Instruction manual ModuleControl Closed Loop

Software Tool for Test and Parameterization of Closed Loop Motor Controller



Version 04.012 June 9, 2023 © Commonplace Robotics GmbH



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1 Introduction

1.1 Contact

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1.2 Intended Use

The intended use of the product is defined by the uses within the defined limits from the technical data. The permissible electrical parameters and the defined permissible ambient conditions must be observed in particular. These are specified in more detail later in this manual. The intended use for this product can be found in the following section 3.

1.3 Target Group and Qualification

The product and this documentation are intended for technically trained professionals such as:

- development engineers
- plant designers
- assemblers/service personnel
- application engineers

Installation, commissioning, as well as operation is only allowed by qualified personnel. These are persons who meet all the following requirements.

- have appropriate training and experience in handling motors and their control.
- know and understand the contents of this technical manual.
- know the applicable regulations

1.4 Symbols Used

All notes in this document follow a consistent form and are structured according to the following classes.



The WARNING notice alerts the reader to possible dangerous situations. Disregarding a warning can **possibly** result in moderate injury to the user. • Within a warning, this describes ways to avoid hazards

• Within a warning, this describes ways to avoid hazards.



This note indicates possible incorrect operation of the product. Failure to comply with this notice may **possibly** result in damage to this product or other products.

1.5 Product Safety

The following EU directives were observed:

- RoHS-Directive (2011/65/EU, 2015/863/EU)
- EMV-Directive (2014/30/EU)

1.6 Regulations

In addition to this technical manual, operation, commissioning is subject to the applicable local regulations, such as:

- Accident prevention regulations
- Local regulations for occupational safety



2 Operation with Module Control

The Module Control software provides various regulation and control methods. A selection is made via the start tab in Module Control, the desired procedure can be selected via the checkboxes to the right of the rotary control.

> CPF	R Module Co	ntrol CLOSED LOOP V	06-011			—	
tart	Parameter	Stand Alone Motion	Firmware Update	Status	Rebel		
Veloc	city Drive:	0.00°/s	IP address:			Supply Voltage: Temp Board: Temp Motor:	n/a V n/a dC n/a dC
CI Gea Gea	hart	1031.11				Position Control /elocity Control Forque Control PWM Control	Zero Position Start Reference Align Rotor
	P	osition SetPoint [°]			sition [°]	300	Controller Connect
C	current: 0 mA wg. (10sec):	0 mA			Status	•	
(Connect CAN	Can address 0x10	Re	əsət Erro	ors	Status not connected	•
Сс	onnect Ethern	IP address: 192.168.3	8.11 Mo	otor Ena	ble		
Log Messages							

Figure 1: Start tab Module Control

2.1 Position Control

The mode "Position Control" sets the board in position control, a setpoint setting is made here via the rotary control from the PC or via the tab "Stand Alone Motion".

2.2 Velocity Control

The mode "Velocity Control" sets the board in velocity control, a setpoint setting is done via the rotary control from the PC. For a sensible setpoint setting, the gear ratio must be specified in the "Gear reduction" field. The setting is done in $\frac{degrees}{s}$, the speed refers to the output speed.

2.3 Torque Control

The mode "Torque Control" sets the board in torque control, a setpoint is set via the rotary control from the PC. The controlled torque represents the internal motor torque. When using the FOC, this



represents the requirement for the torque-forming component.



Attention to load fluctuations In this mode, the motor generates a constant torque; in load-free operation, this leads to extreme speeds. These speeds can destroy the motor.

2.4 weitere Funktionen

Module Control provides the user with information beyond the functional scope of the robot controller, also various functions of the axes can be triggered.

2.4.1 Anzeige Umgebungsdaten

In the upper right corner of the start tab there are current measured values of the board. Here the focus is on the environmental data of the board. These data are the supply voltage, the temperature of the board and the motor. The display n/a shows the user that no measurement has been performed yet and that the motor controller does not have the corresponding sensor.

Supply Voltage:	n/a V
Temp Board:	n/a dC
Temp Motor:	n/a dC

Figure 2: Starttab Environmental parameters

2.4.2 Special board functions

For the operation of the axes in a robot application, various steps are required to put the axis into an operational mode. These functions can also be triggered for test purposes.

A first disesr function is to set the position of the axis at the current position to 0. The Zero Position button is available for this purpose.

The referencing of the axis can be started with Start Reference.

In closed loop mode the motor controllers must know the exact rotor position in reference to the stator field. The measurement of the offset can be triggered by the Align Rotor button.

Zero Position
Start Reference
Align Rotor

Figure 3: Starttab Special functions



3 Module Control Tabs

3.1 Parameter

The parameter tab is used to manage the individual parameters on the module. When Module Control is loaded, it generates a sample parameter set. In most cases this parameter set does not fit to the used board and motor type. Below the table bar there are five buttons in the software, the left three buttons cause interactions with the connected board. The right positioned areas allow the loading of stored configurations, as well as the saving of the current configuration from Module Control. With the button "Read from Board" it is possible to read the current configuration from the board. By means of "Save Changes" only changed parameters can be transferred. All parameters can be saved via the area "Save All".



Restart required

A restart of the motor controller is necessary to accept the parameters. This does not apply to the control parameters.

OR Module Control	CPR Module Control CLOSED LOOP V06-011 – 🗌 🗙							
Start Parameter Sta	nd Alone Motion Firm	ware Updat	e Status	Rebel				
Read from Board	Save Changes	Save All	Re	əstart	Oper	n File	Save I	File
Index SubIndex	Name Value	Unit F	lagChang	ed FlagN	Missing	FlagOptio	onal	
Connect CAN	Can address: 0x10	~ I	Reset Erro	ors	Status not con	inected		•
Connect Ethernet	192.168.3.11		Motor Ena	ble				
Log Messages								
08:57:02:601 INFO 08:57:02:611 INFO 08:57:02:612 INFO	Changing to tabPageF Position Control disab Disabling motion when	WParamete led i changing to	orV2 o FWPara	meterV2 t	ab			^
								\sim

Figure 4: Module Control Parameter Tab



3.2 Parameters

This chapter describes the parameter interface for motor controllers from CPR.



Danger to life!

Changes to the parameter sets may only be carried out by trained personnel. Changing the parameters can override safety interrogations and lead to danger for persons and equipment! High currents can cause fires!.

The motor controllers use the CPR parameter interface in the 2nd version. The parameters are addressed via an index (8bit) [0-255] and a subindex (8bit) [0-255]. The index carries information about the assignment of the parameters to individual system modules. The index contains the following modules:

Index Beschreibung

- **0** Board parameters
- 1 Motor parameters
- 2 Axis parameters
- **3** Control parameters
- 4 Communication parameters

Table 2: Parameter groups

Index 0 board parameters

Idx	SIdx	Name	Unit	Default value		
0	0	Serial no.				
Desc	ription:	Serial number of the product. Used to i	dentify	the date of manufacture.		
0	1	Firmwareversion				
Description:		Firmware version number to identify th	ne curre	nt software version.		
0	2	Hardwareno.				
Description:		Hardware version number to identify the hardware configuration used.				
0	3	min. supply Voltage	V	$V_{cc} - 2V$		
Description:		Minimum permissible supply voltage. The minimum supply voltage should be approx. 2V below the nominal voltage. If the supply voltage falls below this limit, the board issues an error message.				
0	4	max. Boardtemp.	m°C	70000		
Description:		Maximum permissible board temperature				

Table 3: Board parameters



Index 1 motor parameters

Idx	SIdx	Name	Unit	Default value			
1	0	Encoder Tics	1/Rev	4096			
Desc	ription:	Number of encoder pulses per revolution	on accordir	ng to data sheet.			
1	1	No. of Polepairs	No. of Polepairs 7				
Desc	ription:	Number of pole pairs in the motor acco	ording to th	e data sheet.			
1 4		max. RPM RPM 0		0			
Desc	ription:	Maximum rotational speed of the mo- sheet of the motor or on the basis of su the limitation.	Maximum rotational speed of the motor. Setting is made according to the data sheet of the motor or on the basis of subsequent components. The value 0 cancels the limitation.				
1	5	max. Motortemp.	m°C	0			
Desc	ription:	Maximum temperature in the motor. tional sensor. The value 0 deactivates the	The measu ne query.	rement is performed via an op-			
1	6	max. Current	mA	6000			
Desc	ription:	Maximum motor current according to	data sheet.				
1	7	StartUpMethod		1			
		 start options, the motor starts IPO after 0. Openloop 1. Closedloop with rotor alignment 2. Closedloop with index search 3. Closedloop for DC Motor 4. Closedloop with rotor alignment 10. Closedloop with rotor alignment 	and check and autost	for free rotation			
1	9	EncoderInverted	boolean	0			
Desc	ription:	Setting for the direction of rotation of the signals at the input of the controlle 60034-8. After a change, the controller 0. Encoder not inverted 1. Encoder inverted	the encod er must be must be res	er. The direction of rotation of clockwise according to DIN EN tarted.			
	10	MotorInverted	boolean	0			



Idx	SIdx	Name	Unit	Default value		
Description:		The direction of rotation of the motor must be clockwise according to DIN EN 60034-8. If the setting is incorrect, the motor does not rotate. Only the motor current increases.				
		0. Motor not inverted				
1. Motor inverted						
1	11	OpenLoopCurrent	mA	2000		
Desc	ription:	Setpoint current for the openloop control of the motor				
1	12	OpenLoopCurrentStandstill	mA	1000		
Desc	ription:	Setpoint current for the openloop control at standstill.				
1	13	Calibration Current	mA	1000		
Description:		Set current for rotor alignment.				
1	14	Calibration Time	ms	10		
Description:		Duration for the alignment of the rotor				

Table 4: Motor parameters



Index 2 Axis parameters

Idx	SIdx	Name	Unit	Default value
2	0	Reserved		
Description:		Reserved for future use.		
2	1	ReferencingType		1
Description		Selection for the referencing type		

Description: Selection for the referencing type.

- 0. no referencing current position = 0
- 1. Linear motion
- 2. Sinusoidal movement (Sinusoidal search for the sensor.)
- 3. Half disks (referencing method for axes equipped with a half disk, e.g. Robolink DP)
- 4. Gearencoder (only Rebel)

2	2	ReferencingOffset	Tics	0		
Description:		Offset for the axis position after referencing.				
2	3	ReferencingSpeed	RPM	10		

Description: Speed for approaching the sensor.



If the axis is referenced in the wrong direction, this parameter can be set to negative.

2	4	ReferencingSpeedSlow	RPM	2

Description: Speed for fine positioning of the axis during homing.



If the axis is referenced in the wrong direction, this parameter can be set to negative.

2	5	ReferencingSwitchType	0

Description: Type of the reference sensor.

- 0. n.C.
- 1. n.O.

2	6	max. Positionlag	Tics	10000
Descr	iption:	Permissible position error of the axis. V position setpoint. If the limit value is ex appears. If the value is set to 0, there is	Vith fast move ceeded, the a no monitorin	ements, the axis runs after the xis stops and an error message g.
2	7	Break Type	[0-2]	0



Idx	SIdx	Name	Unit	Default value
Desci	ription:	Parameter for activating a brake on the which should be controlled by the mo brakes are released when the axes are a	robot axis. If tor controlle ctivated.	the robot has a holding brake, r, this value must be set. The
		0. no brake		
		1. friction brake		
		2. blocking brake		
		In the blocking brake mode, a free-posi means a pin or similar, which blocks t brake.	tioning move the rotor. A f	ment occurs. A blocking brake riction brake describes a disc
2	8	Break PWM High	% V _{cc}	100
Desci	ription:	If a brake is configured on the axis, th releasing the brake.	nis parameter	specifies the PWM value for
2	9	Break PWM Low	% V _{cc}	50
Desci	ription:	Voltage to hold the brake after releasing output voltage to the specified value.	g the brake, th	ne motor controller lowers the
2	10	IPO Position	Tics	200000
Desci	ription:	Positive position value for the IPO. In s symmetrically around the zero point. T	standalone m hus from -IP0	ode, the IPO moves this value O position to IPO position.
2	11	IPO Velocity	Tics/10ms	200
Desci	ription:	Speed for IPO mode in standalone open	ration,	
2	12	Axis inverted	boolean	0
Desci	ription:	Changes the direction of the axis		
2	13	Gear ratio		0
Desci	ription:	Gear ratio of the gear unit. For i=1:50 c possible.	corresponding	gly 50. Only integer values are

Table 5: Axis parameters



Index 3 Control parameters

Idx	SIdx	Name	Unit	Default value
3	0	Position P		
Desc	ription:	P component for position control.		
3	1	Position I		0
Desc	ription:	I component for position control.		
3	3	Position P scale		
Desc	ription:	Scaling of the P component by 2^x		
3	4	Position min.	RPM	
Desci	ription:	minimum limitation for the output of	the positi	on control.
3	5	Position max.	RPM	
Desci	ription:	maximum limitation for the output of	the positi	ion control.
3	7	Velocity P		
Desci	ription:	P component for speed control.		
3	8	Velocity I		
Desci	ription:	I portion for speed control.	·	
3	10	Velocity P scale		
Desci	ription:	Scaling of the P component in 2^x	·	
3	11	Velocity min.		-1024
Desci	ription:	minimum limitation for the output of	the speed	l control.
3	12	Velocity max.		1024
Desci	ription:	maximum limitation for the output of	the speed	l control.
3	14	DQ-P		
Desci	ription:	P component for DQ control		
3	15	DQ-I		
Desci	ription:	I component for DQ control		
3	17	DQ back calc		
Desci	ription:	Backcalculation factor for DQ controlle	er	
3	18	DQ-min.		-1024
Desci	ription:	minimum limitation for the output of	the DQ co	ontrol
3	19	DQ-max.		1024
Desci	ription:	maximum limitation for the output of	the DQ c	ontrol
3	20	Openloop P	1/100	
Desci	ription:	P component for Openloop current co	ntrol.	
3	21	Openloop I	1/100	
Desc	ription:	I component for Openloop current cor	ntrol.	
3	22	Openloop D	1/100	
Desci	ription:	D component for Openloop current co	ontrol.	
3	23	Openloop AntiWindUp	1/100	

3 MODULE CONTROL TABS



Idx	SIdx	Name	Unit	Default value		
Desci	ription:	AntiWindUp for Openloop current con	trol			
3	24	Openloop min.				
Desci	ription:	minimum limitation for the output of the Openloop current control.				
3	25	Openloop max.				
Desci	ription:	maximum limitation for the output of t	he Open	loop current control.		

Table 6: Control parameters



Idx	SIdx	Name	Unit	Default value
4	0	CAN max. missed Coms		100
Desc	ription:	maximum number of failed communic the value leads to the motor controller	cation atten being switc	npts on the CAN bus. Exceeding hed off.
4	1	CAN ID Source		1
Desc	ription:	Source for the CAN ID:		
		 hardware jumper parameter set 		
4	2	CAN ID		16
Desc	ription:	CAN ID for the controller		
4	3	SPI Active	boolean	0
Desc	ription:	Enable SPI communication	•	

Index 4 Communication parameters

Table 7: Communication parameters

3.3 Stand Alone Motion

In Stand Alone Motion mode, the board independently drives an oscillating motion between two defined points. The PC can be removed in this mode, so test stands can be easily set up. To use the Stand Alone Motion, all error messages must be acknowledged and the motor must be switched on. This state is indicated by the status "no error". Then it is possible to switch to the "Stand Alone Motion" tab. The definition of the positions is done in encoder tics, furthermore it is possible to specify the speed and a desired acceleration. The button "Start" starts the execution of the motion, "Stop" stops the current motion. The parameters are updated by pressing "Start" again. The Stand Alone mode allows the disconnection of the CAN connection.



O CPF	R Module Co	ntrol CLOSED LOOP V	06-011				_	×
Start	Parameter	Stand Alone Motion	Firmware Update	Status	Rebel			
		Pos1 [EncTics]	-95000					
		Pos2 [EncTics]	95000					
		Speed [Tics/10ms]	1200					
		Acc [Tics/10ms ²]	30					
		Delay [s]	0					
		Start	Stop					
C	Connect CAN	Can address	s: R	əsət Erro	ors	Status not conr	nected	
		0x10	×					
0.0	nneet Ethern	IP address:		ator Eng	ble			
	nnect Ethen	192.168.	3.11 W	DIOFENA	DIe			
Log M	lessages							
08:57	- 7:02:601 INF	O Changing to tab	PageFWParameter	/2				~
08:5 08:5	7:02:611 INF 7:02:612 INF	 Position Control Disabling motion 	disabled when changing to	FWPara	meterV2	tab		
08:57	7:49:808 INF	O Changing to tabl	PageStandAlone					
								\sim

Figure 5: Stand-Alone-Motion Module Control

3.4 Firmware Update

Module Control allows an update of the firmware on the connected closed loop controller. This allows new features to be loaded or errors to be corrected. The firmware update tab is used for this purpose.



Parameter Backup Before starting the Firmware Update the parameter have to be backed up.

The motor controller has a short time window after startup in which a firmware update can be activated.

The controllers can be updated to a new version by the following procedure. The updater takes over all functions independently and carries out error handling independently if necessary.

- First read the instructions at the top of the page.
- In the "Firmware File" area, select the desired firmware file.
- In the "Parameter" area, select the desired handling of the axis parameters. You can backup the parameters by default. Below you can select whether the old parameters should be taken over or new parameters from a file should be used. If you decide to use a file, you must select it.
- The area "Write to Device" allows the selection of the CAN-IDs for the update. Thus it is possible to update the complete robot in one pass.
- A click on "Write to Modules" starts the process. The progress and status of the individual mod-



ules can be tracked in the status area.

O CPI	R Module Co	ntrol CLOSED LOOP V	06-011				_		×
Start	Parameter	Stand Alone Motion	Firmware Update	Status	Rebel				
Firm Wan Th Do ma If t up firm us	ware Update nings: is update wil o not turn off by require a r he connectic dater itself si nware. In this able again. If	I take several minute the robot control or c epair at our factory. n breaks for any rea ays "update failed - f s case you may turn i n doubt keep the ro	es, expect about 3- lose this tool until son do not turn off irmware erased" th off the robot but yo bot powered and o	4 minute the upda the robe ne axis is ou need contact o	es per ax ate is fini ot but ins s in a sal to finish our supp	cis. ished. An ir stead try ag fe state but the update ort.	complet ain. If th without before i	te update e t is	~
-Fin File Fir	mware File — e: mware:	n/a n/a					Se	elect	
Par	rameters Create back Keep old pa nput File File:	up rameters ⊖ New fr n/a	om file (select this	if the up	date faile	d)	Sele	ct	~
(Connect CAN	IP address:	R	əsət Erro	ors	Status not conn	ected		٠
Co	onnect Ethern	192.168.3	8.11 M	otor Ena	blə				
Log N	lessages								
08:5 08:5 08:5 08:5 08:5	7:02:611 INF 7:02:612 INF 7:49:808 INF 8:08:174 INF 8:08:174 INF	 Position Control Disabling motion Changing to tabF Changing to tabF O Disabling motion 	disabled when changing to PageStandAlone PageFWUpdate when changing to	FWPara FWUpda	meterV2 ate tab	tab			~

Figure 6: Module Control Firmware Update Tab

3.5 Status

The status tab provides further information about the axis. In this tab, the errors can be viewed individually, the inputs and outputs of the axis, and internal states can be evaluated. Furthermore, the firmware version can be read and outputs on the board can also be set.



O CPR Module Control CLOSED L	OOP V06-011		_	×
Start Parameter Stand Alone M	Notion Firmware Update	Status Rebel		
Inputs Outputs	Errors	Motor Errors		
Input 1 Output 1	Temp Error	Motor n.C.		
Input 2 Output 2	EStop / Low Voltage	OC RMS		
Input 3 Output 3	Motor not enabled	OC Single Phase		
Input 4 Output 4	Com Watchdog	Over Temperature		
Referencing	Positionlag	ADC Errors		
Referenced	Encoder Error	ADC Offset		
Rotor alligned	Over Current	Control Errors		
	Driver Error	 Velocity High Low Allign 		
FirmwareVersion	Gear encoder Errors	Parameter Fault		
check FW Version	Com Error	No free rotation		
no Version	Out of Range			
Can a	address:	Statu	s	
Connect CAN 0x10) ~ Re	eset Errors not c	onnected	
IP add	dress:			
Connect Ethernet 192	.168.3.11 Mo	otor Enable		
Log Messages				
08:57:02:612 INFO Disabling 08:57:49:808 INFO Changing 08:58:08:174 INFO Changing 08:58:08:174 INFO Disabling 08:58:08:174 INFO Changing 08:58:08:174 INFO Disabling 08:58:33:451 INFO Changing	motion when changing to I to tabPageStandAlone to tabPageFWUpdate motion when changing to I to Status	FWParameterV2 tab		^

Figure 7: Module Control Status Tab

3.6 Absolute Encoder of the igus Rebel

For integrated closedloop controllers in the igus Rebel robot arm, a separate page is available in ModuleControl for all special functions of these motor controllers. The special functions include parameterizing the output encoders, calibrating them and checking the calibration data. The display for the encoder position is updated once per second. For this the board must be parameterized accordingly before.

The calibration of the rebel axes is fully automated, the process can be started via the "Start Calibration" button. The axis first moves to -180 degrees and then learns 35 points in 10 degree steps. For calibration, the axis must be load-free and rotatable through 360 degrees.

Module Control also checks the calibration automatically. Module Control displays the data in the window next to the calibration buttons. If a data set is faulty, the window turns red. For the simple recognition of the errors Module Control writes the error message under the line with the faulty data.

3 MODULE CONTROL TABS



A CD	D Madula Ca	atral Cl		06.011							\sim
UP CP		ntroi CL	USED LOOP V	00-011							^
Start	Parameter	Stand	Alone Motion	Firmware U	pdate	Status	Repel				
Firr	mware Versio	n	Kalibrierun	g							\sim
	qet		Start	e Kalibrierung	1						
	-										
	no Versic	n	Stopp	e Kalibrierun	q						
											\sim
Off	iset							Kalibrioru	ng locon		
0	ffact.		00 °	urito	road			Kalibiteru	ng lesen		
0	iisel.		0.0	WILLE	Teau						
Pos	sition Rebeler	ncoder [[°] Positic	on SetPoint [°	1						
	888	381	8 88	1000	18						
	8000	30(0 80	1000	10						
Cu	rrent Position	3 0 (0 80	3000)8					Pobolo	aoder
Cu	rrent Position)0(")0(0 80 0 +	0000)0 -					Rebeler Heart	ncoder ibeat
Cu	rrent Position)0(")0(0 0 0 +)0 -					Rebeler Heart	ncoder ibeat
Cu	rrent Position	30(" 30(Can address)0 -			Status		Rebeler Heart	ncoder beat
Cu	Connect CAN)01 "]01	Can address)000C)0 - Res	set Errc	prs	Status	nnected	Rebeler Heart	ncoder ibeat
Cu	Connect CAN	301 " 301	Can address 0x10)))))()	- Res	søt Errc	ors	Status not co	nnected	Rebeler Heart	ncoder beat
Cu	Connect CAN		Can address 0x10		- Res	set Errc	prs	Status not co	nnected	Rebeler Heart	ncoder ibeat
Cu	Connect Etherr) () () (°]) () () () () () () () () () () () () () () () (Can address 0x10 IP address: 192.168.3	5: 3.11	- Res	set Erro	ors ble	Status not co	nnected	Rebeler Heart	ncoder beat
	Connect CAN		Can address 0x10 IP address: 192.168.3		- Res	set Errc	ble	Status not co	nnected	Rebeler Heart	ncoder ibeat
Current Curren	Connect CAN onnect Etherr Messages		Can address: 0x10 IP address: 192.168.3	S: [3.11]	- Res	set Erro	ble	Status not co	nnected	Rebeler Heart	ncoder beat
Cut Cut Log N 08:5 08:5	Connect CAN onnect Etherr Messages 57:49:808 INF 58:08:174 INF		Can address 0x10 IP address: 192.168.3	S: 3.11	- Res	set Erro	ors ble	Status not co	nnected	Rebeler Heart	ncoder beat
Cut Cut Log N 08:5 08:5 08:5 08:5	Connect CAN onnect Etherr Aessages 57:49:808 INF 8:08:174 INF 8:08:174 INF 8:33:451 INF		Can address Ox10 IP address: 192.168.3 anging to tabF anging to tabF	S: 3.11 PageStandAlc PageFWUpda when chang	- Res	set Errc tor Ena	ors ble ate tab	Status not co	nnected	Rebeler Heart	ncoder beat
Cut Cut Cut Cut Cut Cut Cut Cut Cut Cut	Connect CAN Onnect Etherr Wessages 77:49:808 INF 8:08:174 INF 8:08:174 INF 8:08:174 INF 8:08:174 INF 8:08:174 INF 8:08:174 INF 8:08:174 INF		Can address 0x10 IP address: 192.168.3 anging to tabf sabling motion anging to Stat anging to Reb	S: 3.11 PageStandAlc PageFWUpda when chang tus welEncoder	- Res	set Erro tor Ena	ble ate tab	Status not co	nnected	Rebeler Heart	ncoder beat

Figure 8: Module Control Rebel Tab