LIVISN, B07Z38SS6T
1	12V/110V relay	Omron Automation, G2R-1-T DC12
1	+/- 12 V Power Supply	Cosel USA, Inc., PBW15F-12-N
1	Motor Power supply	Applied Motion, PS150D24

The first five 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

5 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 2: Front panel of the lifter control box

6 Back panel of the box

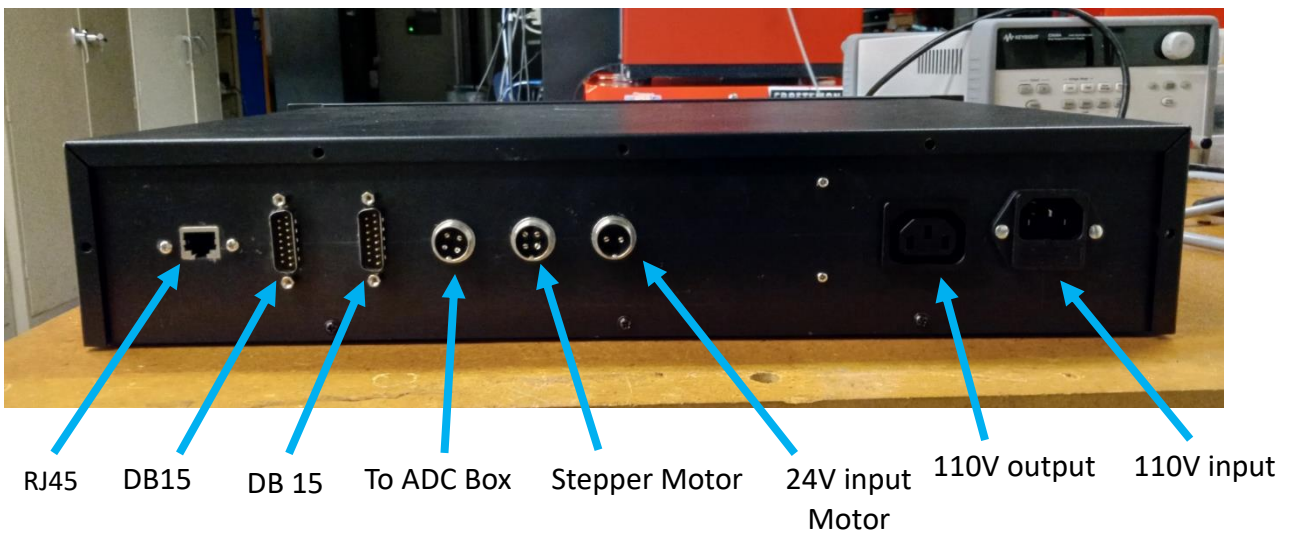


Figure 3 : Back panel of the box

7 Inside the box

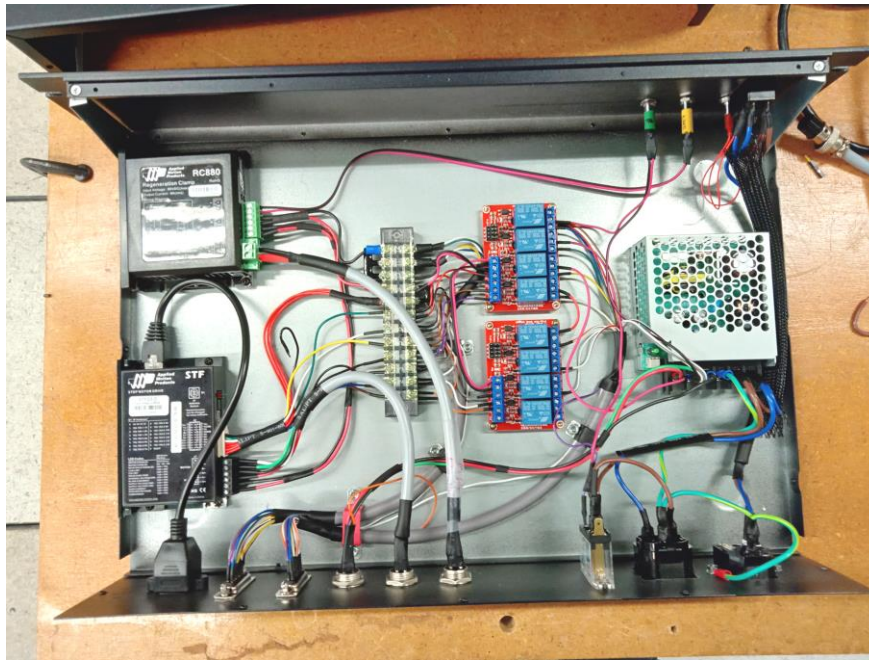


Figure 4 : components inside the box

8 The placement of the control box in the slow control rack



Figure 5 : Placement of the control box on the slow control rack

9 Placement of the motor power supply on the din rail of the slow control rack



Figure 6 : Placement of the motor power supply on the din rail

10 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

The complete wiring is attached separately.

11 Specifications

11.1 4 Channel Relay Module

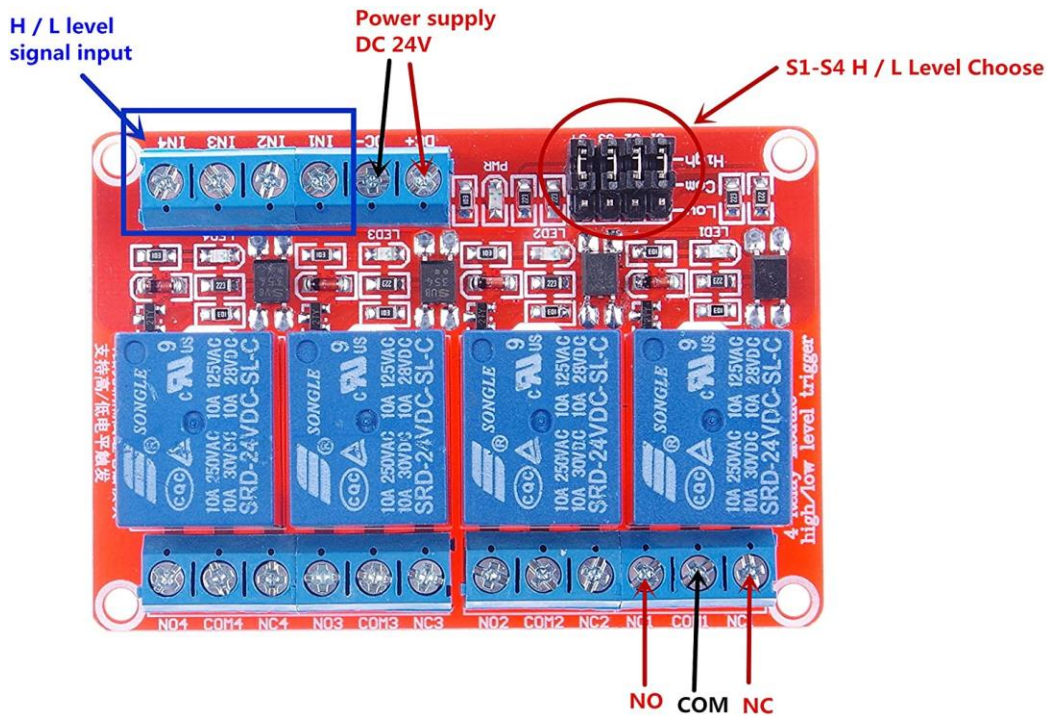


Figure 7 : 4 channel relay module

Table 2 : Specifications of the relay module

Model Number	B07Z38SS6T by LIVISN
Relay voltage and current rating	AC 250V/10A, DC 30V/10A
OPTOCOUPLER isolation	Yes
Module size	73mm * 50mm * 18.5mm (L * W * H)

11.2 Motor controller



Figure 8 : Stepper motor controller

Table 3 : Specifications of motor controller

Model Number:	STF03
Part Number:	STF03-R, STF03-C, STF03-D, STF03-IP, STF03-EC
Supply Voltage:	12-48 VDC
Supply Voltage Type:	DC
Control Modes:	Streaming Commands Q Programming CANopen EtherNet/IP Modbus RTU Modbus TCP EtherCAT
Output Current:	0.1-3.0 A/phase
Communication Ports:	RS-485 CANopen Ethernet EtherNet/IP EtherCAT Ethernet, dual-port
Encoder Feedback:	No
Step Resolution:	Full Half Microstepping Microstep Emulation
Idle Current Reduction:	0-90%
Setup Method:	Software setup
Digital Inputs:	8
Digital Outputs:	4
Dimensions:	3.9 x 2.4 x 0.9 inches
Weight:	5.5 oz
Operating Temperature Range:	0 to 70 °C

11.3 Regeneration Clamp



Figure 9 : Regenerating clamp

Table 4 : Specifications of the regenerating clamp

Electrical Specifications				
Parameter	Min.	Typ.	Max.	Unit
Power Supply voltage	-	-	80	VDC
Input Current (RMS)	-	-	15	Amps
Output Current (RMS)	7.0(max)/Channel, but no more than 15(max) total			Amps
Clamp circuit activation Voltage	1	1.3	1.6	V (Vout-Vin)
Clamp circuit inactivation Voltage	0.3	0.5	0.7	V (Vout-Vin)
Capacitance	-	3000	-	μF
Resistance	9.9	10	10.1	Ω
Continuous Power Dissipation	-	50	-	W
Peak Power Dissipation	-	800	-	W

Environmental Specifications	
Heat Sinking Method	Natural cooling or fan-forced cooling
Surrounding Air Conditions	Avoid dust, oily mist and corrosive air
Operating Temperature	0 - 40°C (32 - 104°F)
Maximum Ambient Humidity	90% non-condensing
Shock	5.9m/s ² maximum
Storage Temperature	-10 - 70°C (14 - 158°F)

11.4 12 V Power Supply



Figure 10 : 12 V power supply module

Table 5 : Specifications of the 12 V power supply

	Model	PBW15F-12
Input	Voltage	100V
	Current	0.4
	Frequency	50/60 Hz
Output	Voltage	+/- 12 V
	Current	0.7 A
	Line Regulation [mV]	60max
	Load Regulation [mV]	600max
Protection	Over Current Protection	
	Over Voltage Protection	
	Operating Indication	LED
Others	Size	31 X 78 X 85mm
	Cooling Method	Convection

11.5 Motor Power supply



Figure 11 : Stepper motor power supply

Table 6 : 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.) <small>Note.2</small>	150mVp-p	
	VOLTAGE ADJ. RANGE	24 ~ 28V	
	VOLTAGE TOLERANCE <small>Note.3</small>	± 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 <small>Note.6</small>	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 <small>Note.7</small>	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