

MARK ROBERTS MOTION CONTROL

ADVANCED FREED BOX



QUICK START GUIDE

QSG Product code: MRMC-2345-00 Product Covered: MRMC-2207-M-02

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Advanced FreeD Box Quick Start Guide

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	Contact information						
Mark Roberts Motion Control Ltd.							
Unit 3, South E	ast Studios						
Blindley Heath							
Surrey							
RH7 6JP	RH7 6JP						
United Kingdom							
Telephone:	+44 (0) 1342 838000						
E-mail:	info@mrmoco.com (sales and general enquiries)						
	broadcast.support@mrmoco.com (customer support)						
Web:	www.mrmoco.com						
	www.mrmocorentals.com						



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Chapter 1 Quick Start



Important safety instructions

To ensure the best from the product, please read this manual carefully. Keep it in a safe place for future reference.

To reduce the risk of electric shock, do not remove the cover from the unit. No user serviceable parts inside. Refer servicing to qualified personnel.

Power and connections

- This unit must be connected to a mains socket outlet with a protective earth connection.
- This unit is not disconnected from the AC power source as long as it is connected to the wall outlet.
- When not using the unit for a long period of time, ensure that the AC power cord is disconnected from the wall outlet.
- The AC wall outlet should be installed near to the unit and be easily accessible.
- Do not plug in or attempt to operate an obviously damaged unit.

General care

- Do not force switches or external connections.
- When moving the unit, disconnect the mains cable and then disconnect the long umbilical cable.
- Do not attempt to clean the unit with chemical solvents or aerosol cleaners, as this may damage the unit. Use a clean dry cloth.
- Do not use around flammable gas. All electrical equipment can generate sparks that can ignite flammable gas.
- Keep away from pets and children. The head has powerful motors that can pinch, so take care not to get your hands trapped in the head or cabling.



• Keep cables tidy. Use cable ties to keep them out of harm's way. If you have a head with slip rings then make use of them; avoid running any cables between the base and the rotating head or camera.

Location

Installation of this unit should be away from sources of excessive heat, vibration, and dust.

Keep the brakes on caster wheels on when using the SLH lift column.

Intellectual property

This product includes confidential and/or trade secret property. Therefore, you may not copy, modify, adapt, translate, distribute, reverse engineer, or decompile contents thereof.



Overview

Thank you for using the Advanced Freed Box from Mark Roberts Motion Control (MRMC). The Advanced FreeD box can be used to transmit FreeD data packets from the camera both in an MHC system



Connecting the cables

SLH and PTA2 FreeD setup

Ensure that your system consisting advanced FreeD box, SLH and PTA-2 is connected. Make sure that SLH and PTA-2 is supplied with a sync signal source. Make sure the system is powered on before FreeD configuration process. Use the USB cable to connect PC or laptop to the FreeD Box. To simplify the FreeD box configuration, a configuration app can be used with it.



1. Run Freed_Merge_Box.exe file and the following window should appear.

FREED MERGE BOX : VERSION 1.2	—
Always select port to Open the serial Port	Version
Serial_Port COM24 Click To Refr	resh Ports Set Board Ip:
Set Board's Subnet:	Set Board's Gateway:
Source 1 Ip Address:	Source 2 Ip Address:
🗌 Merge x 🔲 Merge y 🗐 Merge Z 🗐 No	ot Implemented Board's Port:
No_Of_Desti	inations 5 —
Destination-1 IP:	Destination-1 Port:
Destination-2 IP:	Destination-2 Port:
Destination-3 IP:	Destination-3 Port:
Destination-4 IP:	Destination-4 Port:
Destination-5 IP:	Destination-5 Port:
Destination-6 IP:	Destination-6 Port:
Destination-7 IP:	Destination-7 Port:
Debug Status 0 - Read Settings	Save Settings Rail Rotate Setp/2D Scanner Support
(Only debug status 3 is implemented and alway	ays set debug back to 0 after receiving the information)



2. Click on Serial Port button to select serial port of the FreeD box. After that you should see current settings of the FreeD box.

FREED MERGE BOX : VERSION 1.2	- 🗆 ×
Always select port to Open the serial Port Serial Port Click To Refresh Ports Set Board ip: 193	Version 9.03
Set Board's Subnet: 0.0.0.0 Set Board's Gateway: 0.0	0.0.0
Source 1 Ip Address: 0.0.0 Source 2 Ip Address: 0.0	0.0.0
🗆 Merge x 🗖 Merge y 🗖 Merge Z 🗖 Not Implemented Board's Port: 554	534
No_Of_Destinations 5	
Destination-1 IP: 192.168.1.152 Destination-1 Port: 655	535
Destination-2 IP: 0.0.0.0 Destination-2 Port: 312	267
Destination-3 IP: 0.0.0.0 Destination-3 Port: 66	6
Destination-4 IP: 0.0.0.0 Destination-4 Port: 77	
Destination-5 IP: 0.0.0 Destination-5 Port: 888	88
Destination-6 IP: Destination-6 Port:	_
Destination-7 IP: Destination-7 Port:	
Debug Status 0 Read Settings Save Settings Rail Rotate Set	p/2D Scanner Support

3. Check current settings and make required changes. For example if FreeD box should have IP address 192.168.1.221 and listening port 55535 then type in 192.168.1.221 to the Set Board IP field and 55535 to the Board's Port field

For example if PTA-2 head's IP address is 192.168.1.238, so this IP should be input to the **Source 1 Ip Address** field. If SLH's IP address is 192.168.1.236. Then this IP should be input to the **Source 2 Ip Address** field.



4. In PTA-2 + SLH system we merge Z position then Merge Z checkbox should be checked.

For example PC's (for FreeD packets reception) IP Address is 192.168.1.87 and Port is 55535. In that case we populate **Destination-1 IP**: field and **Destination-1 Port**: field accordingly.

	0.				_
FREED MERGE BOX			-		×
Always select port to Open the serial Port					
Serial Port COM4 - Click To Refre	sh Ports Set Board ip:	192.168	.1.22	1	
Set Board's Subnet: 255.255.255.0	Set Board's Gateway:	192.168	.1.1		-
1		1			
a 11 11 100 100 1 000		102.100	1 00	_	
Source 1 lp Address: 192.168.1.238	Source 2 Ip Address:	192.168	.1.23	0	
					_
🗌 Merge x 🔲 Merge y 🔽 Merge Z 🗌 Not	Implemented Board's Port:	55535			
No. Of Destin	ations 1 -				
No_OI_Destin					
Destination-1 IP: 192.168.1.87	Destination-1 Port:	55535			-
					-
Destination-2 IP:	Destination-2 Port:				
	_				_
Destination-3 IP:	Destination-3 Port:				
Destination-4 IP:	Destination-4 Port:				
Destination 5 IP:	Destination 5 Port				
Destination-5 II.	Destination-5 1 ort.	1			
Destination-6 IP:	Destination-6 Port:				
	_				
Destination-7 IP:	Destination-7 Port:				
Debug Status 0	Read Settings Save Setti	ngs			
(Only debug status 3 is implemented and alway	re set debug back to 0 often u		inform	ation)	
(Only debug status 5 is impremented and alway	s set debug back to 0 after r	eceiving the	morm	ationj	

- 5. After checking of the current settings click **Save Settings** button to complete FreeD box IP setup.
- 6. After that close (exit) the app.



Setting up FreeD box offsets and enabling the 2D scanner support

1. Click the **Rail Rotate Setup/2D Scanner Support** button. The following screen should appear.

🕴 Rail rotate setup & 2D Scanner Support	-		×
Scanner On/Off Scanner PAN angle compensation sign:	1 —	4	
Scanner X offset from the head (mm):			
Scanner Y offset from the head (mm):			
Scanner angular position compensation(0-360 deg):			
Rail X center point of rotation (mm):			
Rail Y center point of rotation (mm):			
Rail X point of rotation angle measurement(mm):			
Rail Y point of rotation angle measurement(mm):			
Rail angle of rotation relatively X axis(deg):			
Head PAN angle compensation(deg):			
Calculated rail rotation angle relatively X axis(deg):			
Read Settings Save Sett	ings		



2. Press the Read Settings button and the following screen appears.

🕴 Rail rotate setup & 2D Scanner Support		—		×			
Scanner On/Off Scanner PAN angle compensation sign: 1							
Scanner X offset from the head (mm):	13.0000						
Scanner Y offset from the head (mm):	22.0000						
Scanner angular position compensation(0-360 deg):	33.0000						
Rail X center point of rotation (mm):	744.000	0					
Rail Y center point of rotation (mm):	555.000	0		-			
Rail X point of rotation angle measurement(mm):	75.0000			-			
Rail Y point of rotation angle measurement(mm):	4.0000			-			
Rail angle of rotation relatively X axis(deg):	555.000	0		-			
Head PAN angle compensation(deg):	1.0000						
Calculated rail rotation angle relatively X axis(deg):	39.4755	•					
Read Settings	Save Sett	ngs					

3. Check the Scanner On/Off option.

4. Set Scanner PAN angle compensation sign to 1.

At the factory, the scanner is installed on the Front Leg of the SLH. So, the scanner installation configuration is:

• Front Leg

In this case, assign these values to the following parameters:

Scanner X offset from the head (mm) to 0.0

Scanner Y offset from the head (mm) to -350.0

Scanner angular position compensation (0-360 deg) to 90.0

• If scanner is installed on the rear right leg then use the following settings:

Scanner X offset from the head (mm) to -302.0



Scanner Y offset from the head (mm) to 174.0

Scanner angular position compensation (0-360 deg) to 210.0

• If scanner is installed on the rear left leg then use the following settings:

Scanner X offset from the head (mm) to 302.0

Scanner Y offset from the head (mm) to 174.0

Scanner angular position compensation (0-360 deg) to 330.0

All the remaining fields except the last one (which is read only) should be set to 0.0

Note that positive PAN angles direction should be CLOCKWISE.

Configuring FreeD Box's IP in MHC for PTA-2 and SLH-1

- 1. Launch MHC. Log in as Admin. In Network Setup, add the PTA-2 head and add SLH-1 as the 'child' of PTA-2.
- Log in as 'Engineer' and navigate to Settings → Robot →FreeD for PTA-2 head. Enter FreeD Box IP and its Port to the corresponding fields in MHC for the PTA-2 head. For example,





3. Enter FreeD Box IP and its Port to the corresponding fields in MHC for SLH. For example,



Setting up FreeD offsets in MHC

Setting up Z room offset on SLH.

1. Ensure you got correct scaling factor on the lift column. It might be found in MHC Server \rightarrow Axis Settings.



Maximup colority: CAN Head 1 Connected Scaling: 1.59781e-05 Image: Connected ON Maximum veloity: S0 Image: Connected ON Maximum acceleration: 90 Read from RAM Enable Change of acceleration: 1 Override Limits Deable Change of deceleration: 90 Read from RAM Enable Change of deceleration: 1 Override Limits Deable Change of deceleration: 1 Override Limits Restore Limits Maximum position: 126 Save to RAM SuccEss Goto Style: All Axes Save to FLASH Hone Zero Home style: OPTO VANE Direct Zero Direct Zero Home time: 60 Refresh -101.237236 Home time: 60 -101.237236 -101.237236 Home offset: 0 -101.237236 -101.237236 Override motor: Yes - +
Mator type: CAN Head 1 Connected Scaling: 1.59781E-05 0 0N Maximum velocity: 50 0 HW: 7, SW: 3, SR. 00 RC39 Maximum acceleration: 90 Read from RAM Enable Change of acceleration: 90 Read from RAM Enable Change of acceleration: 90 Read from RAM Enable Change of acceleration: 1 Override Limits Disable Change of decceleration: 12 Override Limits Restore Limits Maximum position: -221 Save to RAM SUCCESS Backash Offset: 0 Save to RAM SUCCESS Goto Style: Al Axes Direct Zero Home tyle: OPTO VANE Direct Zero Home time: 60 -101.23726 -101.23726 Home offset: 0 Copy Current -101.23726 Automatic Honing: No -101.23726 Override motor: Yes - +
Scaling: 1.59781z-05 Maximum velocity: 50 Maximum acceleration: 90 Change of decceleration: 1 Maximum position: -221 Maximum position: 126 Baddach Offset: 0 Oor Other Save to RAM Baddach Offset: 0 Ober of thme: 60 Home style: 0 Controller - Water theme: 60 Automatic homing: No Override motor: Yes
Maximum velocity: 50 Maximum acceleration: 90 Change of acceleration: 1 Maximum deceleration: 90 Change of acceleration: 1 Maximum position: 1 Change of decceleration: 1 Minimum position: -22.1 Maximum position: 126 Backlash Offset: 0 Goto Style: Al Axes Home style: OPTO VANE Home offset: 0 Copy Current -101.237236 Restriction Type: Controller Automatic homing: No Override motor: Yes
Maximum acceleration: 90 Change of acceleration: 1 Maximum deceleration: 90 Change of acceleration: 90 Change of deceleration: 1 Minimum position: -221 Minimum position: -221 Maximum position: 126 Baddash Offset: 0 Goto Style: All Axes Home velocity: 3.12 Home strike: 0 Copy Current - Home offset: 0 Copy Current - Home offset: 0 Copy Current - Home offset: 0 Copy Current - Verride motor: Yes
Change of acceleration: 1 Enable Maximum decceleration: 90 Read from FLASH Disable Change of decceleration: 1 Override Limits Restore Limits Maximum position: 126 Save to RAM Success Baddah Offset: 0 Save to FLASH Home Zero Home twelcotty: 3.12 Refresh Direct Zero Home time: 60 Copy Current -101.237236 Home offset: 0 Copy Current -101.237236 Verride motor: Yes + +
Maximum decceleration: 90 Read from FLASH Disable Change of decceleration: 1 Override Limits Minimum position: -221 Restore Limits Maximum position: 126 Save to RAM Baddash Offset: 0 Save to FLASH Goto Style: Al Axes V Home style: OPTO VANE Direct Zero Home time: 60 Refresh Home offset: 0 Copy Current Home offset: 0 Copy Current Automatic homing: No - Override motor: Yes -
Change of decceleration: 1 Override Limits Minimum position: -221 Restore Limits Maximum position: 126 Restore Limits Baddash Offset: 0 Save to RAM Goto Style: Al Axes Save to FLASH Home velocity: 3.12 Home Zero Home time: 60 Proc VaNe Home offset: 0 Copy Current Restriction Type: Controller -101.237236 Automatic Honing: No - Override motor: Yes +
Minimum position: -221 Restore Limits Maximum position: 126 Save to RAM Success Baddash Offset: 0 Save to FLASH Success Goto Style: All Axes V Direct Zero Direct Zero Home evolotly: 3.12 Refresh -101.237236 Home offset: 0 Copy Current -101.237236 Homesit: No - + Override motor: Yes V - +
Maximum position: 126 Save to RAM Backlash Offset: 0 Save to FLASH Goto Style: All Axes O Home style: OPTO VANE O Home style: 60 Direct Zero Home offset: 0 Copy Current Home offset: 0 Copy Current Automatic Honing: No - Override motor: Yes -
Baddah Offset: 0 SUCCESS Goto Style: Al Axes Save to FLASH Home Zero Home style: OPTO VANE Direct Zero Direct Zero Home time: 60 Refresh -101.237236 Home offset: 0 Copy Current -101.237236 Automatic homing: No - + Override motor: Yes - +
Goto Style: All Axes Save to FLASH Home Zero Home style: OPTO VANE Direct Zero Home velocity: 3.12 Refresh Home offset: 0 Copy Current Home offset: 0 Copy Current Automatic Homing: No - Override motor: Yes -
Home style: OPTO VANE Direct Zero Home velocity: 3.12 Direct Zero Home time: 60 Refresh Home offset: 0 Copy Current Home offset: Controller -101.237236 Automatic homing: No - Override motor: Yes -
Home velocity: 3.12 Direct 280 Home time: 60 Refresh Home offset: 0 Copy Current Home offset: 0 Copy Current Automatic Homing: No - Override motor: Yes -
Home time: 60 Refresh Home offset: 0 Copy Ourrent -101.237236 Restriction Type: Controller ~ - Automatic Homing: No ~ - + Override motor: Yes ~ - +
Home offset: 0 Copy Current -101.237236 Restriction Type: Controller ~ Automatic Homing: No ~ Override motor: Yes ~
Restriction Type: Controller v Automatic Homing: No v Override motor: Yes v
Autometic Homing: No ~ + Override motor: Yes ~ +
Override motor:
Signal Gain: 30 Restore Axis Settings -101.237236
Tacho Gain: 30 VELOCITY MODE
Integral Gain: 20
Current Limit (mA): 500 RESET HEAD
Temperature Limit: 180 STOP
Positional Error Limit: 250
Stepper Pulse Length: 6
PWM Type: Unipolar V
Homing Current: 32223
PV Filter: 0.99

To test scaling factor correctness move the column to 100mm. The current position should be changed to 100 units.

2. Run SLH to it Zero position (using MHC). Use the following diagram to measure SLH Z Room offset in metres using a tape





measure and add it in the **3D Position Z (m)** box for SLH's FreeD tab.

 \bigcirc

MHC Client v3.0.1.RC7	- Ø ×
O MAN HERERAGE CONTROLLER MATTING RELET COLONE HAR CATTORE MENTS	Logout :
A SARAT LETINGE SEM	
Nor Freed Monoral Views Strategy Easter	
[inem:0 0] [P 192,94,220] [M 1939	
Note port chains in Next 20 public scorebase 1 - styrest (sing) 4	

Setting up offsets on PTA-2

1. Ensure you got correct scaling factors on the PAN and TILT Axis. Use the following MHC Server Axis Settings screens for reference:



PAN

Axis Settings				×
	Can			Consta
Motor type:	CAN			Connected
Scaling:	-1.71661e-06		Pan 🗸	ON
Maximum velocity:	10			HW: 1, SW:1.14.00 RC33 PV
Maximum acceleration:	90		Read from RAM	Eashla
Change of acceleration:	1			Lindble
Maximum decceleration:	90		Read from FLASH	Disable
Change of decceleration:	1			Override Limits
Minimum position:	-180			Restore Limits
Maximum position:	180		Save to RAM	restore camp
Backlash Offset:	0			SUCCESS
Goto Style:	All Axes	~	Save to FLASH	Home Zero
Home style:	ABS CAN	~		Direct Zero
Home velocity:	-0			Direct Zero
Home time:	0		Refresh	
Home offset:	-0	Copy Current		-90.375504
Restriction Type:	Controller	~		
Automatic Homing:	No	~		- +
Override motor:	Yes	~		
Signal Gain:	0		Restore Axis Settings	-90.375504
Tacho Gain:	0			VELOCITY MODE
Integral Gain:	0			
Current Limit (mA):	1000		RESET HEAD	
Temperature Limit:	0			STOP
Positional Error Limit:	250			
Stepper Pulse Length:	250			
PWM Type:	Unipolar	~		
Homing Current:	275			
PV Filter:	0.85			



TILT

Axis Settings				×
Motor type: Scaling:	CAN 1.71661e-06	~	Head 2 V	Connected ON
Maximum velocity: Maximum acceleration: Change of acceleration:	90 90 1		Read from RAM	HW: 1, SW:1.14.00 RC33 PV Enable
Maximum decceleration: Change of decceleration:	90		Read from FLASH	Disable Override Limits
Minimum position: Maximum position:	-24 90		Save to RAM	Restore Limits
Backlash Offset: Goto Style:	0 All Axes	~	Save to FLASH	Home Zero
Home velocity:	0		Refresh	Direct Zero
Home offset: Restriction Type:	0 Controller	Copy Current		-17.946238
Automatic Homing: Override motor:	No Yes	~		- +
Signal Gain: Tacho Gain:	0		Restore Axis Settings	-17.946238 VELOCITY MODE
Integral Gain: Current Limit (mA):	0 1000		RESET HEAD	
Temperature Limit: Positional Error Limit:	0 250			STOP
Stepper Pulse Length: PWM Type:	250 Unipolar	~		
Homing Current: PV Filter:	0.85			



Setting up Z Room Offset on PTA-2

Switch to the PTA head FreeD settings in MHC. Use the above 'Z Room Offsets' diagram to measure the PTA Z Room Offset and enter the value (in metres) in the **3D Position Z (m)** box for the PTA.

Axes	Lens	Polymotion	Depth Sensing	FreeD	Tools	Environment	CV Engine	
		Start FreeD	Interlace	d Video	Simulate Genlock			
		Camera ID	0	2.168.1.221 Port	55535			
						J		
		Nodal point offsets o	n head	3D positi	ion coordinates			
		X alignment (mm)	90	3D position)	(m) 0.000			
		Y alignment (mm)	-200	3D position	r (m) 0.000			
		Z alignment (mm)	-140	3D position 2	č (m) 0.400			
						4		

Setting up X, Y and Z nodal offset on PTA-2

Note

The X, Y and Z Nodal offsets are to be measured with respect to the camera sensor.

Use the following drawing to measure the X and Z Nodal offsets on the PTA-2 head. Note that the positive Z direction is upwards and positive X is on the right.





Use the following drawing to measure the Y Nodal offsets on the PTA-2 head. Note the positivity of Y direction.





Following is an example of the PTA Nodal offsets in MHC.

Axes	Lens	Polymotion	Depth Sensing	FreeD	Tools	Environment	CV Engine	
		_	_					
		Start FreeD	Interlace	d Video Si	mulate Genlock			
		Camera ID	0 IP 192	Port	5553	5		
		Nodal point offsets o	n head	3D position	n coordinates			
		X alignment (mm)	90	3D position X	(m) 0.000	ו		
						1		
		Y angnment (mm)	-200	3D position Y ((m) 0.000	'J		
		Z alignment (mm)	-140	3D position Z	(m) 0.400	J		
	P	TA Nod	al Offsets	in MH(2			
	P	Nodal point offsets of X alignment (rmm) Y alignment (rmm) Z alignment (rmm) TA Noda	n head 90 -200 -140 al Offsets	30 position X 30 position X 30 position X 30 position Z in MHC	n coordinates (m) 0.000 (m) 0.400]		

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Advanced FreeD Box's screen overview

Button	Function
1	Toggle between the screens on the FreeD box display
2	Save settings
3	Start/stop the FreeD box
4	Not used









Screen showing below can be useful to doublecheck that system is setup properly and running.

SRC1 Freq. indicates that FreeD Source 1 (which is the head) is transmitting FreeD packets with a indicated frequency. It also means that the head is receiving sync signal on its genlock input. (Assuming sync simulation is turned off).

SRC2 Freq. indicates that FreeD Source 2 (which is the SLH column) is transmitting FreeD packets with a indicated frequency. It also means that SLH is receiving sync signal on its genlock input. (Assuming sync simulation is turned off).



Sync Freq. is a test feature that can be used to check if sync signal is present in the coax sync cable plugged into advanced sync box. Note that Advanced sync box does not requre sync signal supplied to it.





After the entire system is setup properly in that user interface is used to run or stop 2D scanner in order to get positional data for the SLH+PTA-2 system. After positional data have been acquired (may take 10s to settle) button SAVE can be used to save current position. That position will be saved and system position will be known even after power off/on cycle. If SLH was moved while 2D scanner was off it will be required to run scanner again to update (and SAVE) new current position.



Notes





Mark Roberts Motion Control Ltd.

Unit 3, South East Studios, Blindley Heath, Surrey RH7 6JP United Kingdom Telephone: +44 (0) 1342 838000 info@mrmoco.com www.mrmoco.com

