



EDGE String USBC Approved Version



Owner's Manual

Original Instructions Written in English

www.qubicaamf.com

QubicaAMF Worldwide Technical Support (International) 804.569.1000 ◊ (Domestic) 1.866.460.7263 option 3

Copyright © 2024 QubicaAMF Worldwide, 8100 AMF Dr., Mechanicsville, VA 23111

400-051-247 Rev. C June 2024

ALL RIGHTS RESERVED

All rights to this manual including the diagrams, figures, and technical specifications are the property of QubicaAMF Worldwide, LLC. Reproduction or transmission of any of the material contained in this manual without the prior written permission of QubicaAMF Worldwide, LLC. is strictly prohibited. All of the product information in this manual was carefully prepared based on the latest information available and was believed to be correct at the time of printing. While every effort has been made to ensure accuracy, this publication may inadvertently contain typographical errors, inaccuracies, or errors of omission. QubicaAMF Worldwide, LLC cannot be held responsible for any claims resulting from these errors.

DOCUMENT UPDATES

This manual supersedes all previous versions of the EDGE String USBC Approved Version Owner's Manual. QubicaAMF Worldwide, LLC. reserves the right to revise and/or update this manual at any time without obligation to notify any person or entity of such revision. The document number, revision level, and date below indicate the edition of this manual.

TRADEMARK NOTICES

QubicaAMF and the QubicaAMF logo are the registered trademarks of QubicaAMF Worldwide, LLC.

QubicaAMF TECHNICAL SUPPORT

(USA) 1-866-460-7263 option 3 (Europe – Middle East – Africa) +39 051 4192630

For more contact information, go to <u>https://www.qubicaamf.com/contact/find-your-closest-representatives</u>

QubicaAMF Worldwide, LLC 8100 AMF Drive Mechanicsville, Va. 23111

Copyright © 2024 QubicaAMF Worldwide, LLC Document # 400-051-247 Rev. C Issued Date: 6/21/2024



EDGE String USBC Approved Version Owner's Manual, 400-051-247 Rev. C

Summary of Changes

Change No.	ECR No.
Rev. A	23-0024-03
Rev. B	23-0244
Rev. C	24-0027-01

List of Effective Pages

Page	Change No.	Effective Date
All	Revision A	10/13/2023
52, 54, 57-58, 67-68, 70, 122	Revision B	12/15/2023
79, 180, 185, 186	Revision C	6/21/2024



Table of Contents

1.1. Safety	L2 L3
1.2. Safety Labels Overview1	L3
	4
1.3. Safety Definitions	
1.4. Safety Tools1	16
1.5. Product Configurations & Guard/Cover Locations1	۲
1.5.1. Machine Pair (Config. #: 612-051-212 Rev. A or later)1	18
1.5.2. Single Odd Machine (Config. #: 612-051-209 Rev. A or later)	20
1.5.3. Single Even Machine (Config. #: 612-051-210 Rev. A or later)	22
1.5.4. Extra-Wide Machine Pair (Config. #: 612-051-211 Rev. A or later)	24
1.6. Safety Label Locations	26
1.6.1. Machine Boundary Safety Labels2	26
1.6.2. Pinspotter Safety Labels	27
1.6.3. Chain Lift Safety Labels2	28
Section 2 Operation	29
2.1. Section Overview	29
2.2. Major Components & Subassemblies	29
2.2.1. Pinspotter Pair	29
2.2.2. Pinspotter	30
2.2.3. Brake/Encoder Assembly	30
2.2.4. Reel Arm Assembly	30
2.2.5. Reel Arm	30
2.2.6. Drawbar Assembly	31
2.2.7. Drawbar Pulley	31
2.2.8. Tangle Switch Emitter Board	31
2.2.9. String Comb	31
2.2.10. String Tray	31
2.2.11. Gearmotors	32
2.2.12. Control Box	32
2.2.13. Upper Table	32
2.2.14. Table Pulley	32
2.2.15. Lower Table	33
2.2.16. Pin Centering Ring	33
2.2.17. Kickbacks	33
2.2.18. Kickback Nose Block	34
2.2.19. Machine Support	34
2.2.20. Chain Lift	34
2.2.21. Ball Lifter Assembly	34
2.2.22. Double Division Rail Assembly	35
2.2.23. Chain Lift Sensors	35
2.2.24. Cross Sweep	35
2.2.25. Down Sweep	35
2.2.26. Shield/Pitlight Assembly	86
2.2.27. Pitlight Fixture	86
2.2.28. Ball Detector	86
2.2.29. Pit Assembly	37

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 7

2.2.30. Pit Floor Assembly	37
2.2.31. Pit Curtain	37
2.2.32. Pit Cushion	37
2.2.33. Pit Cushion Block	
2.2.34. Pit Cushion Shock	
2.2.35. Motorized Ball Door	
2.2.36. Pit Rear Guard	
2.2.37. Double Division Guard	
2.2.38. Chain Lift/Machine Guards	
2.2.39. Pit Hinged Top Cover	40
2.2.40. Machine Rear Cover	40
2.2.41. Pinspotter Top Guard	40
2.2.42. Reel Arm Cover	40
2.2.43. Pinspotter Sprocket Guard	41
2.2.44. System Controller	41
2.2.45. Wireways	41
2.2.46. Machine Mounted Curtain Wall	42
2.2.47. 10-Pin Bowling	42
2.3. System Controller	43
2.3.1. Port Layout	44
2.3.2. Port Descriptions	45
2.3.3. Machine Activation	47
2.3.4. Emergency Stop (E-Stop)	47
2.3.5. Keypad	48
2.3.6. Display	49
2.4. Adaptive String Length (USBC Mode)	57
Section 3 Interventions	59
3.1. Section Overview	59
3.2. Level 1 Interventions – Lockout/Tagout (LOTO) Not Required	60
3.2.1. Clear Pin Tangle	60
3.2.2. Clear Stuck Ball on Pit Floor or Pindeck	60
3.2.3. Clear Stuck Ball at Ball Door	60
3.2.4. Clear Ball Jam or Stuck Ball in Double Division	61
3.3. Level 2 Interventions – Lockout/Tagout (LOTO) Required	62
3.3.1. Clear Stuck Ball at Chain Lift	62
Section 4 Troubleshooting	63
4.1. Section Overview	63
4.2. System Controller Error Codes	64
4.3. Machine Control Box Operation/Troubleshooting	70
4.4. Chain Lift Control Box Operation/Troubleshooting	71
4.5. Additional Troubleshooting Cases	72
4.5.1. Ball Not Returned to Bowler	72
4.5.2. Chain Lift Runs Continuously at Slow Speed	73
4.5.3. Chain Lift Stops in Wrong Location	73
4.5.4. Shield Panel Does Not Actuate Correctly	73
4.5.5. Machine Does Not Cycle When Ball is Thrown	74
4.5.6. Machine Cycles When Ball is Not Thrown	74
4.5.7. Pins Do Not Settle on Pindeck at Same Time	74

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 8

	4.5.8. Pins Fell Over When Being Spotted	74
	4.5.9. System Controller Keypad Non-Responsive	75
	4.5.10. Machine Not Scoring Correctly	75
	4.5.11. Foul Detector Not Functioning Correctly	75
	4.5.12. Mask Lights Not Functioning Correctly	76
	4.5.13. Pitlight Not Functioning Correctly	76
Se	ection 5 Drawings & Parts Lists	77
	5.1. Kickbacks	78
	5.2. Ball Detector	79
	5.3. 10-Pin Bowling Pin	80
	5.4. Pinspotter (Frame)	81
	5.5. Pinspotter (Top Guard & Side)	82
	5.6. Pinspotter (Underside)	83
	5.7. Gearmotor & Control Box	84
	5.8. Gearmotor & Control Box Parts List	85
	5.9. Drawbar Tensioner	86
	5.10. Drawbar Assembly & Chain Drive	87
	5.11. Drawbar & Pulley Assembly	88
	5.12. Drawbar Pulley Assembly	89
	5.13. Drawbar Carriage Assembly	90
	5.14. Brake/Encoder Assembly	91
	5.15. Brake/Encoder Unit Assembly	92
	5.16. Reel Arm Assembly	93
	5.17. Tables Assembly	94
	5.18. Shield Mounting Assembly	96
	5.19. Shield/Pitlight Assembly	97
	5.20. Retractable Curtain Assembly	98
	5.21. Odd Machine Pit Floor Assembly	99
	5.22. Odd Machine Back End Assembly	100
	5.23. Odd Machine Pit Cushion Assembly	101
	5.24. Odd Machine Ball Door Assembly.	102
	5.25. Even Machine Pit Floor Assembly	103
	5.26. Even Machine Back End Assembly	104
	5.27. Even Machine Pit Cushion Assembly	105
	5.28. Even Machine Ball Door Assembly	106
	5.29. Pit Cushion Shock Assembly	107
	5.30. Pit Cushion Block (7 Pin Side)	108
	5.31. Pit Cushion Block (10 Pin Side)	109
	5.32. Chain Lift Control Box	110
	5.33. Chain Lift Assembly	111
	5.34. Chain Lift – Upper Assembly Detail	112
	5.35. Chain Lift Upper Sprocket Assembly	115
	5.36. Chain Lift Lower Sprocket Assembly	116
	5.37. Chain Lift Chain Assembly	117
	5.38. Double Division Rail Assembly	118
	5.39. Cross Sweep Assembly	119
	5.40. Ball Wiper	120
	5.41. Downsweep Guard	121

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 9



5.42. Double Division & Pit Rear Guards (Pair)	.122
5.43. Double Division & Pit Rear Guard (Single)	123
5.44. System Controller & Mounting Bracket	.124
5.45. Chain Lift & Side Guards (Odd)	.125
5.46. Chain Lift & Side Guards (Even)	.126
5.47. Machine Rear Cover	.127
5.48. Wireways	.128
5.49. Safety Labels (Rear)	.129
5.50. Safety Labels (Front)	.130
5.51. EDGE String Tool Kit	.131
5.52. Cables	.133
Section 6 Lockout/Tagout (LOTO) Procedure	.135
6.1. LOTO Procedure Inspection Form	.145
Section 7 Cleaning & Preventive Maintenance	. 147
7.1. Section Overview	.147
7.1.1. Preventive Maintenance Intervals	.149
7.1.2. Service Type Definitions	.151
7.2. Cleaning	.153
7.2.1. Clean Pit Floor	.153
7.2.2. Clean Pindeck and Lane with Lane Machine	.153
7.2.3. Clean Ball Wiper Cloths	.153
7.3. Routine Maintenance Procedures	.154
7.3.1. Perform String Adjustment	.154
7.3.2. Repair Worn String Above Pin	. 155
7.3.3. Replace Pin and/or String Sleeve	.156
7.3.4. Replace Pin String	. 157
7.3.5. Rotate Pins	.158
7.3.6. Adjust Drawbar Chain Tension	. 160
7.3.7. Replace Pit Cushion Rivet	.161
7.3.8. Replace Pit Curtain	.161
7.3.9. Replace Double Division Rail Covers	. 162
7.3.10. Lubricate Drawbar Chain	. 162
7.3.11. Lubricate Chain Lift Chain & Lifter Assemblies	. 163
7.4. Non-Routine Maintenance Procedures	.164
7.4.1. Ball Detector Alignment	. 164
7.4.2. Replace Reel Arm Assembly	. 165
7.4.3. Replace Brake/Encoder Unit	.166
7.4.4. Replace Drawbar Chains	. 167
7.4.5. Replace Drawbar	. 168
7.4.6. Replace Drawbar Gearmotor	.169
7.4.7. Replace Gearmotor Drive Coupling	.170
7.4.8. Replace Table Pulley	170
7.4.9. Rotate Pin Centering Ring	.172
7.4.10. Replace Pin Centering Ring	173
7.4.11. Replace Shield Actuation String	.174
7.4.12. Replace Shield Hard-Stop String	. 175
7.4.13. Replace Shield Panel	176
7.4.14. Adjust Chain Lift Chain Tension	.176

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



7.4.15. Replace Chain Lift Gearmotor	
7.4.16. Replace Chain Lift	179
7.4.17. Replace Pit Cushion Block	
7.4.18. Replace Pit Cushion Shock	
7.4.19. Replace Pit Cushion Assembly	
7.4.20. Replace Pit Cushion Components	
7.4.21. Replace Pit Floor	
7.5. Reference Tables	
7.5.1. Bolt Torque Table	
7.5.2. String Length Table	
Section 8 Declarations of Conformity	
8.1. EU Declaration of Conformity	
8.2. UK Declaration of Conformity	
Section 9 EDGE String USBC Approved Version Product Matrix	

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



Section 1 Safety

1.1. Safety

Section Overview

This section contains important safety information pertaining to EDGE String USBC Approved Version. All operators must review and understand the contents of this manual in its entirety before operating this equipment.

Important safety labels and safety-related terms are defined in this section. Operator(s) should refer to these definitions when performing routine operation and maintenance tasks. This section also explains the proper use of specialized safety tools provided with this machine, including pin hooks, lane barriers, and Lockout/Tagout components. Lastly, all required machine guards and covers are identified for each of the four product configurations under which the EDGE String USBC Approved Version is sold (machine pair, single Odd machine, single Even machine and extra-wide machine pair).



Read This First

The following notes and safety guidelines apply throughout this manual and whenever operating this equipment:

- All operators must review and understand the contents of this manual in its entirety before operating this equipment. Failure to follow all safety precautions outlined in this manual can result in personal injury.
- All operators must be approved by owner or facility manager for operation and maintenance tasks (both Level 1 and Level 2 interventions). Machine access must be limited to approved operators only.
- All equipment must be installed, tested, and checked for function by certified QubicaAMF personnel.
- Safety labels are placed at the machine boundary and describe potential hazards. All labels must always be in place while operating this equipment.
- Guards and covers prevent operator access to major hazards. All guarding components must always be in place while operating this equipment.
- All electrical cables must be properly connected before turning on power to this equipment.
- Level 1 interventions outlined in Section 3 Interventions may be performed outside the machine boundary by approved operators only. A pin hook may be used for some Level 1 interventions.
- Level 2 interventions outlined in Section 3 Interventions require Lockout/Tagout (LOTO). Lane barriers must be used on both lanes of a machine pair when performing Level 2 interventions.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 12

- All operator access areas must have sufficient ambient lighting for performing machine operation and maintenance tasks. Level 2 interventions may require additional temporary lighting.
- Steel-toed shoes are recommended when performing machine maintenance tasks.
- Noise levels may reach up to 110dBA while using this equipment. Hearing protection should be used when performing machine operation and maintenance tasks.
- Declaration of Conformity (Section 8) provided by QubicaAMF is fulfilled only if the following safety requirements are observed when using this equipment.
- This manual is part of the EDGE String USBC Approved Version product and must be kept near the machine(s) at all times.
- Training Sign-Off (400-051-253) and Installation Sign-Off (400-051-254) must be filled out before operating this equipment.

1.2. Safety Labels Overview

Warnings at Machine Boundary



Warning

Hazard exists; use caution. Failure to follow all safety guidelines in this manual may result in personal injury.



Electrical Hazard Warning

Indicates electrical shock hazard. Follow safety guidelines in this manual.



No Access – Approved Operator Only

Indicates machine boundary. Only approved operators may use equipment or proceed beyond machine boundary. Follow safety guidelines in this manual.



No Step

Do not step on indicated surface.



Do Not Remove Hardware

Do not remove hardware from indicated assembly. Only approved operators may use this equipment. Follow safety guidelines in this manual.



Read the Manual

Follow all instructions in this manual.



Use Pin Hook

Use pin hook to move pins or balls while standing outside machine boundary.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 13



Additional Warnings Inside Machine or in Manual



Automatic Machine Operation

Machine may start or cycle automatically without warning. **DO NOT** pass machine boundary unless LOTO is used.



Entanglement Hazard

Entanglement hazard exists beyond guarding. **DO NOT** pass machine boundary unless LOTO is used. Use caution when servicing equipment.



Slip Hazard Indicates slip hazard. Use caution.



Trip Hazard Indicates trip hazard. Use caution.



Do Not Remove Guarding

Guarding protects against hazards. LOTO must be used if guarding is removed for maintenance. Re-install all guarding components before putting machine(s) back into service.



Use Lockout/Tagout (LOTO)

LOTO must be used for all Level 2 interventions and whenever operator is within machine boundary. See LOTO procedure (Section 6).



Disconnect the Power Source

Disconnect the power source before servicing or repairing electrical equipment.



Use Lane Barriers

Use lane barriers on both lanes of a machine pair to protect operator from thrown bowling balls and to alert players that maintenance is being performed.



Use Hearing Protection

Indicates high noise levels present. Use hearing protection to avoid hearing loss.

1.3. Safety Definitions

The following section defines common terms related to the safe operation of this equipment. These terms are found throughout this manual. Operator(s) must understand all terms as they are defined below before performing any machine operation or maintenance tasks. See Section 2 Operation for additional product definitions.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 14

- **Cover:** Fixed or movable panel that prevents or limits Operator access to machine components or machine boundary. Can be moved temporarily for some Level 1 Interventions. Removal does not require tools or LOTO.
- **Facility Manager:** Person who has authority to train and approve actions of Operator(s). This person may also be an Operator.
- **Guard:** Fixed protective panel that prevents Operator access to a hazard. Removal requires tools and LOTO.
- Lane Barrier: Rigid barrier that adheres to lane surface. Prevents a thrown ball from contacting Operator when used during maintenance interventions. Required for all Level 2 Interventions. Use Lane Barriers on both lanes of a Machine pair.
- Level 1 Intervention: Maintenance action required to restore Machine to proper operating condition. LOTO and Lane Barriers not required. Operator must remain outside Machine Boundary.
- Level 2 Intervention: Maintenance action required to restore Machine to proper operating condition. LOTO and Lane Barriers required.
- Lockout/Tagout (LOTO): Process to remove electrical power from Machine so that it cannot be re-energized by anyone except Operator who performed LOTO. Required for all Level 2 Interventions or whenever Operator crosses Machine Boundary. See LOTO instructions (Section 6).
- Machine: Full product assembly including Pinspotter, System Controller, Chain Lift, Guards, Covers, and all additional components.
- Machine Boundary: Envelope of Machine formed by components and Guards. Limits access of Operator to safe zones. Operator must perform LOTO before crossing Machine Boundary.
- **Operator Access Area:** Area behind Machine Boundary where Operator can access System Controller and can perform Level 1 Interventions.
- **Operator:** Any person trained and qualified to operate or perform maintenance on Machine. May also be referred to as a mechanic.
- **Owner:** Person who receives installed Machine and is responsible for safe Machine operation. This person may also be a Facility Manager.
- **Pin Hook:** Required tool for some Level 1 Interventions. Use Pin Hook to detangle pins and strings or to clear a ball jam near pit ball door.

Player: Person who is playing the 10-Pin bowling game. Also called a Bowler. ALL PLAYERS MUST BE PROHIBITED FROM ACCESSING MACHINE BOUNDARY.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com

1.4. Safety Tools

The following tools are provided with the EDGE String USBC Approved Version and are required for the safe execution of Level 1 and Level 2 interventions. Operator(s) must use these tools whenever indicated by the following labels located throughout this manual and on the machine.



Pin Hook

Required tool for some Level 1 interventions. Use Pin Hook to detangle pins and strings or to clear a ball jam near pit ball door. Operator must always remain outside machine boundary while using Pin Hook. Do not reach below pit hinged top cover when clearing a ball jam. Always keep end of Pin Hook away from face.



Figure 1-1, Pin Hook



Lockout/Tagout (LOTO)

Process to remove electrical power from machine so that it cannot be reenergized by anyone except operator who performed LOTO. Required for all Level 2 interventions or whenever operator crosses machine boundary. See LOTO instructions (Section 6).



Lane Barrier

Rigid barrier that adheres to lane surface. Prevents a thrown ball from contacting operator when used during maintenance interventions. Required whenever operator is working in front of machine(s) or inside machine boundary. Use Lane Barriers on both lanes of machine pair. Install Lane Barriers 10 ft [3m] in front of each machine when in use.



Figure 1-2, Lane Barrier

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



1.5. Product Configurations & Guard/Cover Locations

This manual applies to the following product configurations:

•	Machine Pair	(Configuration #: 612-051-212)
•	Single Odd Machine	(Configuration #: 612-051-209)
•	Single Even Machine	(Configuration #: 612-051-210)
•	Extra-Wide Machine Pair	(Configuration #: 612-051-211)

Descriptions, specifications, and guard/cover component locations of each configuration are listed below. See Section 9 for a complete product matrix. Guards/covers and the physical limits of the machine protect the operator from potential hazards. See Section 2 Operation for additional component descriptions. Fixed guards are located around the chain lift, common division kickbacks and at the rear of the machine. Hinged covers on top of each pit and at the rear of each pinspotter frame allow limited access for Level 1 interventions. Operator(s) must use LOTO if any guard is removed for maintenance. Do not reach over guarding or into machine boundary during machine operation. See Section 3 Interventions for instructions on specific intervention cases. All guards, covers, product labels, and safety labels must be in place to operate the machine.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



1.5.1. Machine Pair (Config. #: 612-051-212 Rev. A or later)

Detail A, Model Label

QUBICA®AMF

8100 AMF DR, MECHANICSVILLE, VA 23111 USA

EDGE STRING - USBC APPROVED

WT/MASS, PINSPOTTER & TABLES: 325 lb [148kg]

UK CA

CE

MODEL # 051-202-100 (10-PIN, PAIR)

SYSTEM DOCUMENT: 400-051-247 SCHEMATIC # 051-202-210

110dB USE EAR PROTECTION

IP3X

S/N:

051-202-185 B

INSTALL WITH 612-051-212 OR 612-051-211

YYYYMMDDXXXX

Machines to be installed per

YEAR OF MANUFACTURE : 20YY

local electrical codes.

WORLDWIDE HEADQUARTERS

8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

Description

Pinspotter pair installation used for 10-Pin bowling game. Machines mounted together on adjacent Odd and Even lanes (e.g. 1/2, 3/4, ...). Machines share a common chain lift mounted in double division between machines.





Detail B, System Controller Label



Label located on rear of System Controller

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 18

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



JBICAVAMF

MAKING BOWLING AMAZING

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



1.5.2. Single Odd Machine (Config. #: 612-051-209 Rev. A or later)





JBICAVA

MAKING BOWLING AMAZING

AE





1.5.3. Single Even Machine (Config. #: 612-051-210 Rev. A or later)



WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



1.5.4. Extra-Wide Machine Pair (Config. #: 612-051-211 Rev. A or later)



WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





BICAVA

1.6. Safety Label Locations

JBICAVA

MAKING BOWLING AMAZING

Safety labels are placed on the machine to warn operator(s) of potential hazards. Part numbers and locations of all safety labels for a machine pair are shown below. The same label placement applies for an Odd or Even single machine or extra-wide machine pair installation. All safety labels must be in place during machine operation.





1.6.2. Pinspotter Safety Labels





1.6.3. Chain Lift Safety Labels



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





Section 2 Operation

2.1. Section Overview

This section provides an overview of the EDGE String USBC Approved Version, including descriptions of the major components/sub-assemblies, user-configurable settings, diagnostics tools, and machine operation. It also explains how to use the system controller keypad/display, the primary user interface for machine operation and routine maintenance tasks.

Applicable Safety Warnings



2.2. Major Components & Subassemblies

Figure 2-1 shows the EDGE String installed in a pinspotter pair configuration. Both pair and single pinspotter configurations are available. The following section outlines the major machine components/subassemblies with brief descriptions of each item.

2.2.1. Pinspotter Pair



Figure 2-1, EDGE String USBC Approved Version Pinspotter Pair

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

1111 - USA Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611 web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com

2.2.2. Pinspotter

Assembly consisting of reel arm assembly, brake/encoder assemblies, drawbar assembly, pulley flip bracket, drawbar gearmotor, machine control box, upper and lower table assemblies, string comb, string pan, top guard, and reel arm cover. Performs bowling operations of lifting and setting pins. See Figure 2-2.

2.2.3. Brake/Encoder Assembly

Pinspotter assembly consisting of sheet metal mounting plate, brake pawl, encoder pulley, and brake/encoder circuit board. Senses string movement and holds scored pins in brake position. Pinspotter uses one assembly per pin. See Figure 2-3.





Figure 2-2, Pinspotter

Figure 2-3, Brake/Encoder Assembly

2.2.4. Reel Arm Assembly

Pinspotter assembly consisting of sheet metal mounting bracket, reel arm shaft, and ten spring-loaded reel arms. Reel arms serve as attachment point for each pin string and provide additional string storage. They also rotate to relieve string tension during pin impacts and string tangles. See Figure 2-4

2.2.5. Reel Arm

Spool mechanism for attaching pin string to pinspotter and storing excess string. Rotates about reel arm shaft to relieve string tension during pin impacts and string tangles. Arm rotation trips optical tangle switch during string tangle to activate pinspotter detangle function. Pinspotter uses one reel arm per pin. See Figure 2-5.



Figure 2-4, Reel Arm Assembly



Figure 2-5, Reel Arm

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 30

2.2.6. Drawbar Assembly

Pinspotter assembly consisting of chain drive, guide blocks, sheet metal bracket, drawbar shaft, and ten drawbar pulleys. Assembly is driven by drawbar gearmotor to lift and lower pins. See Figure 2-6.

2.2.7. Drawbar Pulley

Molded plastic pulley that rotates about drawbar shaft as pinspotter lifts and lowers pins. Pinspotter uses one drawbar pulley per pin. See Figure 2-7.



Figure 2-6, Drawbar Assembly



Figure 2-7, Drawbar Pulley

2.2.8. Tangle Switch Emitter Board

Circuit board equipped with infrared LED transmitter. Mounted inside pinspotter frame next to reel arm assembly. Functions together with pinspotter control box to create optical beam that senses reel arm rotation during string tangles and activates pinspotter detangle function. See Figure 2-8.



Figure 2-8, Tangle Switch Emitter Board

2.2.9. String Comb

Plastic plate that guides pin strings into brake/encoder assemblies. Prevents string tangles inside pinspotter frame. See Figure 2-9.

2.2.10. String Tray

Molded plastic pan that supports slack string inside pinspotter frame. Prevents string tangles inside pinspotter frame. See Figure 2-10.



Figure 2-9, String Comb

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





Figure 2-10, String Tray



2.2.11. Gearmotors

Assembly consisting of DC brushless motor, planetary gearbox, shaft coupling, and mounting bracket. A 50:1 drive ratio gearmotor powers the pinspotter drawbar assembly. A 25:1 drive ratio gearmotor powers the chain lift. See Figure 2-11.

2.2.12. Control Box

Electronic control board used to drive pinspotter chain lift, gearmotors and ball doors. Transmits data signals between pinspotters, chain lift, and system controller. Each gearmotor requires its own dedicated control box. See Figure 2-12.



Figure 2-11, Gearmotor



Figure 2-12, Control Box

2.2.13. Upper Table

Pinspotter assembly consisting of plywood panel and ten table pulleys. See Figure 2-13.

2.2.14. Table Pulley

Assembly consisting of aluminum mounting block and molded plastic pulley. Directs pin strings from pinspotter to each pin spot on pindeck. Pinspotter uses one pulley assembly per pin. See Figure 2-14.



Figure 2-13, Upper Table



Figure 2-14, Table Pulley

400-051-247 Rev. C

P

EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

2.2.15. Lower Table

Pinspotter assembly consisting of plywood panel and ten pin centering rings. See Figure 2-15.

2.2.16. Pin Centering Ring

Molded plastic ring mounted to underside of lower table assembly. Stabilizes pins when pins are lifted off pindeck. Pinspotter uses one pin centering ring per pin. See Figure 2-16.



Figure 2-15, Lower Table



Figure 2-16, Pin Centering Ring

2.2.17. Kickbacks

Plywood panel that encloses pindeck area. Supports pinspotter and upper/lower table assemblies. Common division kickbacks (see Figure 2-17a) are 70mm thick. Double division kickbacks (see Figure 2-17b) are 70mm thick with 24mm thick outer edges.



Figure 2-17a, Common Division Kickback



Figure 2-17b, Double Division Kickback

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

2.2.18. Kickback Nose Block

Plywood block installed in front of each kickback. Protects leading edge of kickbacks from ball impacts. See Figure 2-18.

2.2.19. Machine Support

Sheet metal weldment that supports pinspotter and upper/lower table assemblies on top of kickbacks. See Figure 2-19.





Figure 2-18, Kickback Nose Block

Figure 2-19, Machine Support

2.2.20. Chain Lift

Assembly consisting of sheet metal frame, ball stop rails, gearmotor, sprocket/shaft assemblies, chain drive, ball sensors and two ball lifter assemblies. Lifts balls from double division rails to cross sweep for returning balls to bowlers. See Figure 2-20.

2.2.21. Ball Lifter Assembly

Chain lift assembly consisting of bent hoop, mounting bracket, shaft, and stabilizer posts. Mounts to chain lift chain loop for lifting balls. Two per chain lift. See Figure 2-21.





Figure 2-21, Ball Lifter Assembly

Figure 2-20, Chain Lift

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 34

2.2.22. Double Division Rail Assembly

Assembly consisting of two ball rails, rail covers, mounting brackets, and ball stop plate. Guides balls from ball door to chain lift. Ball stop plate prevents balls from rolling backwards away from chain lift. See Figure 2-22.

2.2.23. Chain Lift Sensors

Transmitter/Receiver combination mounted on either side of the lower Chain Lift Assembly, used to detect when a ball is at the base of the lift. Activates the Chain Lift motor. See Figure 2-23.





Figure 2-22, Double Division Rail Assembly

2.2.24. Cross Sweep



Welded rod assembly joining chain lift to down sweep. Guides balls from chain lift to down sweep to return balls to bowlers. See Figure 2-24.

2.2.25. Down Sweep

Welded rod assembly joining cross sweep to under-lane ball track. Guides balls from cross sweep to under-lane ball track to return balls to bowlers. See Figure 2-25.



Figure 2-24, Cross Sweep

Figure 2-25, Down Sweep

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

2.2.26. Shield/Pitlight Assembly

Assembly consisting of shield, pitlight fixture, sheet metal frame, shield actuation string, and shield hard-stop string. Shield assembly is driven by drawbar assembly. Shield rotates up and down to alert players when lane is ready to bowl. See Figure 2-26.

2.2.27. Pitlight Fixture

BICAVA

MAKING BOWLING AMAZING

LED light fixture that illuminates pindeck area. See Figure 2-27.





Figure 2-26, Shield/Pitlight Assembly

Figure 2-27, Pitlight Fixture

2.2.28. Ball Detector

Assembly consisting of sheet metal enclosure, optical sensors, and reflectors. Senses thrown ball and triggers pinspotter to cycle. See Figure 2-28.



Figure 2-28, Ball Detector

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611
2.2.29. Pit Assembly

Assembly consisting of sheet metal side frames, cross braces, pit floor, pit curtain, pit cushion, pit cushion blocks, pit cushion shock, motorized ball door, rear guard, and hinged top cover. See Figure 2-29.

2.2.30. Pit Floor Assembly

Pit assembly consisting of sheet metal joists, plywood base, wedge supports, plastic top panel. and bridge panel. Catches fallen pins and guides balls to ball door. See Figure 2-30.



Figure 2-29, Pit Assembly

Figure 2-30, Pit Floor Assembly

2.2.31. Pit Curtain

Pit assembly consisting of sheet metal support, plastic slides and rubberized fabric panel. Prevents pin damage and deflects pins to pit floor. Can be retracted to ease access to the pindeck area. See Figure 2-31.

2.2.32. Pit Cushion

Pit assembly consisting of welded sheet metal support, cushion plank, cushion pads, and cushion cover. Stops a thrown ball. See Figure 2-32.



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 37

2.2.33. Pit Cushion Block

Pit assembly consisting of sheet metal bracket, plastic bearing block and shield disc. Supports pit cushion assembly on side frames. Block assemblies for 7-pin and 10-pin sides are not interchangeable. See Figure 2-33.

2.2.34. Pit Cushion Shock

Pit assembly consisting of sheet metal mounting bracket and shock absorber. Absorbs energy of ball impact against pit cushion. See Figure 2-34.



Figure 2-33, Pit Cushion Block

Figure 2-34, Pit Cushion Shock

2.2.35. Motorized Ball Door

Assembly consisting of plastic ball door blade, sheet metal hub and electric linear actuator. Blocks fallen pins from entering chain lift area. See Figure 2-35



Figure 2-35 Motorized Ball Door

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

2.2.36. Pit Rear Guard

Tool-removable plastic guarding panel mounted to rear of pit assembly. Defines machine boundary and protects operator during machine operation. See Figure 2-36.

2.2.37. Double Division Guard

Thermo-formed plastic guarding assembly mounted to rear of double division. Defines machine boundary and protects operator during machine operation. Toolremovable polycarbonate access panel allows limited access to chain lift area for maintenance interventions. See Figure 2-37.





Figure 2-36, Pit Rear Guard

Figure 2-37, Double Division Guard

2.2.38. Chain Lift/Machine Guards

Tool-removable sheet metal and polycarbonate guarding assembly mounted around chain lift, common divisions, and double division. Defines machine boundary and protects operator during machine operation. See Figure 2-38.



Figure 2-38, Chain Lift/Machine Guards

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





2.2.39. Pit Hinged Top Cover

Hinged plastic panel mounted on top of pit assembly. Defines machine boundary and allows limited access to pit area for maintenance interventions. See Figure 2-39.

2.2.40. Machine Rear Cover

Sheet metal and polycarbonate assembly with hinged access door. Defines machine boundary and allows limited access to pindeck area for maintenance interventions. See Figure 2-40.





Figure 2-39, Pit Hinged Top Cover



2.2.41. Pinspotter Top Guard

Tool-removable plastic panels fastened to top of pinspotter frame. Defines machine boundary, protects operator during machine operation, and keeps dust/debris out of pinspotter frame. See Figure 2-41.

2.2.42. Reel Arm Cover

Hinged sheet metal panel located at the rear of pinspotter frame. Defines machine boundary and allows limited access to reel arms and brake/encoder units for maintenance interventions. See Figure 2-42.



Figure 2-41, Pinspotter Top Guard



Figure 2-42, Reel Arm Cover

400-051-247 Rev. C



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

2.2.43. Pinspotter Sprocket Guard

Tool-removable molded plastic guard mounted inside pinspotter frame. Prevents operator from contacting drawbar drive sprockets during maintenance interventions. Four guards per pinspotter. See Figure 2-43.

2.2.44. System Controller

JBICAVA

MAKING BOWLING AMAZING

Primary control module for pair of pinspotters. Includes control board, power supply, ON/OFF switch, E-Stop button, keypad, and display. Converts high voltage main power supply to 24VDC and distributes power to pinspotters and chain lift. Handles communication tasks among all machine subsystems. Primary user interface for machine operation and routine maintenance tasks. See Figure 2-44.





Figure 2-43, Pinspotter Sprocket Guard

Figure 2-44, System Controller

2.2.45. Wireways

Plastic and sheet metal wire ducts for routing electrical cables within the machine boundary. See Figure 2-45.



Figure 2-45, Wireways

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

2.2.46. Machine Mounted Curtain Wall

Assembly consisting of wood panel, wire ducts and sheet metal support brackets mounted to top of pinspotter frame. Used for mounting auxiliary components (e.g., scoring hub, bumper control module, etc.) to the machine for easier operator access. See Figure 2-46.



Figure 2-46, Machine Mounted Curtain Wall

2.2.47. 10-Pin Bowling

Bowling game using full-sized ball (8.5" [216mm] diameter) and ten full-sized pins (15.0" [381mm] height).

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

2.3. System Controller

8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

The system controller is the primary control module for a pair of pinspotters and can be used with or without a scoring system. It is located above the double division ball return area at the rear of the machines.

This device must only be used indoors to protect all the electrical components from any outdoor weather conditions. It must also be used in temperatures between 0-40°C and at a maximum altitude of 3000mt.

Main electrical power (208-230VAC) is supplied from a center's main service distribution panel limited to 20A current and is routed to the main power inlet connector on the top of the system controller. Operating current is 3.2A. **Warning:** Proper protective grounding of the product is required.

An ON-OFF switch is located next to the main power inlet connector. This switch controls power to a pinspotter pair and is used to shut down/re-boot all machine systems. A power supply inside the system controller converts the main supply power to 24VDC which is distributed to the control boxes of the pinspotters and chain lift. The system controller also handles communication tasks among all machine subsystems, including the pinspotter control boxes, chain lift control box, pit light, mask lights, ball detector, foul detector, ball lift control box, and scoring system.

The system controller is the primary user interface for machine operation and routine maintenance tasks. A display and pushbutton keypad are located on the front face of the unit for accessing machine functions, user-configurable settings, and system diagnostics tools.



2.3.1. Port Layout



Figure 2-48, System Controller Plug Layout

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 44



2.3.2. Port Descriptions

PORT	COMPATIBILITY	DESCRIPTION			
GREEN PINSPOTTER POWER GREEN	Only with QubicaAMF Devices: 051-203-110-xx – EDGE String USBC Approved Version Control	This port supplies +24V power to the ODD EDGE String Control Box unit. The EDGE String USBC Approved Version Control Box Unit drives the machines motors, encoders, solenoids and sensors This port is for data communication between the ODD			
PINSPOTTER DATA	Box (or equivalent)	EDGE String Control Box Unit and the EDGE String USBC Approved Version System Controller.			
YELLOW PINSPOTTER POWER	Only with QubicaAMF Devices: 051-203-110-xx – EDGE String USBC Approved Version Control	This port supplies +24V power to the CHAIN LIFT EDGE String USBC Approved Version Control Box Unit. The EDGE String USBC Approved Version Control Box Unit drives the machines Chain Lift Motor			
YELLOW PINSPOTTER DATA	Box (or equivalent)	This port is for data communication between the CHAIN LIFT Control Box and the EDGE String USBC Approved Version System Controller.			
RED PINSPOTTER POWER	Only with QubicaAMF Devices: 051-203-110-xx – EDGE String	This port supplies +24V power to the EVEN EDGE String USBC Approved Version Control Box Unit. The EDGE String USBC Approved Version Control Box Unit drives the machines motors, encoders, solenoids and sensors			
RED PINSPOTTER DATA	Box (or equivalent)	This port is for data communication between the EVEN EDGE String USBC Approved Version Control Box Unit and the EDGE String USBC Approved Version System Controller.			
BALL DETECTOR	Only with QubicaAMF Devices: 051-200-761 – ES BLACK BALL TRIGGER (or equivalent)	This port supplies power to the photocells that are inside the ES BLACK BALL TRIGGER (or equivalent QubicaAMF product) and receives the signals that confirms the ball passage on both Odd and Even Lanes.			
FRONT BALL LIFT	Only with QubicaAMF Devices: 252-003-100-02 BALL LIFT CONTROL UNIT (or equivalent)	This port interfaces with the BALL LIFT CONTROL UNIT (or equivalent QubicaAMF product), to drive the front Ball Return system.			
FOUL DETECTOR	Only with QubicaAMF Devices: 088-000-222-01 XLi FOUL DETECTOR (or equivalent)	This port supplies power to the photocells that are inside the XLi FOUL DETECTOR (or equivalent QubicaAMF product) and receives the signals that check if the player has stepped beyond the foul line on the ODD or EVEN Lane.			
MASK LED	Only with QubicaAMF Devices: 260-001-157 MASK 1BALL/2BALL LIGHTS (or equivalent)	This port supplies power to the MASK 1BALL/2BALL LIGHTS (or equivalent QubicaAMF product) that shows the games frame status to the player, by LED or LIGHT display.			
I/01	Only with QubicaAMF Devices	This port is provided to maintain compatibility with obsolete QubicaAMF's pinspotter systems and accessories.			
1/02	Only with QubicaAMF Devices	This port is provided to maintain compatibility with obsolete QubicaAMF's pinspotter systems and accessories.			

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





I/O3	Only with QubicaAMF Devices	This port is provided to maintain compatibility with obsolete QubicaAMF's pinspotter systems and accessories.
PITLIGHTS/DIAG	Only with QubicaAMF Devices	This is a serial port used only by QubicaAMF operators to program and read machine status.
SCORING	Only with QubicaAMF Devices: 288-250-025-02 - 5HD-HUB-02 (or equivalent).	This is a serial port that interfaces with the 5HD-HUB- 02 to communicate with the Front Desk (the main center's PC where the QubicaAMF bowling management program is installed). Essentially it takes orders for example to open a lane for a game, and gives all machine status information.
MCU IN	Only with QubicaAMF Devices: 290-002-105 - MCU (or equivalent).	This is a serial port that is either connected to QubicaAMF's USB-RS486 adapter (MCU) that is connected to a PC or to another EDGE String USBC Approved Version System Controller MCU Out port. Pinspotter functions are controlled through this port.
MCU OUT	Only with QubicaAMF Devices: 290-002-105 - MCU (or equivalent).	This is a serial port that can be connected in cascade configuration to the next EDGE String USBC Approved Version System Controller MCU IN port.
AUX SERIAL	Only with QubicaAMF Devices	This is a serial port that is normally not used, but is provided to give some custom functions when required.
DMX 1 IN/OUT	With QubicaAMF Devices: 275-002-032 – EFFECTS SERVER X) or equivalent) With Customer's Devices: Compatible only with devices that use the DMX communication.	This is a DMX port that can be connected with QubicaAMF's EFFECTS SERVER X or any customer supplied DMX device port.
DMX 2 IN/OUT	With QubicaAMF Devices: 275-002-032 – EFFECTS SERVER X)or equivalent) With Customer's Devices: Compatible only with devices that use the DMX communication.	This is a DMX port that can be connected with QubicaAMF's EFFECTS SERVER X or any customer supplied DMX device port. Daisy Chain CAT5 cable from/to System Controller. Last System Controller needs terminator (p/n TOOTCS120TER).
CH1 DECK LIGHTS OUTPUT	Only with QubicaAMF Devices: 275-002-035 ODD CP DECK LIGHT FIXTURE (or equivalent).	This port supplies power and drives the QubicaAMF CP DECK LIGHT FIXTURE.
CH2 DECK LIGHTS OUTPUT	Only with QubicaAMF Devices: 275-002-035 EVEN CP DECK LIGHT FIXTURE (or equivalent).	This port supplies power and drives the QubicaAMF CP DECK LIGHT FIXTURE.
E-STOP	Only with QubicaAMF Devices	This port can be connected to a QubicaAMF plug, that serves like a security key, or to a QubicaAMF E-STOP Device. If nothing is connected, the system goes into E-STOP error mode, which won't allow the machine to turn on or the motors to run.

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





WARNING:



• High voltage is present inside the system controller. Use caution when operating or handling this equipment. Refer to Section 4 Troubleshooting of this manual for instructions on performing maintenance tasks involving the system controller.



- The system controller contains no user-serviceable parts.
- The system controller includes a tamper indicator. Opening the system controller enclosure will void the warranty.

2.3.3. Machine Activation

Use the following procedure to activate the pinspotter pair from a power OFF condition:

- 1. Switch system controller main power switch to ON.
- 2. Press **RESET E-STOP** button.
- 3. Wait until system controller restarts and both pinspotters and chain lift stop moving.
- 4. If resetting AC power during a game, proceed to Step 5. Otherwise, machine activation is complete.
- 5. Set Odd lane *Chassis Mode* to BOWL (see Section 2.3.6.3.1 Settings Sub-Menu).
- 6. Set Even lane *Chassis Mode* to BOWL (see Section 2.3.6.3.1 Settings Sub-Menu).
- 7. On Odd lane keypad controls, press **FULL SET**, then press **PLAY** to reconnect Odd lane with facility scoring system (if installed).
- 8. On Even lane keypad controls, press **FULL SET**, then press **PLAY** to reconnect Even lane with facility scoring system (if installed).

2.3.4. Emergency Stop (E-Stop)

An emergency stop (E-Stop) pushbutton is located on the front of the system controller (see Figure 2-47). Activating the E-Stop will immediately remove all electrical power from the pinspotter pair and chain lift gearmotors. The E-Stop should be used only in emergency situations requiring an immediate removal of electrical power to the machines and chain lift. The E-Stop is not to be used as a substitute for LOTO or to perform any maintenance. See Section 6 for LOTO procedure.

Use the following procedure to restart the pinspotter pair from an E-Stop condition:

- 1. Rotate E-Stop pushbutton clockwise until red knob pops out.
- 2. Press **RESET E-STOP** button.
- 3. Wait until system controller restarts and both pinspotters and chain lift stop moving.
- 4. Press **PLAY** on Odd lane keypad controls.
- 5. Press PLAY on Even lane keypad controls.

400-051-247 Rev. C



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

2.3.5. Keypad

The keypad is used to enter and view settings, check machine status, change operating modes, clear error messages, and perform machine functions. Keypad layout and pushbutton functions are explained below.

As shown in Figure 2-49, pushbuttons on the upper portion of the keypad are used for general machine control and keypad navigation. They are not specific to a lane. Pushbuttons on the lower portion of the keypad are split into two groups and are used to perform various machine functions. The right group controls the Odd machine. The left group controls the Even machine.



Figure 2-49, System Controller Keypad

2.3.5.1. Keypad Pushbuttons

Table 2-1	Table 2-1, Reypau I usibuttons					
General	Machine Co	ontrol/Keypad Navigation				
	LANE	Alternates control between Odd and Even lanes.				
	MENU	Press once for <i>Settings/Functions/Counters</i> . Press twice for <i>Diagnostics</i> .				
	BACK	Return to previous menu.				
	UP	Scroll up.				
	DOWN	Scroll down.				

Table ? 1 Kowned Pushbuttons

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 48



	ОК	Enter next menu. Set user-configurable setting.					
Lane-Sp	Lane-Specific Machine Controls						
	WORK	Place pinspotter into MECHANIC mode. Acknowledges TCS error.					
	PLAY	Exits MECHANIC mode. Clears an error.					
	RE-SPOT Sets last known pin combination onto pindeck.						
	PINS UP Lifts and holds all pins in brake position and shield in UP position.						
	FULL SET	Places all pins onto pindeck.					
	STRING ADJ	Initiates string adjustment function.					

2.3.6. Display

The system controller includes a display for accessing machine functions, userconfigurable settings, and system diagnostics tools. Figure 2-50 shows an example of the default main screen displayed during normal machine operation.

2.3.6.1. Main Screen



Figure 2-50, Display – Main Screen

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



The lane ID's of the Odd and Even lanes are displayed along with status icons indicating lane mode, ball number, foul detector status and bumpers setting.

The *Odd/Even Lane Mode* icons indicate the current operating mode of the given lane. As indicated in Figure 2-50, a "1" to the left of the lane ID indicates a 1st Ball play condition. A "2" to the left of the lane ID indicates a 2nd Ball play condition.

The following table lists all possible display icons and their meanings. Note that the display is permanently unlocked and cannot be password-protected.

2.3.6.2. Display Icons

Table 2-2, Display Icons

Chassis	Chassis Modes					
9	BOWL	Machine is ON and waiting for ball to enter machine. Machine cycles when ball is thrown. Pinfall data is sent to scoring system.				
Ø	STANDBY Machine is idle and ready for game to start. Machine will not cycle if a ball is thrown, but will respond to certain keypad commands.					
Å	MECHANIC mode Machine is ready for adjustment/maintenance/test. Machine will not respond to thrown ball.					
G	CONTINUOUS CYCLE	Machine cycles every 10 seconds. Used for testing.				
Foul De	tector Status					
Ň	<i>Foul Detector</i> setting set to ON					
	Foul Detector setting set to WARNING					
۴	Foul detector activated					
Bumper	Settings					
	Bumpers down					
Ш	Bumpers up					
USBC M	lode					
USBC	Displayed between la Mode.	ne number and directional arrow. Machine is in USBC				

2.3.6.3. MCU Menu

The system controller *MCU* menu contains sub-menus for *Settings*, *Functions*, *Ball Counters*, and *Frame Counters*. Options within these sub-menus can be used for daily machine operation, troubleshooting, and preventive maintenance. Press **MENU** once to access the *MCU* menu. Then, scroll down to the desired sub-menu and press **OK** to access its available options. Press **BACK** to return to the previous screen or continue pressing **BACK** to return to the home screen.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

2.3.6.3.1. **Settings Sub-Menu**

The Settings sub-menu includes several user-configurable settings which the operator can set based on operational preferences, bowling center layout, and equipment configuration. All available settings are described below.

Parameter	Possible Settings	Additional Information
Low Lane ID	1, 2, 3, 5127	Set to lowest lane number of the pair. For single lanes,
		use that lane number.
Chassis Mode	BOWL, STANDBY	See Section 2.3.6.2 for definitions of machine modes.
		MECHANIC mode is automatically set by pressing any
		of the lane-specific machine control pushbuttons.
Auto Ball Return	ON, OFF	Recommended setting is ON.
Shutoff		
Ball Return Select	QAMF, OTHER	Set for brand of front ball return installed.
Foul Type	Xli, XL	Set to Xli for use with Radaray Xli or Radaray Plus.
		Set to XL for use with Radaray XL.
Foul Detector	ON, WARNING, OFF	Select ON for warning buzzer and score penalty. Select
		WARNING for buzzer only (no score penalty). Select
		OFF for no warning buzzer or score penalty.
Game	10PINS, DUCKPIN,	Set to 10PINS for Tenpin use.
	HIGHWAY66	
Mask Lights	AS BALL NUMBER, AS	Set to AS BALL NUMBER for 10-Pin use.
	BOWL/NO BOWL	
Pin Data Delay	2.0, 2.3, 2.6, 3.0, 3.3, 3.6,	Time (in seconds) after ball is detected before pin fall
	4.0, 4.3, 4.6, 5.5	data is collected. Recommended setting is 3.0.
		Increasing value will score delayed pin falls but will
		delay start of next machine cycle.
Pin Detect Count	4, 5, 615	Relative string movement required to register a fallen
		pin. Recommended setting is 12.
Pin Park State	UP, DOWN,	Sets pin parking position when machine is turned OFF.
	PINS/SHIELD UP	
Pit Light	WHITE, COLOR	Select WHITE for white light. Select COLOR for light
		color.
Scoring System	SCORING,	Select SCORING for use with QubicaAMF scoring
	STANDALONE, BASIC	system. Select STANDALONE for no scoring. Select
		BASIC for use with other manufacturer's scoring
		system.
Tenth Frame	FULL, PARTIAL, OFF	Determines machine response when tenth frame switch
Switch		(if installed on front ball return) is pressed. Select Full
		for full pin set, PARTIAL for partial pin set, or OFF
		for no response.
Inhibit Pin Errors	ON, OFF	Machine will ignore errors associated with individual
		pins (brake error, pin encoder error, etc.).
		Recommended setting is OFF.

Table 2-3, Settings Sub-Menu

JUBICA®AMF

MAKING BOWLING AMAZING

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611 web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



DMX Stream	DEFAULT, ASSIST +	DEFAULT - DMX Slave- normal address. Used with
	SHARED, ASSIST,	Effect Server.
	SHARED	ASSIST+SHARED - DMX assist- address + 256. Used
		with handheld controller together w/ pit light setting on
		MCU when capping lights are on same line as pit
		lights.
		ASSIST - DMX assist- normal address. Used with
		handheld controller together w/ pit light setting on
		MCU.
		SHARED - DMX Slave- address + 256. Used with
		handheld controller when capping lights are on same
		line as pit lights - typically w/ Hwy66.

2.3.6.3.2. Functions Sub-Menu

The *Functions* sub-menu includes several user-controllable functions that the Operator can use for troubleshooting and maintenance tasks. All available functions are described below.

Function Pins Full Set	Explanation Sets all pins onto pindeck.
Pins Partial Set	Sets last known pin combination onto pindeck.
Pins Up	Lifts and holds all pins in brake position and shield in UP position.
Pins Down	Sets last known pin combination onto pindeck.
Brake Adjust	Not applicable
String Adjust	Activates string adjustment operation.
Continuous Cycle with Random Pins	Operates machine in continuous cycle with random pin setting.
Reset Bowling Ball Counters	Resets ball counter for balls thrown with machine in BOWL mode.
Reset Mechanic Ball Counters	Resets ball counter for balls thrown with machine in MECHANIC mode.
Reset Bowling Frame Counters	Resets frame counter for frames played with machine in BOWL mode.
Reset Mechanic Frame Counters	Resets frame counter for frames played with machine in MECHANIC mode.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



2.3.6.3.3. Counters Sub-Menus

JBICAVA

MAKING BOWLING AMAZING

The *Ball Counters* and *Frame Counters* sub-menus display ball and frame counters for use in documenting trouble calls and scheduling preventive maintenance. In either counter menu, the upper three numbers are the total counts since manufacture and cannot be reset. The lower three numbers are the total counts since the counter was last reset using the *Functions* menu. Figures 2-51 and 2-52 show each counter's display for a given lane.





Figure 2-52, Display – Frame Counters Screen

2.3.6.4. Diagnostics Menu

The system controller Diagnostics menu contains sub-menus for *Text*, *Graphics*, and *Hardware*. Options within these sub-menus can be used for daily machine operation, troubleshooting, and preventive maintenance. Press **MENU** twice to access the *Diagnostics* menu. Then, scroll down to the desired sub-menu and press **OK** to access its available options. Press **BACK** to return to the previous screen or continue pressing **BACK** to return to the home screen.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

2.3.6.4.1. Text Sub-Menu

The *Text* sub-menu displays a list of critical machine components that are monitored by the system controller during normal operation. This menu can be useful when troubleshooting a machine error. Table 2-4 lists all monitored components and their possible states.

Component	Possible States	Additional Information
Backend Breaker	OK, Tripped	Not applicable
Backend Motor	On, Off, Asleep	Not applicable
Ball Detector	Ball, No Ball	Displays current input state to system
		controller from ball detector
Ball Lift	On, Off, Asleep	Displays current input state to system
		controller from front ball return. Asleep is a
		state in which ball lift motor turns off after a
		period of inactivity.
Ball Sensor	-	Not applicable
Drive Encoder	0 to 1250/Valid/Invalid	Displays current drawbar motor encoder
		count. Invalid indicates either an out-of-range
		value or home position has not been set.
		NOTE: In USBC mode, the drive encoder will
		be approximately 1376.
Encoder Sensors	=	Not applicable
Drive RPM/CMD	-900 to 1800	Displays rotational speed that machine
		controller is asking drawbar motor to operate.
E-Stop Loop	Closed, Open	Displays current E-Stop loop status.
Foul Detector	Foul, No Foul	Displays current input state to system
H (LOC)		controller from foul detector
Home (LOS)	Home, Not Home	Indicates whether drawbar is at pin
I D I		stabilization position
Lane Breaker	OK, Iripped	Not applicable
Mask Light On	BALL I,	Displays current output state from system
Maahania Call	BALLI/BALL2	Controller to mask light unit
Mechanic Call	On, OII	On 11 Mechanic Call button is pressed
Pin Encoder	$\lambda\lambda, \lambda\lambda, \lambda\lambda, \lambda\lambda, \lambda\lambda, \lambda\lambda, \lambda\lambda, \lambda\lambda, \lambda\lambda, \lambda\lambda,$	Displays current count of all pin string
Softwara	ΛΛ, ΛΛ, ΛΛ, ΛΛ, ΛΛ VV VV	Displays installed software version
Steel Lights	V Λ.ΛΛ	Not applicable
Grn = Rod =	-	not applicable
Tenth Frame	On, Off	On if Tenth Frame button is pressed

Table 2-4, Text Sub-Menu

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

2.3.6.4.2. Graphics Screen

MAKING BOWLING AMAZING

The *Graphics* screen uses a graphical interface to display the status of multiple machine functions in real-time. Figure 2-53 shows the display while using this tool.



2.3.6.4.3. Hardware Sub-Menu

The *Hardware* sub-menu contains several tools for testing and monitoring various hardware components internal to the system controller.

1. The *Keypad* tool allows the user to test the functionality of all pushbuttons on the system controller keypad. Figure 2-54 shows the keypad display while using this tool. After accessing this tool, press any pushbutton to test its functionality. Pressing a properly functioning pushbutton will result in "Valid Key!" on the display. A countdown will begin after pressing any pushbutton. Press any other pushbutton to continue testing. Otherwise, wait for the countdown to expire to exit the *Keypad* tool.



Figure 2-54, Display – Keypad Test Screen

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Table 2-5, Keypad Pushbutton ID

MAKING BOWLING AMAZING

		Drive	Input	Number			Drive	Input	Number			Drive	Input	Number
ad		1	1	1			2	1	7			3	1	13
ol/Keypa		1	2	2	control		2	2	8	ontrol		3	2	14
Contro ation	$\textcircled{\bullet}$	1	3	3	ichine C	Î	2	3	9	chine C	(i)	3	3	15
lachine Navig		1	4	4	ane Ma		2	4	10	ane Ma		3	4	16
eneral N		1	5	5	Even L		2	5	11	Odd L		3	5	17
Ğ		1	6	6			2	6	12			3	6	18

2. The *Configuration* tool displays information about the system controller software version. Figure 2-55 shows the keypad display while using this tool. "Model" displays the name of the installed software. "ID" displays the serial number of the system controller main board. "Build" displays the software version number of the installed software.



Figure 2-55, Display – Configuration Screen

3. The *Tasks* tool displays processes currently running on the system controller. This tool can be used as a task manager for certain troubleshooting operations.



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

2.4. Adaptive String Length (USBC Mode)

With the release of Conqueror version 14.50.01, the ability to select a "Game Mode" for your EDGE String USBC Certified Machines is now available. The "Game Mode" Setting controls the playable length of the strings within the machine. This gives you two options for how you want your machine to perform:

Casual Play – Great for open play, this mode allows your customers to enjoy the reliability EDGE String has come to be known for. NOTE: Casual Game Mode STILL MEETS REQUIREMENTS for IBF Bowling.

USBC Certified – This mode extends the string length of the machine, providing the fidelity of pin action expected of a USBC Certified String Machine. Additionally, the pin data delay will be set to 4 seconds if it is normally set to less than 4 seconds by default.

Verify updates are correctly installed

- To verify the updates installed correctly, first check your Conqueror Version. To find this, go to the Home Tab, and then go to "Utilities -> About Conqueror" to check that the Build Number is 14.50.01 or greater.
- If this is correct, you next need to check your System Controllers for each machine. Each System Controller needs to be at Software Version 8.27 or greater. If the software version is not 8.27 or greater, reach out to Tech Support for assistance.

o To find the System Controller Software Version, consult Section 2.3.6.3.1 Settings Sub-Menu.

Ensure machines are set up as "EDGE String USBC" in Conqueror

To ensure Conqueror sees that your machines are installed as the "EDGE String USBC Certified" machines, go to the Home tab in Conqueror, then go to "SETUP -> Lane Setup -> Lane Setup" and check the Machine Setting for each Lane Pair. If the machine is set as "EDGE String" instead of "EDGE String USBC," this selection option will not work, and the machine will default to "USBC Certified" mode for all games.

Default settings

If you intend to play in the below listed Game Modes for each type of play, you should not have to change any settings:

- Open Play Casual Mode
- League USBC Certified
- Tournament USBC Certified

Instructions to change the "Game Mode" setting from default

The below instructions focus on changing the Game Mode when opening a lane from the "All Lanes" Screen, for Open Play.

- From the Lanes Selection Screen, pick the lane you want to open, then click to open the lane as you typically would.
- If you plan to open the lane in the default game type ("Casual Play" for Open Games), you do not have to do anything.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



- If you plan to open the game in" USBC Certified" Mode, select "Options" at the bottom of the screen, then go to the "Bowling / Lane Services" Tab.
- On the Right-Hand Side, you will see a selection called "EDGE String game mode." Choose "USBC certified" to change the machine to USBC Certified String Settings. Choose "Send to lane," then close.

▲ Option sets: ∨	Basic Advance	ed Bowling / Lane	Services	Modifications	Score Style		
# 1(DEFAULT)	Bowling ser	vices	Ir	Intercom			
ES LONG STRINGS	Service c	all	La	ane Chatter			
	Recap sh	eet	V Bo	owler Photo			
TOURNAMENT	✓ Statistics		🗸 Vi	irtual Waiter			
	Technicia	ın call	🗸 Vi	ideo Intercom			
	Pinspotte	er functions	✓ Ta	Takeaway picture message			
	Disable automa	atic recap	EDGE	EDGE String game mode			
	✓ Display Won/Lo	ost in recap screen	USBC	USBC certified			
	✓ Lane On Adver	tising	Supe	erTouch slideshow			
	Cleaning mode	eaning mode after lane closure bowling session ault / T. Default		 Automatic Statist 	ic slideshow		
	Extend bowling ses			Scoring grid			
	G. Default / T. Defa			lat, updated in real t	ime v		
	D <u>e</u> scription:						
	OPEN default options				Send to lane		
×							

To change these settings in Leagues or Tournaments (changing from the default "USBC Certified" to "Casual Play"), follow the above instructions, but in the League Setup or Tournament Setup areas.

NOTE: Any games played in "Casual Play" Game Mode ARE NOT VALID for USBC Purposes. Any Leagues or Tournaments that do not have "USBC Certified" selected as the Game Mode are considered Unsanctioned.

As you prepare your first League Games after this update, we suggest that you verify the lanes are in USBC Certified Mode to ensure everything is running correctly, before bowlers begin the games. If you run into any issues, please reach out to Tech Support.

How to Verify USBC Mode

MAKING BOWLING AMAZING

To verify that a lane is in "USBC Certified" mode, select the Options from the "All Lanes" Tab, and check the "EDGE String game mode" setting in that lane's Lane Options.

In addition, you can check the System Controller for that lane. If the lane is in "USBC Certified" mode, the label "USBC" will be listed next to the Lane Number.



EUROPEAN HEADQUARTERS

NOTE: For League Play, when league roster is sent to lanes, but practice has not started, the lanes will not display "USBC" on the System Controller. Once the lanes enter practice, the machines will start and enter into USBC Mode, with "USBC" displayed on the System Controllers.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Section 3 Interventions

3.1. Section Overview

JBICAVA

MAKING BOWLING AMAZING

This section contains information and instructions about interventions for the EDGE string. These instructions are classified as Level 1 and Level 2 interventions as defined below.

An intervention is defined as a machine stop or occurrence requiring a minimum amount of time to rectify and return to service.

LEVEL 1 INTERVENTIONS may be performed without shutting off system controller (LOTO not required). Follow instructions and precautions carefully, especially regarding prohibition of bowling play during clearing of problem.

LEVEL 2 INTERVENTIONS require Lockout/Tagout (see Lockout/Tagout (LOTO) Procedure Section 6) and lane barriers (see Page 16) during clearing of problem.

Applicable Safety Warnings



Tools

In addition to safety tools described in Section 1 (Safety), other tools may be required for specific tasks. See each intervention for list of tools needed.

WARNING:



• High voltage is present inside the system controller. Use caution when operating or handling this equipment. Implement Lockout/Tagout (LOTO) before servicing any electrical components (see Section 6). The main circuit breaker must always be OPEN, or the power plug DISCONNECTED prior to performing any service/repair to electrical systems.



- The system controller contains no user-serviceable parts.
- The system controller includes a tamper indicator. Opening the system controller enclosure will void the warranty.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



JBICAVA

MAKING BOWLING AMAZING

- CAUTION. Thrown balls and scattering pins can cause injury if bowling play is allowed during an operator intervention. Operator is responsible for performing required safety procedures. Operator may implement lane barriers if needed to protect against thrown balls during maintenance.
- Keep end of pin hook away from face in case a ball is thrown during intervention.
- Do not reach into machine boundary with arms or body.

3.2.1. Clear Pin Tangle

- 1. Press WORK.
- 2. Open machine rear cover.
- 3. Unlatch (by pulling handle rearward) and pull curtain fully rearward.
- 4. Use pin hook to pull tangled pin strings within reach to pull pins out of pit.
- 5. Untangle the pins and place back into the pit.
- 6. Push curtain fully forward until latched.
- 7. Close machine rear cover.
- 8. Press PLAY.

3.2.2. Clear Stuck Ball on Pit Floor or Pindeck

- 1. Press WORK.
- 2. Open pit hinged top cover or machine rear cover to access stuck ball(s).
- **3.** Guide ball(s) toward ball door with grip end of pinhook.
- 4. Press **RE-SPOT** to allow ball door to open and re-spot pins if necessary.
- 5. Close all open covers.
- 6. Press PLAY.

3.2.3. Clear Stuck Ball at Ball Door

- 1. Press WORK.
- 2. Open pit hinged top cover or machine rear cover to verify ball is stuck at ball door.
- 3. Press **RE-SPOT**, this will open ball door.
- 4. Verify ball has rolled past ball door (may need to move ball with grip end of pin hook).
- 5. Close all open covers.
- 6. Press PLAY.

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000













3.2.4. Clear Ball Jam or Stuck Ball in Double Division



- 1. Press WORK.
- 2. Open pit hinged top cover or machine rear cover to access stuck ball(s).
- **3.** Lift ball door blade using grip end of pin hook, then pass pin hook through ball door opening to clear ball jam.
- 4. If ball(s) cannot be cleared, follow "Clear Stuck Ball at Chain Lift" (see Page 62).
- 5. Close all open covers.
- 6. Press PLAY.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 61

EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

3.3. Level 2 Interventions – Lockout/Tagout (LOTO) Required

CAUTION

JBICAVA

MAKING BOWLING AMAZING



- LOCKOUT/TAGOUT PROCEDURE MUST BE PERFORMED whenever an operator crosses machine boundary to perform maintenance. Ensure that all power is off and machine cannot re-energize. Lockout/Tagout operation protects against potential entanglement and potential electrical hazard. See Section 6.
- Thrown balls and scattering pins can cause injury if bowling play is allowed during an operator intervention. Operator is responsible to perform all required safety procedures. Deploy lane barriers to protect against thrown balls during maintenance (see Section 1.4 page 16).
- Level 2 interventions may only be performed by qualified personnel. Owner/facility manager must verify that operators are trained to work safely and perform required safety tasks.

3.3.1. Clear Stuck Ball at Chain Lift

Precautions: LOTO, Lane Barriers **Tools:**

- Ratchet or Impact Driver
- ¹/₂" Socket
- Pin Hook

Location: Operator Access Area (behind machine) Est. Time: 10 min

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove pit rear guards and double division guard.
- 3. Use pin hook or reach with hand to clear ball jam and remove any foreign objects.
- 4. Reinstall double division guard and pit rear guards.
- 5. Remove LOTO and lane barriers. Return machine to service.



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Section 4 Troubleshooting

4.1. Section Overview

MAKING BOWLING AMAZING

This section contains information that will help the user identify and correct common problems that might occur during normal machine operation. It also outlines the diagnostic tools available in the EDGE String USBC Approved Version system controller. In addition to displaying common error codes, the system controller also includes text-based and graphics-based diagnostic menus that display several machine parameters during operation. These tools can help the user quickly restore normal machine operation in the event of a malfunction.

Applicable Safety Warnings



WARNING:



• High voltage is present inside the system controller. Use caution when operating or handling this equipment. Implement lockout/tagout (LOTO) before servicing any electrical components (see Section 6). The main circuit breaker must always be OPEN, or the power plug DISCONNECTED, prior to performing any service/repair to electrical systems.



- The system controller contains no user-serviceable parts.
- The system controller includes a tamper indicator. Opening the system controller enclosure will void the warranty.

Read This First

If you have a problem with your EDGE String USBC Approved Version, always verify the following points before replacing system components or consulting QubicaAMF technical support.

- Check that the main electrical power at the system controller is ON. Verify that the main breaker has not been tripped.
- Check that the system controller is set to BOWL mode.
- Restart the system controller by cycling the main breaker OFF and then ON.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



- Check that all power and signal cables are securely connected. Confirm that all electrical contacts are fully inserted in their respective connectors.
- Reset any customized settings on the system controller back to factory defaults.
- Verify that the ball detector functions properly. The assembly should be activated ONLY when the light beam is obstructed.
- Review all troubleshooting items in this section.

4.2. System Controller Error Codes

In the event of a machine malfunction, the system controller screen will display an error code. These codes will be displayed in either constant or flashing text. Table 4-1 lists all possible error codes and explains possible causes for each one. Refer to Section 2 (Operation) for instructions on how to navigate the system controller menu structure and how to clear an error using the keypad.

When troubleshooting an error, perform only one check/alteration/adjustment at a time. The solutions shown below for each error code are listed in the intended troubleshooting order. Begin with the first solution listed for a given error. If the error persists, move on to the next suggested solution. Note that some errors require the operator to press **PLAY** to clear the error. If that is the case, press **PLAY** after each troubleshooting step to verify whether the error has been resolved.

Error codes that recur frequently should be noted and investigated further as they may be an indication of an incorrect machine setting or of equipment that should be replaced/adjusted.

The system controller displays separate error codes for both the odd and even lanes. When viewing a screen showing information for only one lane, only error codes associated with that lane will be displayed. Press **LANE** to switch between odd and even lanes. Multiple error codes on one lane will display one at a time. Clearing one will display the next.

Error Code	Explanation/Solution
BALL DET.	Both ball detector sensors are blocked for longer than 10s. Press
	WORK then PLAY to clear error. Check for any obstructions
	between detector and reflector. Check detector and reflector
	alignment. Check electrical connections between detector and
	system controller. Replace electrical cable if needed. Replace
	detector/reflector if needed.

Table 4-1, System Controller Error Codes

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

D	U	B	C	4	A	N	IF
	MAK	ING E	BOWL	ING A	MA	ZIN	3

BALL RETURN	The front ball return is in an error state, is powered off, or the signal cable to the system controller is disconnected. Reset any anomaly at ball return. If using a non-QubicaAMF ball return controller, check that Ball Return Select is set to OTHER in system controller settings. Check all electrical connections between ball return control box and system controller. Replace electrical cable if needed. Code will clear automatically once error is resolved.
CIRL COM ##	malfunction. Restart power to system controller. Reload system controller controller software. Replace system controller if needed.
DETANGLING	Machine is performing a detangle routine. Code will clear automatically once all pin strings are detangled or once detangle routine times out. A detangling routine can be stopped by pressing WORK.
DISABLED	System controller could not initialize all system components during start-up. Restart power to system controller. Check all electrical connections between system controller and control box. Replace electrical cable(s) if needed. Replace system controller and/or control box if needed. Note, code will always be displayed for missing lane of a single lane installation.
DRAWBAR 1	Drawbar movement is restricted. Press WORK then PLAY to clear error. Restart power to machine control box, press FULL SET , then press PLAY . Check that drawbar drive system is not jammed (drive chains too tight, internal string tangle, worn components, etc.). Check all electrical connections between control box and motor. Replace motor control box and/or motor if needed. Check coupling hubs for loose setscrews and key/keyway wear.
DRAWBAR 2	Expected drawbar motor encoder count was not reached within the pre-programmed time. Press WORK then PLAY to clear error. Restart power to machine control box, press FULL SET , then press PLAY . Check that drawbar drive system is not jammed (drive chains too tight, internal string tangle, worn components, etc.). Check all electrical connections between control box and motor. Replace control box and/or motor if needed.
DRIVE ERR 1	Machine control box does not recognize drawbar motor. Press WORK then PLAY to clear error. Restart power to control box, press FULL SET, then press PLAY. Check all electrical connections between control box and motor. Replace control box and/or motor if needed.
DRIVE ERR 2	Machine control box over-voltage condition. Press WORK then PLAY to clear error. Restart power to control box, press FULL SET , then press PLAY . Check all electrical connections between control box and drawbar motor. Replace control box and/or motor if needed.

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

DRIVE ERR 3	Machine control box over-temperature condition. Press WORK then PLAY to clear error. Restart power to control box, press FULL SET , then press PLAY . Check that drawbar drive system is not jammed (drive chains too tight, internal string tangle, worn components, etc.). Check all electrical connections between control box and motor. Replace control box and/or motor if needed.
DRIVE ERR 4	Machine control box internal voltage measurement error. Press WORK then PLAY to clear error. Restart power to control box, press FULL SET, then press PLAY. Check all electrical connections between control box and motor. Replace control box and/or system controller if needed.
DRIVE ERR 5	The actual value of the 24VDC output from the power supply is outside a specified range.
DRIVE ERR 6	System controller cannot find drawbar hard stop closest to reel arms (zero mark). Press WORK then PLAY to clear error. Restart power to machine control box, press FULL SET , then press PLAY . Check that drawbar drive system is not jammed (drive chains too tight, internal string tangle, worn components, etc.). Check that drawbar drive shaft coupling does not slip. Check that drawbar motor-to-gearbox coupling does not slip. Check all electrical connections between control box and motor. Replace control box and/or motor if needed.
DRIVE ERR 7	Machine could not perform drawbar calibration at start-up. Press WORK then PLAY to clear error. Restart power to machine control box, press FULL SET , then press PLAY . Check that drawbar drive system is not jammed (drive chains too tight, internal string tangle, worn components, etc.). Check that drawbar drive shaft coupling does not slip. Check that drawbar motor-to- gearbox coupling does not slip. Check all electrical connections between control box and motor. Replace control box and/or motor if needed.
DRIVE ERR13	Machine control box software update failed. Ensure that system controller E-Stop switch is not activated. Restart power to system controller, press FULL SET, then press PLAY.
DRIVE ERR14	Pinspotter fuse in system controller is blown or missing (see Page 43). Replace fuse. Restart power to system controller, press FULL SET, then press PLAY.
DRIVE ERR15	Machine control box not properly grounded. Press WORK then PLAY to clear error. Restart power to control box, press FULL SET , then press PLAY . Check electrical connection between machine and center's main grounding bus. Check that grounding screws are present and fully tightened between control box and pinspotter. Check that all other machine grounding screws are present and fully tightened. Replace control box if needed.

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 66



DRV CAL ERR	Drawbar failed to reach end of travel during first pinspotting cycle following machine startup or string adjustment procedure. Press WORK then PLAY to clear error. Check that strings are not too tight and loosen strings if needed. Restart power to machine control box, press FULL SET , then press PLAY . Check that drawbar drive system is not jammed (drive chains too tight, internal string tangle, worn components, etc.). Check all electrical connections between control box and motor. Replace control box and/or motor if needed.
E-STOP	Machine is shut down in emergency stop condition. E-STOP pushbutton has been pressed. Follow standard procedure to reset E-Stop. Check that E-Stop jumper is securely connected in rear of system controller. Replace system controller if needed.
E-LONG ERR	The ES control box on the Even lane is set for long strings (USBC), while the ES control box on the Odd lane is set for short strings.
KEYPAD ERR	Stuck button on system controller keypad. Replace system controller.
LENGTH ERR	The scoring system is trying to set the string length, but the machine is not an Edge String USBC.
LIFT ERR 1	Chain lift control box does not recognize chain lift motor. Press WORK then PLAY to clear error. Restart power to control box, press FULL SET, then press PLAY. Check all electrical connections between control box and motor. Replace control box and/or motor if needed.
LIFT ERR 2	Chain lift control box over-voltage condition. Press WORK then PLAY to clear error. Restart power to control box, press FULL SET , then press PLAY . Check all electrical connections between control box and chain lift motor. Replace control box and/or motor if needed.
LIFT ERR 3	Chain lift control box over-temperature condition. Press WORK then PLAY to clear error. Restart power to control box, press FULL SET , then press PLAY . Check that chain lift drive system is not jammed (drive chain too tight, lifter assembly caught, worn components, etc.). Check all electrical connections between control box and motor. Replace control box and/or motor if needed.
LIFT ERR 4	Chain lift control box internal voltage measurement error. Press WORK then PLAY to clear error. Restart power to control box, press FULL SET, then press PLAY. Check all electrical connections between control box and motor. Replace control box and/or system controller if needed.

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

LIFT ERR 6	Chain lift did not cycle after 30s of being instructed to operate.
	Press WORK then PLAY to clear error. Restart power to chain
	lift control box (chain lift should re-calibrate). Check that chain
	lift drive system is not jammed (drive chain too tight, lifter
	assembly caught, worn components, etc.). Check all electrical
	connections between control box and motor. Replace control box
	and/or motor if needed.
LIFT ERR 7	Invalid chain lift configuration set on the configuration impers.
LIFT ERR13	Chain lift control box software undate failed. Ensure that system
	controller E-Ston switch is not activated Restart power to system
	controller press FULL SET then press PLAV
LIFT ERR 14	Chain lift fuse in system controller is blown or missing (see Page
	43) Replace fuse Restart power to system controller press FULL
	SET then press PLAV
LIFT FRR 15	Chain lift control box not properly grounded Press WORK then
	PLAV to clear error. Restart power to control box, press FULL
	SET then press PLAV Check electrical connection between
	machine and center's main grounding bus. Check that grounding
	service are present and fully tightened between control box and
	screws are present and runy tightened between control box and mounting breaket and hetween mounting breaket and ningratten
	Choole that all other machine grounding groups are present and
	Check that all other machine grounding screws are present and
	i fully tightened. Replace control box il needed.
	Control Controlling and the second se
LIFT INIT	System Controller unable to communicate with the chain lift
LIFT INIT	System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes.
LIFT INIT MAIN ERR ##	System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller
LIFT INIT MAIN ERR ##	System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system
LIFT INIT MAIN ERR ##	System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed.
LIFT INIT MAIN ERR ## O LONG ERR	System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes.Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed.The ES control box on the Odd lane is set for long strings
LIFT INIT MAIN ERR ## O LONG ERR	System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short
LIFT INIT MAIN ERR ## O LONG ERR	System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings.
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes.Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed.The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings.Pin # (1-10) string movement after brake solenoid activation.
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical connections between machine control box and brake/encoder unit.
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical connections between machine control box and brake/encoder unit. Replace electrical cable(s) if needed. Replace control box if
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical connections between machine control box and brake/encoder unit. Replace electrical cable(s) if needed. Replace control box if needed.
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE## PIN ENC. ##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical connections between machine control box and brake/encoder unit. Replace electrical cable(s) if needed. Replace control box if needed. Pin # (1-10) string encoder could not sense string movement when
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE## PIN ENC. ##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical connections between machine control box and brake/encoder unit. Replace electrical cable(s) if needed. Replace control box if needed. Pin # (1-10) string encoder could not sense string movement when pin was raised/lowered. Press WORK then PLAY to clear error.
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical connections between machine control box and brake/encoder unit. Replace electrical cable(s) if needed. Replace control box if needed. Pin # (1-10) string encoder could not sense string movement when pin was raised/lowered. Press WORK then PLAY to clear error.
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical connections between machine control box and brake/encoder unit. Replace electrical cable(s) if needed. Replace control box if needed. Pin # (1-10) string encoder could not sense string movement when pin was raised/lowered. Press WORK then PLAY to clear error. Check that strings are not adjusted too tight. Replace
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical connections between machine control box and brake/encoder unit. Replace electrical cable(s) if needed. Replace control box if needed. Pin # (1-10) string encoder could not sense string movement when pin was raised/lowered. Press WORK then PLAY to clear error. Check that strings are not adjusted too tight. Replace brake/encoder unit if needed. Check for any string path anomalies. Check all electrical connections between machine string between machine control box and brake/encoder unit if needed.
LIFT INIT MAIN ERR ## O LONG ERR PIN BRAKE##	 System Controller unable to communicate with the chain lift controller. To clear, press PLAY on both lanes. Subsystem error (1-10). Operating system or system controller malfunction. Restart power to system controller. Reload system controller software. Replace system controller if needed. The ES control box on the Odd lane is set for long strings (USBC), while the ES control box on the Even lane is set for short strings. Pin # (1-10) string movement after brake solenoid activation. Machine made several attempts but failed to set brake. Press WORK then PLAY to clear error. Replace brake/encoder unit if needed. Replace any worn string(s). Check all electrical connections between machine control box and brake/encoder unit. Replace electrical cable(s) if needed. Replace error. Check that strings are not adjusted too tight. Replace brake/encoder unit if needed. Check for any string path anomalies. Check all electrical connections between machine control box and brake/encoder unit if needed.

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611 $web: www.qubicaamf.com\ -\ email:\ info@qubicaamf.com\ -\ eshop:\ eshop.qubicaamf.com\ -\ eshop:\ es$

PIN FELL	One or more pins fell over while being set on pindeck. Machine made several attempts but failed to set pins. Press WORK then PLAY to clear error. Check for foreign objects on pindeck. Check for damaged/worn pin bases and pin centering rings. Check that strings are not too loose. Increase value of system controller <i>Stabilize Time</i> setting (factory default is 2.0). Replace machine control box if needed.
SYS ERR 1	Internal subsystem error. Operating system or system controller malfunction. Restart power to the system controller. Reload system controller software. Replace system controller if needed. Report error to QubicaAMF technical support.
SYS ERR 2	Machine control box sensed string encoder pulses with all pins resting on pindeck. Press WORK then PLAY to clear error. Check string adjustment. Check that string support wire (Item 5, Page 83) is properly installed. Use string encoder counts on <i>Diagnostics Graphics</i> screen (Figure 2-24, Page 53) to identify a possible faulty brake/encoder unit. Replace brake/encoder unit.
SYS ERR 3	Internal subsystem error. Operating system or system controller malfunction. Restart power to the system controller. Reload system controller software. Replace system controller if needed. Report error to QubicaAMF technical support.
SYS ERR 4	Ball detector triggered before machine/scoring was ready for next ball (HWY66 configuration only). Check that system controller <i>Game</i> setting is set to 10PINS. Report error to QubicaAMF technical support.
TANGLED	Machine failed to detangle pins after several attempts. Manually detangle pin strings using pin hook. Press WORK then PLAY to clear error. Check for any string path anomalies. Check that strings are not adjusted too tight. Replace tangle switch emitter board if needed. Replace machine control box if needed. Check electrical connection between control box and tangle switch emitter board. Replace electrical cable if needed.
T-SENSOR	Optical tangle switch activated for longer than 20 seconds. Press WORK then PLAY to clear error. Replace tangle switch emitter board if needed. Replace machine control box if needed. Check electrical connection between control box and tangle switch emitter board. Check for any string path anomalies. Check for any broken reel arm springs.

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

4.3. Machine Control Box Operation/Troubleshooting

Each pinspotter is powered by a machine control box (P/N 051-203-110-xx). This unit powers all pinspotter subsystems including the drawbar motor, string brake/encoder boards, ball door actuator and tangle switch emitter board. It also handles all communication tasks between these subsystems and the system controller. The following chart outlines the functionality of the control board LED indicators during various operating conditions.

NOTE: At startup, the ES Control box turns the "pin 10" LED on to identify that the machine is an Edge String USBC.



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 70

4.4. Chain Lift Control Box Operation/Troubleshooting

JBICAVA

MAKING BOWLING AMAZING

The chain lift is also powered by a chain lift control box (P/N 051-203-110-xx), independent from the Odd and Even machine control boxes. This unit powers the chain lift drive motor and the ball detection sensors. It also handles all communication tasks between these subsystems and the system controller. The following chart outlines the functionality of the control board LED indicators during various operating conditions.



Machine control box internal communication error

The number of flashes indicates a specific drive error. Error will also display on the system controller

LED 6 Flashing - BALL LIFT IS WAITING FOR COMM - Waiting for communications from the system controller. Once communication is established, it will begin calibration.

LED 6 & 7 Flashing - BALL LIFT IS CALIBRATING - Calibration attempt in progress. Once calibrated, these LED's will turn off.

LED 6, 7 & 8 Flashing - BALL LIFT IS IN SAFE MODE - Calibration failed. Must power cycle to correct.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



4.5. Additional Troubleshooting Cases

This section covers additional scenarios which may not trigger a system controller error code but must be addressed to restore normal machine operation. For each scenario, possible causes are listed in the order of highest likelihood, beginning with the most likely root cause.

4.5.1. Ball Not Returned to Bowler

Cause 1: Ball stuck in pit away from door.

Solution: Open hinged pit cover and clear ball from pit using pin hook (see Page 60).

- Cause 2: Ball door electrical/mechanical problem.
 - Solution: Check all electrical connections between machine control box and ball door actuator, and between control box and system controller. Check that ground screws are fully tightened between control box and mounting bracket and machine. Replace control box and/or ball door actuator if necessary. Inspect ball door assembly for any mechanical issues (jammed hub, loose/broken hardware). Replaces components as needed.

Cause 3: Ball jam on double division rail system leading to chain lift.

Solution: Open hinged pit cover and clear ball jam using pin hook through ball door. If access is not available through ball door, remove double division cover and clear ball using pin hook (see Page 62; LOTO required). Check for damage/wear on double division rail covers.

Cause 4: Chain lift electrical/mechanical problem.

Solution: Check all electrical connections between chain lift control box and chain lift motor and between control box and system controller. Check all electrical connections to ball sensors at bottom of chain lift. Check that ground screws are fully tightened between control box and mounting bracket and between mounting bracket and machine. Replace control box and/or motor if needed. Remove chain lift from machine (see Page 179) and inspect for any mechanical issues (slipping drive shaft coupling, damaged lifter assembly, damaged sprocket, loose chain). Replace components as needed.

Cause 5: Improper cross sweep-to-downsweep connection.

Solution: Check that all hardware at cross sweep-to-downsweep junction is in place and fully tightened. Verify smooth transition between cross sweep and downsweep. Adjust as needed.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 72


Cause 6: System controller *Auto Backend Shutoff* and/or *Auto Ball Return Shutoff* settings set to ON. Solution: Set system controller *Auto Ball Return Shutoff* settings to OFF

(see Page 51). Cause 7: Chain lift fuse in system controller is blown (lanes will be in

STANDBY mode). Solution: Replace chain lift fuse in system controller (see Page 43).

4.5.2. Chain Lift Runs Continuously at Slow Speed

Cause 1: Defective chain lift ball sensor.

Solution: Check all electrical connections between chain lift control box and ball sensors at bottom of chain lift. Remove chain lift from machine (see Page 179) and replace ball sensor(s)/cables if needed. Replace control box if needed.

Cause 2: Slipping gearmotor shaft coupling.

Solution: Check that both coupling hubs are fully tightened to drive shaft with keys in place. Check condition of coupling spider. Replace if needed.

Cause 3: Defective chain lift gearmotor. Solution: Replace gearbox and/or motor (see Page 178).

4.5.3. Chain Lift Stops in Wrong Location

Cause 1: Chain lift control box improper calibration.

Solution: Clear all balls from double division rail system. Restart power to control box. Chain lift will power up and begin calibration process automatically (lift will cycle several revolutions at slow speed). Chain lift should stop with one lifter assembly at bottom of lift and other lifter assembly at top of lift.

Cause 2: Slipping gearmotor shaft coupling.

Solution: Check that both coupling hubs are fully tightened to drive shaft with keys in place. Check condition of coupling spider. Replace if needed.

Cause 3: Defective chain lift gearmotor. Solution: Replace gearbox and/or motor (see Page 178).

4.5.4. Shield Panel Does Not Actuate Correctly

Cause 1: Improper string connection at drawbar and/or shield panel. **Solution:** Check that actuation string quick link is securely connected to drawbar and bottom hole in shield panel bracket.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 73

4.5.5. Machine Does Not Cycle When Ball is Thrown

- Cause 1: System controller *Chassis Mode* setting not set correctly for given lane. Solution: Set system controller *Chassis Mode* setting to BOWL (see Page 51).
- Cause 2: System controller error code (machine has shut down). Solution: See Table 4-1 page 64 for complete list of system controller error codes and troubleshooting tips.
- Cause 3: Ball detector malfunction/out of alignment.
 - Solution: Check ball detector/reflector alignment (see Page 164). Check for any damage or dust on reflector and sensor. Check all electrical connections between ball detector and system controller. In the *Text* or *Graphics* sub-menus of the system controller *Diagnostics* menu, verify that *Ball Detector* status alternates between BALL and NO BALL while passing object through detector beam (see Page 54). Restart power to system controller. Replace components as needed.

4.5.6. Machine Cycles When Ball is Not Thrown

Cause 1: Ball detector malfunction/out of alignment or is dirty.

Solution: Check ball detector/reflector alignment. Check for any damage or dust on reflector and sensor. Check all electrical connections between ball detector and system controller. In the *Text* or *Graphics* sub-menus of the system controller *Diagnostics* menu, verify that *Ball Detector* status alternates between BALL and NO BALL while passing object through detector beam (see Page 54). Restart power to system controller. Replace components as needed.

4.5.7. Pins Do Not Settle on Pindeck at Same Time

Cause 1: Strings are too tight/loose. **Solution:** Perform a string adjustment (see Page 154).

4.5.8. Pins Fell Over When Being Spotted

Cause 1: Strings are too loose. Solution: Perform a string adjustment (see Page 154).

Cause 2: Bottom of pin is damaged. **Solution:** Replace pin (see Page 156).

Cause 3: Foreign object on playing surface. **Solution:** Clean pindeck (see Page 153).

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 74

4.5.9. System Controller Keypad Non-Responsive

Cause 1: Faulty keypad/system controller.

Solution: Using the *Keypad Test* tool in the system controller *Diagnostics* menu (see Page 55) test any non-functioning pushbuttons. Restart power to system controller. Replace system controller if needed.

4.5.10. Machine Not Scoring Correctly

Cause 1: System controller *Scoring System* setting not set correctly. Solution: If operating with QubicaAMF scoring, set system controller *Scoring System* setting to SCORING. If operating with non-QubicaAMF scoring, set to BASIC or STANDALONE. See Page 51.

Cause 2: System controller *Game* setting not set correctly. Solution: Set system controller *Game* setting to 10 PINS (see Page 51).

Cause 3: System controller *Inhibit Pin Errors* setting not set correctly.
Solution: Set system controller *Inhibit Pin Errors* setting to OFF see Page 51). System controller will now output pin encoder and pin brake errors (if applicable), which can then be addressed.

Cause 4: System controller *Pin Data Delay* setting not set correctly.

Solution: Factory default setting is 3.0 seconds. (see Page 51). Increasing value will provide more time for pin action to settle before frame is scored but will delay start of next machine cycle.

Cause 5: System controller *Pin Detect Count* setting not set correctly. Solution: Recommended setting is 12 (see Page 51). Increasing value will allow for greater pin shift (off-spotting) during play but may not score a pin correctly if value is set too high.

4.5.11. Foul Detector Not Functioning Correctly

Cause 1: Foul detector malfunction.

Solution: Check foul detector/reflector alignment. Check for any damage or dust on reflector and sensor. Check all electrical connections between foul detector and system controller. In the *Text* sub-menu of the system controller *Diagnostics* menu, verify that *Foul Detector* status alternates between FOUL and NO FOUL while passing object through detector beam (see Page 54). Restart power to system controller. Replace components as needed.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

Cause 2: System controller *Foul Detector* setting not set correctly.
 Solution: Set system controller *Foul Detector* setting to ON to allow foul detector activation to control scoring. Set to WARNING for warning only (no effect on scoring). Set to OFF to deactivate foul detector (see Page 51).

4.5.12. Mask Lights Not Functioning Correctly

Cause 1: Mask light unit malfunction.

MAKING BOWLING AMAZING

Solution: Check all electrical connections between mask light unit and system controller. In the *Text* sub-menu of the system controller *Diagnostics* menu, verify that *Mask Light On* status alternates between BALL 1 and BALL 1/BALL 2 for each frame (see Page 54). Restart power to system controller. Replace components as needed.

Cause 2: System controller *Mask Lights* setting not set correctly. Solution: Set system controller *Mask Lights* parameter to AS BALL NUMBER (see Page 51).

4.5.13. Pitlight Not Functioning Correctly

Cause 1: Pitlight/system controller malfunction.

Solution: Restart power to system controller. Check all electrical connections between system controller and pit light (including ground wire). If operating with CenterPunch Effects Server, check electrical connections to adjacent system controllers and refer to manual 400-275-000 for proper effects server installation/operation.

Cause 2: System controller *Pit Light* setting not set correctly. Solution: Set system controller *Pit Light* setting to WHITE for white light only. Set to COLOR for alternative light color.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 76

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



Section 5 Drawings & Parts Lists

General Notes

- Any part number shown in **BOLD** type in a parts list indicates that there is an exploded • view drawing for that item on the following pages.
- Some part numbers are listed as ###-###-XX, where "-XX" represents -01 through -• 99 for revisions. Please contact QubicaAMF for help with ordering replacement parts.
- This section does not cover items specific to extra-wide machine pair installations. See EDGE String USBC Approved Installation Manual (400-051-261), Section 13 for reference.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 77

EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



5.1. Kickbacks



Item	Part Number	Description
1	051-200-079	SIDE FRAME SPRT PLATE CMN
2	829-642-202	SCREW, FHPTS 12 X 1.25 ZN TY17
3	051-200-220	ASM, KICKBACK, COMMON
4	817-157-201	SCREW, HHMS ⁵ / ₁₆ -18 X 1.25 BP SEMS DP
5	722-501-104	SFR 0.38 X 0.56 X 0.53 BO
6	814-852-802	#16 x 5.00 FHPWS ZN
7	051-200-504	KICKBACK NOSE BLOCK
8	051-202-175	ASM, KICKBACK, 07P
9	051-200-228	KICKBACK DBL DIV, FILL TOP
10	051-200-227	KICKBACK DBL DIV, FILL FRNT
11	051-202-176	ASM, KICKBACK, 10P
12	049-006-531	SCREW, FHPWS 10 X 2.00 ZN
13	051-202-136	WDMT, CHAIN LIFT MOUNT

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 78



5.2. Ball Detector



Item	Part Number	Description
1	051-200-776	ES BALL TRIGGER REFLECTOR (incl items 5, 9, 10)
2	288-300-019	PHOTOSENSOR w/SUPPORT
3	289-300-117	4FOT SMD BOARD
4	289-X06-117	VITE M4x10 T.C. CROCE ZNC
5	289-X06-140	VITE M3x6 T.C.CROCE ZNC
6	289-X06-257	CROSS RECESSED PAN HEAD
7	289-X09-280	ES SHORT SENSOR - BASE
8	289-X09-281	ES SHORT SENSOR – COVER
9	289-X09-282	210 mm SHORT REFLECTOR PLATE
10	PLAREF30AS	ROUND REFLECTOR 31mm
11	SCRKIT15	VITE M3x8 T.C.CROCE ZNC

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 79



5.3. 10-Pin Bowling Pin



Item	Part Number	Description
1	031-480-339	SET OF 10 PINS, EDGE STRING AMFLITE GLOW
2	051-160-014	PIN SLEEVE
3	051-202-181	STRING- 1 PIN
4	051-202-182	STRING- 2, 3 PINS
5	051-202-183	STRING- 4-6 PINS
6	051-202-184	STRING- 7-10 PINS

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 80

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611 $web: www.qubicaamf.com\ -\ email:\ info@qubicaamf.com\ -\ eshop:\ eshop.qubicaamf.com\ -\ eshop:\ es$



5.4. Pinspotter (Frame)



Item	Part Number	Description
1	01-065	FW 5/16 USS ZN
2	051-070-084	DECAL, ENTANGLEMENT - GEARS
3	051-200-007	WDMT, END PANEL
4	051-200-085	WDMT, MACH MOUNT LH
5	051-200-086	WDMT, MACH MOUNT RH
6	051-200-252	PAINT PROTECTION STRIP
7	051-200-258-01	REEL ARM COVER PANEL WT. DECAL
8	051-200-259	PLASTIC PULL HANDLE
9	051-200-318	WDMT, DRIVE TENSIONER BRKT
10	051-200-319	WDMT, TENSIONER, ADJ. ARROW
11	051-200-362	WDMT, STRING TRAY SUPPORT
12	051-200-609	MACH COVER SUPPORT
13	051-200-808	MECH LUG, 2 WIRE, 14-1/0 AWG
14	051-202-112	ES USBC SIDE PLATE, 07P
15	051-202-113	ES USBC SIDE PLATE, 10P
16	051-202-118	ES USBC PINSPOTTER TOP GUARD
17	051-202-119	ASM, ES USBC MACH TOP COVER ADPTR
18	088-001-823	COMPRESSION SPRING
19	7016-411032-062	PHPMS 10-32 X 0.63 ZN
20	7024-710800-075	THPTS 8 X 0.75 ZN TYA
21	7050-021050-006	FW 10 SAE ZN
22	722-501-100	SFR 0.19 X 0.19 X 0.31 NY
23	809-857-245	HHCS 5/16-18 X 1.50 GR8 PB
24	818-757-121	HWMS 5/16-18 X .75 GR8 BP DP
25	823-449-117	HWFTS 1/4-20 X .50 ZN
26	838-740-002	HLN 10-32 ZN NM

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 81



5.5. Pinspotter (Top Guard & Side)



Item	Part Number	Description
1	051-200-028	WDMT, FLG BEARING NUT PL
2	051-200-232	IR TRANSMITTER
3	051-200-252	PAINT PROTECTION STRIP
4	051-200-414	WDMT, MACHINE CONNECTOR
5	051-200-608	MAGNETIC LATCH 40LB
6	051-200-734	DRAWBAR MAGNET SUPPORT
7	051-202-112	ES USBC SIDE PLATE, 7PS
8	051-202-118	ES USBC PINSPOTTER TOP GUARD
9	051-202-173	WIRE DUCT, ES USBC MACHINE
10	701-424-000	FLANGE BEARING
11	7016-411032-062	SCREW, PHPMS 10-32 X 0.63 ZN
12	7108-401800-050	RIVET, RVT BLD 0.19 X 0.43 AL
13	711-506-000	GROMMET, GPI 0.75 X 0.88 X 0.09 RB 1
14	801-757-160	SCREW, FBCS 5/16-18 X 1.00 GR8 BO
15	809-849-100	1/4-20 x 0.63 SCR HHC GR8 BO
16	813-233-062	PHPMS 6-32 X 0.38 ZN SEMS
17	818-240-062	PHPMS 10-32 X 0.38 ZN SEMS
18	818-240-082	SCREW, PHPMS 10-32 X 0.50 ZN SEMS
19	838-740-002	NUT, HLN 10-32 ZN NM
20	948-631-062	5/32 x 3/8 x 3/64 WASHER

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 82



5.6. Pinspotter (Underside)



Item	Part Number	Description
1	051-200-086	WDMT, MACH MOUNT RH
2	051-200-085	WDMT, MACH MOUNT LH
3	01-065	WASHER, FW ⁵ / ₁₆ USS ZN
4	809-857-245	SCREW, HHCS ⁵ / ₁₆ -18 X 1.50 GR8 PB
5	051-200-315	STRING SUPPORT WIRE, 0.25
6	711-001-003	CAP
7	051-200-362	WDMT, STRING TRAY SUPPORT
8	051-200-198	STRING TRAY
9	818-757-121	SCREW, HWMS ⁵ / ₁₆ -18 X 0.75 BP DP
10	835-557-003	NUT, HFJN ⁵ / ₁₆ -18 BO
11	919-005-001	RNG SE 0.238 X 0.035 BP

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 83



5.7. Gearmotor & Control Box



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 84



5.8. Gearmotor & Control Box Parts List

Item	Part Number	Description
1	051-203-110-XX	ASM, CONTROL BOARD
2	818-240-082	SCREW, PHPMS 10-32 X 0.50 ZN SEMS
3	051-200-073	MACHINE WIRE HARNESS
4	051-200-313	WDMT, DRIVE SIDE NUT PLATE
5	051-200-364	WDMT, DRAWBAR STOP
6	051-200-308	WDMT, INLINE GB MOUNT BACK
7	701-024-032	BEARING
8	785-501-786	COUPLING HUB
9	907-200-800	KEY, SQ 0.19 X 0.72 Q
10	785-501-787	COUPLING SPIDER
12	051-200-310-01	ASM, GEARMOTOR, DRAWBAR
13	051-200-312	MOTOR MOUNT, SPACER
14	051-200-311	INLINE GB MOUNT FACE
15	801-757-121	SCREW, FBCS 5/16-18 X 0.75 GR5 BP PA
16	827-006-167	HWMS M6.1 X 16 ZN FT
17	818-757-161	HWMS 5/16-18 X 1.00 GR8 BP DP
18	818-757-121	SCREW, HWMS 5/16-18 X 0.75 BP DP
19	711-508-034	GROMMET, GPI 1.25 X 1.50 X 0.09 RB 1
20	051-202-113	ES USBC SIDE PLATE 10 PS
21	823-449-117	SCREW, HWFTS ¹ / ₄ -20 X 0.50 ZN TY1
22	818-240-062	PHPMS 10-32 X 0.38 ZN SEMS
23	051-200-734	DRAWBAR MAGNET SUPPORT
24	051-200-608	MAGNETIC LATCH 40LB
25	948-631-062	5/32 x 3/8 x 3/64 WASHER
26	813-233-062	PHPMS 6-32 X 0.38 ZN SEMS

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 85

EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

 $web: www.qubicaamf.com\ -\ email:\ info@qubicaamf.com\ -\ eshop:\ eshop.qubicaamf.com\ -\ eshop:\ es$



5.9. Drawbar Tensioner



Item	Part Number	Description
1	809-857-487	SCREW, HHCS ⁵ / ₁₆ -18 X 3.00 GR5 ZN FT
2	948-722-111	WASHER, FW ⁵ / ₁₆ SAE BO
3	051-200-318	WDMT, DRIVE TENSIONER BRKT
4	051-200-317	WDMT, DRIVE TENSIONER
5	088-001-823	COMPRESSION SPRING
6	051-200-319	WDMT, TENSIONER, ADJ. ARROW
7	051-200-364	WDMT, DRAWBAR STOP
8	701-424-000	FLANGE BEARING
9	801-757-160	SCREW, FBCS ⁵ / ₁₆ -18 X 1.00 GR8 BO
10	818-757-121	SCREW, HWMS ⁵ / ₁₆ -18 X 0.75 BP DP
11	823-449-117	SCREW, HWFTS 1/4-20 X 0.50 ZN TY1

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 P

Page 86

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

5.10. Drawbar Assembly & Chain Drive

QUBICA®AMF

MAKING BOWLING AMAZING



Item	Part Number	Description
1	9102092	SPROCKET
2	01-122	RIVET, RVT BLD 0.19 X 0.55 ZN
3	051-200-012-01	DRAWBAR & PULLEY ASM
4	051-200-016	DRIVE SHAFT, REAR
5	051-200-017	DRIVE SHAFT, FRONT
6	051-202-116	DRAWBAR DRIVE CHAIN
7	051-202-114	BAR, DRAWBAR GUIDE
8	051-200-530	SPROCKET GUARD
9	070-001-909	SET SCREW, SSS 1/4-20 X 0.31 CUP BO PA
10	818-240-082	SCREW, PHPMS 10-32 X 0.50 ZN SEMS
11	907-200-800	KEY, SQ 0.19 X 0.72 Q
	M0690011	MASTER LINK #40 CHAIN (not shown)

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





5.11. Drawbar & Pulley Assembly 051-200-012-01



Item	Part Number	Description
1	051-200-013	DRAWBAR SHAFT
2	051-200-020	DRAWBAR PULLEY, SHIELD, ANGLE
3	051-200-034	SPACER
4	051-200-184-01	ASM, DRAWBAR CARRIAGE
5	051-200-735	ASM, DRAWBAR PULLEY
6	7018-002520-087	SHSCS 1/4-20 X 0.88 BO
7	801-749-562	FBCS 1/4-20 X 0.63 GR8 BO

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 88

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



5.12. Drawbar Pulley Assembly 051-200-735



Part Number	Description
051-200-736	DRAWBAR PULLEY PLATE
7016-411032-075	PHPMS 10-32 X 0.75 ZN
7016-411032-125	PHPMS 10-32 X 1.25 ZN
7036-001032-000	HLN 10-32 ZN NM
9103071	SFR .188 X 0.38 X 0.13 NY
M-0100B	BUSHING
P-016A	PULLEY
	Part Number 051-200-736 7016-411032-075 7016-411032-125 7036-001032-000 9103071 M-0100B P-016A

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

5.13. Drawbar Carriage Assembly 051-200-184-01

QUBICA®AMF

MAKING BOWLING AMAZING



Item	Part Number	Description
1	051-200-041	WDMT, DRAWBAR CARRIAGE ANGLE
2	051-200-737	DRAWBAR GUIDE
3	809-849-205	SCREW, HHCS 1/4-20 X 1.25 GR8 BO
4	838-549-002	NUT, HLN ¼-20 ZN NE

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 90

EUROPEAN HEADQUARTERS

3111 - USA Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611 web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



5.14. Brake/Encoder Assembly



Item	Part Number	Description
1	01-519	5/16-18 HEX FLANGED NUT
2	051-070-043	DECAL, NO ACCESS UNAUTHORIZED
3	051-200-030	WDMT, B/E SUPPORT CHANNEL 10PIN
4	051-200-039	WDMT, STRING GUARD
5	051-200-050-02	ASM, BRAKE/ENCODER UNIT
6	051-200-068	STRING COMB PLATE
7	051-200-235	BRAKE ENCODER WIRE DUCT
8	051-200-255	PIN ID DECAL, 10PIN
9	7108-401800-050	RIVET, RVT BLD 0.19 X 0.43 AL
10	809-857-100	SCREW, HHCS 5/16-18 X 0.63 GR8 BO

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 91



5.15. Brake/Encoder Unit Assembly 051-200-050-02



Item	Part Number	Description
1	051-200-052-01	ASM, B/E SUPPORT PLATE
2	051-200-053	BRAKE PAWL
3	051-200-055	ASM, ENCODER PULLEY
4	051-200-056	STRING GUIDE
5	051-200-058	BRAKE/ENCODER BOARD
6	051-200-059	BRAKE/ENCODER CABLE
7	051-200-281	STRING RETENTION WIREFORM
8	051-200-715	BRAKE PAWL LINKAGE
9	051-200-777	SOLENOID PULL-24VDC
10	722-505-003	SFR 0.32 X 0.50 X 0.09 AL
11	810-257-221	SHSCS 5/16-18 X 1.38 BO
12	813-227-047	PHPMS 6-32 X 0.25 ZN SEMS
13	818-233-052	PHPMS 8-32 X 0.31 ZN SEMS
14	818-240-062	PHPMS 10-32 X 0.38 ZN SEMS
15	840-039-002	HLN 10-24 FLX CAD L/T
16	856-057-007	HFLN 5/16-18 ZN NE GR5
17	880-149-161	SHSSB 1/4 X 1.00 BO

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 92



5.16. Reel Arm Assembly



Item	Part Number	Description
1	051-200-037	WDMT, REEL ARM FRAME
2	051-200-036	REEL ARM SHAFT
3	051-200-286	ASM, REEL ARM
4	S-080	EXTENSION SPRING
5	7018-002520-087	SCREW, SHSCS ¹ /4-20 X 0.88 NS
6	948-884-187	WASHER, FW 0.68 X 1.13 X 0.08 ZN
7	051-200-034	SPACER
8	051-200-257	UHMW EDGE WEAR STRIP
9	818-757-121	SCREW, HWMS ⁵ / ₁₆ -18 X 0.75 BP DP

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



5.17. Tables Assembly



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 94

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Tables Assembly Parts List

Item	Part Number	Description
1	051-200-064	UPPER TABLE, 10PIN
2	051-200-061	LOWER TABLE, 10PIN
3	051-200-080	WDMT, MACHINE SUPPORT
4	051-200-067	WDMT, LWR TABLE MOUNT
5	051-200-062	ASM, TABLE PULLEY
6	051-200-027	10PIN CENTERING RING
7	7050-050106-009	WASHER, FW 12 SAE ZN
8	M-0041	SCREW, HHCS 1/2-20 X 1.75 ZN SP
9	7036-003716-000	NUT, HLN ³ /8-16 ZN NE
10	721-508-029	ISOLATOR, VIBR MT 1.63 X 0.38 M-F
11	801-265-248	BOLT, CB ³ / ₈ -16 X 1.50 SS
12	838-849-007	NUT, HLN ¼-20 ZN NTE
13	000-026-865	WASHER, FW 0.25 X 0.88 X 0.06 ZN
14	811-949-287	SCREW, FHPMS ¼-20 X 1.75 ZN
15	859-048-168	SCREW, FBLS 5/16 X 1.00 HG
16	051-200-069	STRING GUIDE, HEAD PIN
17	7038-003118-000	NUT, KN ⁵ / ₁₆ -18 ZN
18	01-065	WASHER, FW ⁵ / ₁₆ USS ZN
19	7030-003118-325	U BOLT, UB ⁵ / ₁₆ -18 X 3.25 NS
20	809-857-245	SCREW, HHCS ⁵ / ₁₆ -18 X 1.50 GR8 PB
21	835-557-003	NUT, HFJN ⁵ / ₁₆ -18 BO

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



5.18. Shield Mounting Assembly



Item	Part Number	Description
1	01-065	WASHER, FW 5/16 USS ZN
2	01-519	NUT, HFLN 5/16-18 ZN SER
3	051-200-213	HARD STOP BRACKET
4	051-202-226	ACTUATION STRING
5	051-200-870	ASM, SHIELD PULLEY
6	801-257-248	BOLT, CB 5/16-18 X 1.50 SS
7	809-857-280	SCREW, HHCS 5/16-18 X 1.75 GR8 PB
8	818-757-121	HWMS 5/16-18 X .75 BP DP
9	835-557-003	NUT, HFJN 5/16-18 BO
10	HW251	1/4" QUICK LINK

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

5.19. Shield/Pitlight Assembly

QUBICA®AMF

MAKING BOWLING AMAZING



Item	Part Number	Description
1	01-392	SCREW, PHPMS 10-32 X 1.75 ZN
2	01-519	NUT, HFLN 5/16-18 ZN SER
3	051-070-025	CARABINER SHIELD TMS
4	051-200-202	WDMT, SHIELD/PITLIGHT BKT, 10P
5	051-200-204	WDMT, SHIELD/PITLIGHT BKT, 07P
6	051-200-205	HANGER BRACKET
7	051-200-209	SHIELD PANEL
8	051-200-210	HINGE BACKING PLATE
9	051-200-211	SHIELD REINFORCEMENT TUBE
10	051-200-212-01	STRING ATTACHMENT BRACKET
11	051-200-874	HARD STOP STRING
12	051-200-876	CROSS BRACE
13	275-002-035	CP DECK LIGHT FIXTURE
14	7016-411032-062	SCREW, PHPMS 10-32 X 0.63 ZN
15	7016-411032-075	SCREW, PHPMS 10-32 X 0.75 ZN
17	7050-021050-006	#10 WASHER FLAT SAE
18	711-506-000	GROMMET, GPI 0.75 X 0.88 X 0.09 RB 1
19	818-757-121	HWMS 5/16-18 X 0.75 GR8 BP DP
20	838-740-002	NUT, HLN 10-32 ZN NM
21	863-040-087	SCREW, PHPMS M4-0.7 X 8 ZN
22	935-023-098	RVT BLD 0.19 X 0.58 AL BLK
23	HW251	THREADED QUICK LINK
24	M-0700-51	HINGE

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 P

Page 97

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

5.20. Retractable Curtain Assembly 051-202-249

QUBICAVAME

MAKING BOWLING AMAZING



Item	Part Number	Description
1	051-202-239	RT CURTAIN SLIDE BLOCK
2	051-202-240	RC LATCH BLOCK 7PS
3	051-202-241	RC LATCH BLOCK 10PS
4	051-202-242	RETRACTABLE CURTAIN HANDLE
5	051-202-244	PIT CURTAIN CLAMP
6	051-202-245	WDMT, RETRACTABLE CURTAIN USBC
7	051-202-246	RAIL CATCH
8	051-202-247	RC ANGLE TRACK
9	051-202-251	RETRACTABLE PIT CURTAIN
10	808-549-102	BHSCS 1/4-20 X 0.63 BO
11	808-840-261	FHSCS 10-32 X 0.38 BO
12	808-849-120	FHSCS 1/4-20 X 0.75 BO
13	817-149-141	HHMS 1/4-20 X .88 BP SEMS DP
14	818-757-121	HWMS 5/16-18 X .75 GR8 BP DP
15	856-149-001	HFLN 1/4-20 BO STV
16	856-157-001	HFLN 5/16-18 BO STV
17	908-040-087	PIN GR 0.19 X 0.50 ZN C

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 98

5.21. Odd Machine Pit Floor Assembly

QUBICAVAME

MAKING BOWLING AMAZING



Item	Part Number	Description
1	051-200-729-01	ASM, PIT FLOOR, ODD
2	051-200-731-01	PIT FLOOR SUPPORT, ANGLED
3	051-200-733-01	ASM, PIT FLOOR SUPPORT, ANGLED (incl. items 2, 4, 11)
4	051-200-757	PIT FLOOR STRIP, HOOK
5	051-202-121	ASM, ES USBC PIT FLOOR SUPPORT (incl. items 4, 6, 11)
6	051-202-122	ES USBC PIT FLOOR SUPPORT
7	051-202-148	ASM, PIT BRIDGE SUPPORT CHAN (incl. items 4, 8, 11)
8	051-202-149	PIT BRIDGE SUPPORT CHAN
9	051-202-150	ASM, ES USBC PIT, BRIDGE BOARD (incl. items 9, 10)
10	051-202-153	ES USBC PIT, BRIDGE PLASTIC
11	7108-401800-050	3/16 X 1/2 ALUM POP RIVET DH
12	818-757-161	HWMS 5/16-18 X 1.00 GR8 BP DP

400-051-247 Rev. C

P

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

5.22. Odd Machine Back End Assembly

QUBICA®AMF

MAKING BOWLING AMAZING



ltem	Part Number	Description
1	051-200-172	PIT CROSS SUPPORT
2	051-200-174	WDMT, SHOCK MOUNT
3	051-200-181	ASM, CUSHION, ODD
4	051-200-379	PIN STOP CHANNEL, ODD
5	051-200-536	ASM, PIT COVER, TOP
6	051-200-589	DECAL, PIT REAR GUARD
7	051-200-631	ASM, PIT REAR GUARD, ODD
8	051-202-140	WDMT, SIDEFRAME, ODD 07P
9	051-202-142	WDMT, SIDEFRAME, ODD 10P
10	051-202-249	RETRACTABLE CURTAIN ASSY
11	051-203-109	WDMT, SUPPORT, COVER, PIT
12	088-002-275	JACK SCREW
13	088-002-276	LOCKING TAB
14	817-157-151	SCREW, HHMS 5/16-18 X 0.94 BP SEMS DP
15	817-157-201	HHMS 5/16-18 X 1.25 BP SEMS DP
16	818-757-141	SCREW, HWMS 5/16-18 X 0.88 BP DP
17	946-688-322	WASHER, FW 0.81 X 2.00 X 0.16 ZN

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 P

Page 100

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



5.23. Odd Machine Pit Cushion Assembly



Item	Part Number	Description
1	070-002-050	CUSHION TUBE WLDMT, ODD
2	000-024-796	PLANK ODD, CUSHION ASM ODD
3	000-022-770	SPONGE PAD, CUSHION ASM
4	000-024-807	CUSHION RUBBER, ODD
5	051-200-254	CUSHION CVR, EXTENDED, 6-HOLE
6	000-028-529	RIVET, CUSHION ASM
7	7023-410800-100	SCREW, PHPPS 8 X 1.00 BO
8	000-024-750	CUSHION MOUNT WELDNUT
9	801-865-287	SCREW, FBCS ³ / ₈ -16 X 1.75 GR5 ZN PAS
10	801-865-367	SCREW, FBCS ³ / ₈ -16 X 2.25 GR5 ZN PAS
11	770-011-232	CABLE TIE, CBT 14.0 X 4.00 X 120 BLK

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





5.24. Odd Machine Ball Door Assembly



Item	Part Number	Description
1	049-007-750	ACTUATOR, 290N, 50mm, M0
2	049-007-752	CLEVIS, DECOUPLING, 50MM, ACTL
3	051-202-159	ASM, BLADE BALL DOOR, ODD
4	051-202-167	ASM, BALL DOOR SHAFT (incl items 5, 17)
5	051-202-168	BALL DOOR SHAFT
6	051-202-169	WDMT, CLEVIS BRKT, SIDE MOUNT
7	051-202-172	BALL DOOR FLANGE BEARING
8	7050-034175-012	1.75 x .344 x .062 WASHER FLAT
9	706-902-005	PIN CL 0.31 X 1.13 ZN
10	706-902-007	PIN CL 0.25 X 1.06 ZN
11	801-757-081	SCREW 5-16/18 x 1/2 HEX WASHER
12	808-849-100	1/4-20 x 5/8 SCREW SOFL
13	809-849-245	1/4-20 x1 1/2 SCR HXHD GR8 BLK
14	818-757-121	HWMS 5/16-18 X .75 BP DP
15	856-149-001	1/4-20 HFLN BO STV
16	911-064-237	3/8 x 1 3/8 COTTER PIN ZINC BOWTIE
17	913-437-100	0.19 x 0.63 PIN NS
18	948-753-101	1/4 FLAT WASHER BLACK OXIDE

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 P

EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



5.25. Even Machine Pit Floor Assembly



Item	Part Number	Description
1	051-200-728-01	PIT FLOOR ASSEMBLY, EVEN
2	051-200-731-01	PIT FLOOR SUPPORT, ANGLED
3	051-200-733-01	ASM, PIT FLOOR SUPPORT, ANGLED (incl. items 2, 4, 11)
4	051-200-757	PIT FLOOR STRIP, HOOK
5	051-202-121	ASM, ES USBC PIT FLOOR SUPPORT (incl. items 4, 6, 11)
6	051-202-122	ES USBC PIT FLOOR SUPPORT
7	051-202-148	ASM, PIT BRIDGE SUPPORT CHAN (incl. items 4, 8, 11)
8	051-202-149	PIT BRIDGE SUPPORT CHAN
9	051-202-150	ASM, ES USBC PIT, BRIDGE BOARD (incl. items 9, 10)
10	051-202-153	ES USBC PIT, BRIDGE PLASTIC
11	7108-401800-050	RIVET, RVT BLD 0.19 X 0.43 AL
12	818-757-161	SCREW, HWMS 5/16-18 X 1.00 GR8 BP DP

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 103

5.26. Even Machine Back End Assembly

QUBICA®AMF

MAKING BOWLING AMAZING



Item	Part Number	Description
1	051-200-172	PIT CROSS SUPPORT
2	051-200-174	WDMT, SHOCK MOUNT
3	051-200-182	ASM, CUSHION, EVN
4	051-200-378	PIN STOP CHANNEL, EVN
5	051-200-536	ASM, PIT COVER, TOP
6	051-200-589	DECAL, PIT REAR GUARD
7	051-200-632	ASM, PIT REAR GUARD, EVN
8	051-202-144	WDMT, SIDEFRAME, EVN 07P
9	051-202-146	WDMT, SIDEFRAME, EVN 10P
10	051-202-249	RETRACTABLE CURTAIN ASSY
11	051-203-109	WDMT, SUPPORT, COVER, PIT
12	088-002-275	JACK SCREW
13	088-002-276	LOCKING TAB
14	817-157-151	SCREW, HHMS 5/16-18 X 0.94 BP SEMS DP
15	817-157-201	HHMS 5/16-18 X 1.25 BP SEMS DP
16	818-757-141	SCREW, HWMS 5/16-18 X 0.88 BP DP
17	946-688-322	WASHER, FW 0.81 X 2.00 X 0.16 ZN

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 104

5.27. Even Machine Pit Cushion Assembly

QUBICA®AMF

MAKING BOWLING AMAZING



Item	Part Number	Description
1	070-002-252	CUSHION TUBE WLDMT, EVEN
2	000-024-795	PLANK EVEN, CUSHION ASM EVEN
3	000-022-770	SPONGE PAD, CUSHION ASM
4	000-024-808	CUSHION RUBBER, EVEN
5	051-200-254	CUSHION CVR, EXTENDED, 6-HOLE
6	000-028-529	RIVET, CUSHION ASM
7	7023-410800-100	SCREW, PHPPS 8 X 1.00 BO
8	000-024-750	CUSHION MOUNT WELDNUT
9	801-865-287	SCREW, FBCS ³ / ₈ -16 X 1.75 GR5 ZN PAS
10	801-865-367	SCREW, FBCS ³ / ₈ -16 X 2.25 GR5 ZN PAS
11	770-011-232	CABLE TIE, CBT 14.0 X 4.00 X 120 BLK

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 Page 105

5.28. Even Machine Ball Door Assembly

QUBICA®AMF

MAKING BOWLING AMAZING



Item	Part Number	Description
1	049-007-751	ACTUATOR, 290N, 50mm, M1
2	049-007-752	CLEVIS, DECOUPLING, 50MM, ACTL
3	051-202-158	ASM, BLADE BALL DOOR, EVEN
4	051-202-167	ASM, BALL DOOR SHAFT (incl items 5, 17)
5	051-202-168	BALL DOOR SHAFT
6	051-202-169	WDMT, CLEVIS BRKT, SIDE MOUNT
7	051-202-172	BALL DOOR FLANGE BEARING
8	7050-034175-012	1.75 x .344 x .062 WASHER FLAT
9	706-902-005	PIN CL 0.31 X 1.13 ZN
10	706-902-007	PIN CL 0.25 X 1.06 ZN
11	801-757-081	SCREW 5-16/18 x 1/2 HEX WASHER
12	808-849-100	1/4-20 x 5/8 SCREW SOFL
13	809-849-245	1/4-20 x1 1/2 SCR HXHD GR8 BLK
14	818-757-121	HWMS 5/16-18 X .75 BP DP
15	856-149-001	1/4-20 HFLN BO STV
16	911-064-237	3/8 x 1 3/8 COTTER PIN ZINC BOWTIE
17	913-437-100	0.19 x 0.63 PIN NS
18	948-753-101	1/4 FLAT WASHER BLACK OXIDE

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 106



5.29. Pit Cushion Shock Assembly



Item	Part Number	Description
1	051-200-174	WDMT, SHOCK MOUNT
2	000-022-824	SHOCK ASB ASM, CUSHION
3	000-024-534	EAR HANGER, CUSHION ASM
4	051-200-349	CLEVIS PIN, PIN CL 0.50 X 2.05
5	911-073-307	BOWTIE PIN, PIN BC 0.09 X 1.88 ZN
6	948-975-172	WASHER, FW 0.53 X 1.06 X .10 NS
7	818-757-161	SCREW, HWMS ⁵ / ₁₆ -18 X 1.00 GR8 BP DP
8	01-519	NUT, HFLN ⁵ / ₁₆ -18 ZN SER

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 107



5.30. Pit Cushion Block (7 Pin Side)



Item	Part Number	Description
1	000-022-300	SHIELD
2	000-022-797	BLOCK SUPPORT 07P
3	051-200-178-01	CUSHION BOX SPRT
4	911-564-647	PIN CL 0.38 X 4.00 ZN

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 108


5.31. Pit Cushion Block (10 Pin Side)



Item	Part Number	Description
1	000-022-300	SHIELD
2	000-022-796	BLOCK SUPPORT 10P
3	051-200-178-01	CUSHION BOX SPRT
4	911-564-647	PIN CL 0.38 X 4.00 ZN

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 Page 109

5.32. Chain Lift Control Box

QUBICA®AMF

MAKING BOWLING AMAZING



ltem	Part Number	Description
1	818-240-082	SCREW, PHPMS 10-32 X 0.50 ZN SEMS
2	823-449-117	SCREW, HWFTS 1/4-20 X 0.50 ZN TY1
3	818-757-141	SCREW, HWMS ⁵ / ₁₆ -18 X 0.88 BP DP
4	051-200-446	WDMT, C LIFT CTRL BOX BRKT
5	051-203-110-XX	ASM, CONTROL BOX

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 110



5.33. Chain Lift Assembly



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 111

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



5.34. Chain Lift – Upper Assembly Detail



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 112



Chain Lift Assembly Parts List

Item	Part Number	Description
1	01-519	NUT, HFLN 5/16-18 ZN SER
2	051-070-084	DECAL, ENTANGLEMENT - GEARS
3	051-200-105	LIFTER PAN
4	051-200-108	BUSHING, BALL LIFT MOUNT
5	051-200-111	CHAIN LIFT, DRIVE SHAFT
6	051-200-112	ASM, CHAIN LIFT, SPROCKET
7	051-200-116	ASM, CHAIN LIFT BODY, LOWER
8	051-200-117	ASM, CHAIN LIFT IDLER
9	051-200-120	ASM, CHAIN LIFT, CHAIN
10	051-200-129	REST RAIL, COVER, LOWER
11	051-200-130	WDMT, REST RAIL
12	051-200-131	REST RAIL, COVER, UPPER
13	051-200-132	REST RAIL RETAINER
14	051-200-139	WDMT, CHAIN LIFT HEAD
15	051-200-142	CHAIN LIFT, CAM
16	051-200-232	IR TRANSMITTER
17	051-200-272	IR RECEIVER
18	051-200-274	CABLE, CHAIN LIFT BALL SENSOR
19	051-200-309	ASM, INLINE GB MOUNT BACK
20	051-200-311	GEARMOTOR MOUNT PLATE
21	051-200-312	MOTOR MOUNT SPACER
22	051-200-433-01	ASM, GEARMOTOR, CHAIN LIFT
23	051-200-449	METAL CORE BUMPER
24	051-200-479	LIFTER WEAR STRIP
25	051-200-481	ASM, C LIFT STUD PLATE
26	051-200-483	ASM, C LIFT STUD SENSOR BRKT
27	051-200-499	SENSOR CABLE TAPE
28	051-200-529	GROUNDING CABLE, CHAIN LIFT
29	051-200-654	MOUNT, CHAIN LIFT, EVN
30	051-200-655	MOUNT, CHAIN LIFT, ODD
31	051-200-658	ASM, LIFTER CONTROL
32	701-424-000	FLANGE BEARING
33	711-520-013	GROMMET, GPI 0.31 X 0.50 X 0.25 RB
34	722-501-102	SPACER, SFR 0.32 X 0.75 X 1.25 AL
35	785-501-786	COUPLING HUB
37	785-501-788	COUPLING SPIDER, URETHANE
38	801-757-121	SCREW, FBCS 5/16-18 X 0.75 GR5 BP PA
39	801-757-160	SCREW, FBCS 5/16-18 X 1.00 GR8 BO
40	804-549-207	U BOLT, UB ¼-20 X 0.56 X 1.25 ZN
41	809-857-485	SCREW, HHCS 5/16-18 X 3.00 GR8 BO
42	817-157-151	SCREW, HHMS 5/16-18 X 0.94 BP SEMS DP
43	818-240-062	SCREW, PHPMS 10-32 X 0.38 ZN SEMS
44	818-757-121	SCREW, HWMS 5/16-18 X 0.75 BP DP
45	827-006-167	SCREW, HWMS M6-1 X 16 ZN FT
46	834-557-002	NUT, HLN 5/16-18 ZN
47	838-549-002	NUT, HLN ¼-20 ZN NE
48	838-740-002	NUT, HLN 10-32 ZN NM
49	843-140-002	NUT, KN 10-32 ZN

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 113



Chain Lift Assembly Parts List cont.

ltem	Part Number	Description
50	856-057-007	HFLN 5/16-18 ZN NE GR5
51	907-200-800	KEY, SQ 0.19 X 0.72 Q
52	948-753-101	WASHER, FW ¼ SAE BO
53	948-722-111	WASHER, FW 5/16 SAE BO
54	835-557-003	HFJN 5/16-18 BO

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

 $web: www.qubicaamf.com\ -\ email:\ info@qubicaamf.com\ -\ eshop:\ eshop.qubicaamf.com\ -\ eshop:\ es$



5.35. Chain Lift Upper Sprocket Assembly 051-200-112



Item	Part Number	Description
1	051-200-835	CHAIN LIFT, SPROCKET
2	051-200-114	CHAIN LIFT, SPROCKET DRIVE HUB
3	051-200-115	UPPER LIFTER CAM
4	051-200-456	SFR 0.25 X 0.38 X 2.28 ZN
5	722-501-097	SFR 0.38 X 0.63 X 1.06 AL
6	948-753-101	FW 1/4 SAE BO
7	809-849-445	HHCS 1/4-20 X 2.75 GR8 BO
8	807-257-060	STCP 5/16-18 X 0.38 KNL BO

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 115



5.36. Chain Lift Lower Sprocket Assembly 051-200-117



Item	Part Number	Description
1	051-200-118	CHAIN LIFT, IDLER SHAFT
2	051-200-180	CHAIN LIFT, IDLER BEARING
3	051-200-835	CHAIN LIFT, SPROCKET
4	901-100-111	CLLR SLD 0.75 X 5/16-18 ZN

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 116

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



5.37. Chain Lift Chain Assembly 051-200-120



Item	Part Number	Description
1	051-200-121	CHAIN
2	051-200-124	LIFTER ASM
3	051-200-123	LIFTER PAD
4	051-200-122	LIFTER STOP BAR
5	051-200-138	STOP BAR WEAR PAD
6	838-740-002	NUT, HLN 10-32 ZN NM
7	01-123	SCREW, FHPMS 10-32 X 0.63 ZN
8	811-940-147	SCREW, FHPMS 10-32 X 0.88 ZN

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 117



5.38. Double Division Rail Assembly



Item	Part Number	Description
1	051-200-143	RAMP RAIL
2	051-200-145	WDMT, RAMP BALL DEFLECTOR
3	051-200-146	RAMP RAIL SUPPORT EVEN
4	051-200-147	RAMP RAIL SUPPORT ODD
5	051-200-673	REINFORCED RAMP RAIL COVER
6	051-200-807	RAMP RAIL STRAP
7	809-857-325	SCREW, HHCS ⁵ / ₁₆ -18 X 2 GR8 BO
8	817-157-151	SCREW, HHMS ⁵ / ₁₆ -18 X 0.94 BP SEMS DP
9	818-757-141	SCREW, HWMS ⁵ / ₁₆ -18 X 0.88 BP DP
10	856-157-001	5/16-18 HFLN BO STV

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 118

5.39. Cross Sweep Assembly

QUBICAVAME

MAKING BOWLING AMAZING



Item	Part Number	Description
1	051-202-134	WDMT, CROSS SWEEP
2	051-200-503	BALL RAIL WEAR COVER
3	856-057-007	NUT, HFLN ⁵ / ₁₆ -18 ZN NE GR5
4	818-757-141	SCREW, HWMS ⁵ / ₁₆ -18 X 0.88 BP DP
5	049-006-353	RAIL DOWNSWEEP WDMT
6	817-157-201	SCREW, HHMS ⁵ / ₁₆ -18 X 1.25 BP SEMS DP
7	859-048-168	SCREW, FBLS ⁵ / ₁₆ X 1.00 ZN
8	051-200-096	WDMT, CROSS SWEEP, FRONT BRKT
9	051-200-491	WDMT, DBLDIV SIDE GUARDS, BRKT
10	051-200-098	WDMT, CROSS SWEEP, CENTER BRKT
11	744-102-058	HOSE CLAMP

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 119



5.40. Ball Wiper Kit 051-200-760



ltem	Part Number	Description
1	070-004-669	CLOTH BALL WIPER
2	051-200-759	BALL RAIL WEAR COVER
3	000-021-813	SUPPORT - WIPE
4	000-021-820	WIPER CLOTH RING, NEW
5	818-757-121	HWMS 5/16-18 X .75 BP DP
6	817-157-201	SCREW, HHMS ⁵ / ₁₆ -18 X 1.25 BP SEMS DP

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 120

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

 $web: www.qubicaamf.com\ -\ email:\ info@qubicaamf.com\ -\ eshop:\ eshop.qubicaamf.com\ -\ eshop:\ es$



5.41. Downsweep Guard



Item	Part Number	Description
1	088-501-895	DOWN SWEEP GUARD
2	088-501-901	WDMT, DWN SWP GRD, BRKT, LOWER
3	088-501-903	WDMT, DWN SWP GRD, BRKT, UPPER
4	808-557-120	SCREW, BHSCS 5/16-18 X 0.75 BO
5	948-722-111	WASHER, FW 5/16 SAE BO
6	827-339-160	SCREW, PHPWS 10 X 1.00 BO

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 Page 121



5.42. Double Division & Pit Rear Guards (Pair)



ĺ	ltem	Part Number	Description
	1	051-200-526	ASM, DBL DIV GUARD
	2	051-200-631	ASM, PIT REAR GUARD, ODD
	3	051-200-632	ASM, PIT REAR GUARD, EVN
	4	817-157-151	SCREW, HHMS ⁵ / ₁₆ -18 X 0.94 BP SEMS DP
	5	051-200-528	DBL DIV ACCESS PANEL
	6	709-002-010	QTB PH 85-P-540-16
	7	709-002-051	WASHER, QTB RT 85-34-301-12
	8	709-002-022	¹ / ₄ TURN FASTENER - FEMALE
	9	051-200-589	DECAL, REAR PIT GUARD
	10	051-200-590	DECAL, MACHINE NUMBER 0
	11	051-200-591	DECAL, MACHINE NUMBER 1
	12	051-200-592	DECAL, MACHINE NUMBER 2
	13	051-200-593	DECAL, MACHINE NUMBER 3
	14	051-200-594	DECAL, MACHINE NUMBER 4
	15	051-200-595	DECAL, MACHINE NUMBER 5
	16	051-200-596	DECAL, MACHINE NUMBER 6
	17	051-200-597	DECAL, MACHINE NUMBER 7
	18	051-200-598	DECAL, MACHINE NUMBER 8
	19	051-200-599	DECAL, MACHINE NUMBER 9
		950-001-012	FW 0.25 X 0.75 X 0.13 RB (NOT SHOWN)

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 122

5.43. Double Division & Pit Rear Guard (Single)

QUBICA®AMF

MAKING BOWLING AMAZING



Item	Part Number	Description	
1	051-200-547	ASM, WW, SINGLE, ODD	
2	051-200-549	ASM, WW, SINGLE, EVEN	
3	051-200-556	SIDE FRAME CL GUARD BRKT	
4	051-200-557	KICKBACK CL GUARD BRKT	
5	051-200-560	ASM, GUARD, DBL DIV, SINGLE EVEN	
6	051-200-561	ASM, GUARD, DBL DIV, SINGLE ODD	
7	051-200-567	DBL DIV ACCESS PANEL, XW-SINGLE	
8	051-200-589	DECAL, REAR PIT GUARD	
9	051-200-633	ASM, PIT REAR GUARD, ODD, SINGLE	
10	051-200-634	ASM, PIT REAR GUARD, EVEN, SINGLE	
11	051-202-194	WDMT, SIDE FRAME, SINGLE EVEN, ES USBC	
12	051-202-195	WDMT, SIDE FRAME, SINGLE ODD, ES USBC	
13	088-200-278	SPACER, SFR 0.25 X 0.50 X 0.19 ZN	
14	709-002-010	FASTENER SOCO *5-0-540	
15	709-002-022	¹ / ₄ TURN FASTENER - FEMALE	
16	709-002-051	WASHER, QTB RT 85-34-301-12	
17	817-149-141	SCREW, HHMS 1/4-20 X 0.88 BP SEMS DP	
18	817-157-151	SCREW, HHMS 5/16-18 X 0.94 BP SEMS DP	
19	838-549-002	NUT, HLN ¼-20 ZN NE	
20	859-048-168	SCREW, FBLS 5/16 X 1.00 ZN	
21	950-001-012	FW 0.25 X 0.75 X 0.13 RB	

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 123

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com

5.44. System Controller & Mounting Bracket

QUBICAVAME

MAKING BOWLING AMAZING



Item	Part Number	Description	
1	051-200-366	WDMT, CONTROLLER MOUNT EVN	
2	051-200-368	WDMT, CONTROLLER MOUNT ODD	
3	051-200-441	SYSTEM CONTROLLER GUARD	
4	051-200-901	SYSTEM CONTROLLER	
5	289-X06-240	VTB/30/FP M6 ROUND THREE-LOBE	
6	817-149-141	SCREW, HHMS ¹ / ₄ -20 X 0.88 BP SEMS DP	
7	817-157-151	SCREW, HHMS 5/16-18 X 0.94 BP SEMS DP	
8	818-757-141	SCREW, HWMS 5/16-18 X 0.88 BP DP	

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 124



QUBICA®AMF

MAKING BOWLING AMAZING



Item	Part Number	Description	
1	051-200-390	WDMT, GUARD, BALL RETURN, ODD	
2	051-200-393	WDMT, GUARD, BALL RETURN, EVEN	
3	051-200-630	CROSS SWEEP SIDE GUARD	
4	051-200-890	C LIFT GUARD, PC PANEL	
5	051-202-125	WDMT, ES USBC C LIFT GUARD, ODD	
6	051-202-131	WDMT, ES USBC C LIFT GUARD, TOP EVEN	
7	051-202-133	ES USBC C LIFT GUARD, TOP ODD	
8	051-202-139	SIDE GUARD, COMMON DIV ES USBC	
9	817-149-141	SCREW, HHMS ¼-20 X 0.88 BP SEMS DP NUT, HFLN ¼-20 BO STV	
10	856-149-001		

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 Page 125



5.46. Chain Lift & Side Guards (Even)



Item	Part Number	Description	
1	051-200-390	WDMT, GUARD, BALL RETURN, ODD WDMT, GUARD, BALL RETURN, EVEN	
2	051-200-393		
3	051-200-463	C LIFT, COUPLING GUARD	
4	051-200-630	CROSS SWEEP SIDE GUARD	
5	051-202-127	WDMT, ES USBC C LIFT GUARD, EVN BTM	
6	051-202-139	SIDE GUARD, COMMON DIV, ES USBC	
7	051-202-129	WDMT, ES USBC C LIFT GUARD, EVN TOP	
8	817-149-141	SCREW, HHMS 1/4-20 X 0.88 BP SEMS DP	
9	856-149-001	NUT, HFLN ¼-20 BO STV	

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





5.47. Machine Rear Cover



Item	Part Number	Description	
1	051-200-259	PULL HANDLE	
2	051-200-601	HINGE	
3	051-200-608	MAGNETIC LATCH	
4	051-200-610	PC DOOR PANEL	
5	051-200-621	LATCH STRIKE BRKT, DOOR	
6	051-200-622	DOOR, LATCH BACKER	
7	051-203-104	PANEL, GUARD, PC HINGE	
8	051-203-105	PANEL, GUARD, PC, CATCH	
9	051-203-107	ASM, PLATE, HINGE, PC	
10	051-203-111	PLATE, CATCH, PC	
11	051-203-113	WDMT, FRAME, GUARD, PC	
12	7024-710800-075	SCREW, THPTS 8 X 0.75 ZN TYA	
13	758-501-101	RVT BLD 0.25 X 0.38 NY BLK	
14	808-840-120	#10-32 x 3/4 SCREW SOFL	
15	813-227-062	SCREW, PHPMS 6-32 X 0.38 ZN	
16	817-149-141	SCREW, HHMS 1/4-20 X 0.88 BP SEMS DP	
17	856-149-001	NUT, HFLN ¼-20 BO STV	

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 127

EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



5.48. Wireways



Item	Part Number	Description	
1	809-849-100	SCREW, HHCS 1/4-20 X 0.63 GR8 BO	
2	948-753-101	WASHER, FW ¼ SAE BO	
3	838-549-002	NUT, HLN ¼-20 ZN NE	
4	051-200-500	WIRE DUCT, CONTROLLER, SHORT	
5	051-200-484	WW SUPPORT, CONTROLLER	
6	817-149-141	SCREW, HHMS ¹ / ₄ -20 X 0.88 BP SEMS DP	
7	051-200-416	WIRE DUCT, CROSS MACH, SHORT	
8	7108-401800-050	RIVET, RVT BLD 0.19 X 0.43 AL	
9	051-200-417	WIRE DUCT, CROSS MACH, LONG	
10	051-200-415	WW SUPPORT, CROSS MACHINE	
11	051-202-173	WIRE DUCT, ES USBC MACHINE	
12	051-200-422	WW SUPPORT, DOUBLE DIVWDMT, DOUBLE DIV WW BRKTSCREW, FBLS ¼ X 1.00 ZN	
13	051-200-421		
14	859-048-167		

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 128

5.49. Safety Labels (Rear)

QUBICA®AMF

MAKING BOWLING AMAZING



Item	Part Number	Description	
1	051-070-082	DECAL, PIN HOOK	
2	051-070-043 DECAL, NO ACCESS UNAUTHORI		
3	051-070-083	DECAL, WARNING	
4	051-070-044	DECAL, NO STEP	

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 P

Page 129



5.50. Safety Labels (Front)



Item	Part Number	Description	
1	051-070-043	DECAL, NO ACCESS UNAUTHORIZED DECAL, LANE BARRIER	
2	051-070-134		
3	051-200-587	DECAL, SHIELD	

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 Page 130



5.51. EDGE String Tool Kit 610-051-044



EDGE String Tool Kit Parts List

Item	Part Number	Description	
1	000-100-000	SCREWDRIVER, CKLAUCK TOOL	
2	051-200-532	ASM, CLIFT SERVICE LOCK	
3	051-200-605	DECAL, TOOLBOX, EDGE STRING 1	
4	051-200-627	DECAL, TOOLBOX, EDGE STRING 2	
5	051-200-700	ASM, STRING SLEEVE TOOL	
6	051-200-779	BALL TRIGGER ALIGNMENT TOOL	
7	051-200-784	BALL TRIGGER COVER TOOL	
8	051-201-265	ASM, LIFT TENSIONER	
9	051-203-119	BALL SENSOR TESTER	
10	400-051-036	STRING SLEEVE TOOL INSTRUCTION	
11	724-001-012	TAPE, ELEC, BLK, ROLL	
12	724-008-013	TAPE, MASKING, ROLL	
13	780-501-010	3/16 HEX BIT SOCKET, 3/8 DRIVE	
14	784-003-000	PIT REMOVAL/RIVET TOOL	
15	786-502-002	PLIERS, NEEDLE NOSE, 6"	
16	786-503-003	PLIERS, SLIP JOINT, 6"	
17	786-504-004	PLIERS, DIAGONAL CUTTING, 7"	
18	789-001-002	SCREWDRIVER; PHILLIPS; #2	
19	789-001-003	SCREWDRIVER, PHILLIPS, #3	
20	789-006-008	SCREWDRIVER; SLOTTED; 1/4"	
21	789-505-008	3/8 DRIVE RATCHET	
22	789-509-018	7/16 DEEP SOCKET, 3/8 DRIVE	
23	789-509-019	9/16 DEEP SOCKET, 3/8 DRIVE	
24	789-509-030	1/2 DEEP SOCKET, 3/8 DRIVE	
25	789-509-033	3/8 DEEP SOCKET, 3/8 DRIVE	
26	789-510-056	10mm COMBINATION WRENCH	
27	789-510-057	8mm DEEP SOCKET, 3/8 DRIVE	
28	792-004-003	PHILLIPS BIT, #2, 1/4 HEX X 2	
29	792-004-006	PHILLIPS BIT, #3, 1/4 HEX X 2	
30	792-005-061	TOOL BOX, EDGE STRING	
31	792-505-036	SPRING PULLER STEEL TBL	
32	792-524-001	POP RIVET TOOL	
33	793-502-061	ALLEN WRENCH, 3/32 X 6.63	
34	793-502-062	ALLEN WRENCH, 1/8 X 6.63	
35	793-502-063	ALLEN WRENCH, 5/32 X 6.75	
36	793-502-064	ALLEN WRENCH, 3/16 X 7.00	
37	793-502-065	ALLEN WRENCH, 1/4 X 7.13	
38	793-506-022	3/8 COMBINATION WRENCH	
39	793-506-023	7/16 COMBINATION WRENCH	
40	793-506-024	1/2 COMBINATION WRENCH	
41	793-506-025	9/16 COMBINATION WRENCH	
42	793-506-050	3/4 COMBINATION WRENCH	
43	793-514-048	LOCKING PLIERS; 10"	
44	793-516-001	ALLEN WRENCH, 4mm X 6.00	
45	793-516-005	ALLEN WRENCH, 5mm X 6.00	

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



OUBICAVAME MAKING BOWLING AMAZING

5.52. **Cables**



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com

O' DEE	
200-274	1
N	
/DC	
DC	
+VDC	
-VDC	

			1/14.031-200-210
	CONTROLBOXPIN	COLOR	FUNCTION
	3	N/C	N/C
	6	N/C	N/C
	9	N/C	N/C
	12	N/C	N/C
	13	N/C	N/C
	14	N/C	N/C
	15	N/C	N/C
-	16	N/C	N/C
1	17	N/C	N/C
	18	N/C	N/C
	19	N/C	N/C
	20	N/C	N/C
	21	N/C	N/C
	22	N/C	N/C
	23	N/C	N/C
	24	N/C	N/C
	25	N/C	N/C
	26	N/C	N/C
	27	N/C	N/C
	28	BLACK	RECEIVER +VDC
	29	WHITE	RECEIVER - VDC
	30	N/C	N/C
	31	RED	TRANSMITTER +VDC
	32	GREEN	TRANSMITTER - VDC
	JUI	MPER CONNECT	TIONS
	FROMCONTROLBOXPIN	COLOR	TO CONTROLBOX PIN
	1	GREEN	2
	4	WHITE	5
	7	RED	8
	10	BLACK	11

Page 133



Section 6 Lockout/Tagout (LOTO) Procedure

Note: This following section is a copy of document 400-051-203, current revision.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





EDGE String Lockout/Tagout (LOTO) Procedure

Document Overview

This document outlines the recommended lockout/tagout (LOTO) supplies and procedures for the EDGE String. This information should be used to supplement a facility's existing LOTO program. Please note that the facility is responsible for creating and maintaining a LOTO program in compliance with applicable safety standards. This document alone does not constitute a regulation-compliant LOTO program.

Owner/Facility Manager Responsibilities

Under national law in the USA and EU countries, it is the responsibility of the owner/facility manager to provide a safe workplace. A safe working environment includes training on the proper use of LOTO procedures and devices.

WARNING:



• High voltage is present inside the system controller. Use caution when operating or handling this equipment. Implement lockout/tagout (LOTO) before servicing any electrical components. The main circuit breaker must always be OPEN, or the power plug DISCONNECTED, prior to performing any service/repair to electrical systems.



- The system controller contains no user-serviceable parts.
- The system controller includes a tamper indicator. Opening the system controller enclosure will void the warranty.

I. LOTO Overview

Potential for serious injury exists if an operator attempts to work inside the machine boundary of an energized machine. A machine is considered energized whenever it is connected to a main power supply. Energized machines may cycle automatically. Machine components could move without warning and injure an operator attempting to work inside the machine boundary. No person should ever attempt to work inside the machine boundary of an energized machine!

Lockout/Tagout (LOTO) includes a set of supplies and procedures for temporarily deenergizing a machine. With LOTO implemented, a machine's main electrical power is physically removed and can only be restored by the same operator who de-energized the equipment. This also prevents anyone from restoring electrical power inadvertently. LOTO is a crucial aspect of workplace safety when performing troubleshooting and maintenance tasks.

Note

• A machine is energized if main electrical power is physically connected to a machine AND the machine's main power supply circuit breaker is ON.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 136



- A machine may be energized even if its system controller power switch is set to OFF.
- A machine may be energized even if it is not operating.

II. LOTO Supplies

A. LOTO Device Overview

There is a wide variety of LOTO supplies depending on the application. Several common LOTO items are shown below. Note that some, but not all of these items are supplied with the EDGE String. The owner/facility manager is responsible for selecting and procuring additional LOTO supplies based on the specific operational requirements of a given facility.



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 137

B. Distribution of LOTO Padlocks and Lock Tags

The owner/facility manager is responsible for the availability and safe distribution of all LOTO padlocks and lock tags. Below are two suggested procedures for managing this responsibility. Note, these are recommended procedures only. The owner/facility manager is responsible for defining all LOTO procedures based on the specific operational requirements of a given facility.

I. Padlock/Lock Tag Procedure 1

The owner/facility manager issues padlocks and lock tags directly to each operator permitted to work on the machine(s). Each operator should be issued a minimum of three lock tags. Each operator must mark his/her name on each lock tag using a permanent marker or label maker. Each operator must always keep all assigned padlocks and lock tags in his/her possession while on duty.

Operator padlocks and lock tags may be used together with a plug lockout, circuit breaker lockout, or lockout hasp to implement LOTO on a machine. These supplies should be kept in one secure area accessible to all operators. While LOTO is implemented, the operator must place his/her personal lock tag on the LOTO device. The operator must keep his/her key in his/her possession until all work is completed and LOTO is removed.

Once LOTO is removed, the operator should retrieve his/her personal lock tag and return all used LOTO supplies to the facility's designated safety center. An operator's personally assigned padlocks and lock tags should be stored in the facility's safety center while that operator is off duty.

II. Padlock/Lock Tag Procedure 2

The owner/facility manager issues a minimum of three lock tags directly to each operator permitted to work on the machine(s). Each operator must mark his/her name on each lock tag using a permanent marker or label maker. Each operator must always keep all assigned lock tags in his/her possession while on duty.

The owner/facility manager shall determine all required LOTO supplies (padlocks, plug lockouts, circuit breaker lockouts, lockout hasps, etc.) and shall locate these supplies at each machine.

While LOTO is implemented, the operator must place his/her personal lock tag on the LOTO device. The operator must keep the padlock key in his/her possession until all work is completed and LOTO is removed.

Once LOTO is removed, the operator should retrieve his/her personal lock tag and return all used LOTO supplies to the designated safety center for that machine. An operator's personally assigned lock tags should be stored in the facility's safety center while that operator is off duty.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 138

III. EDGE String LOTO Procedure

Below are recommended LOTO procedures for various machine/facility configurations. Note, these are recommended procedures only. The owner/facility manager is responsible for defining all LOTO procedures based on the specific operational requirements of the facility.

Read This First

- All operators must be trained on a facility's safety rules and practices (including LOTO) before performing any operation or maintenance tasks.
- Operators may perform required operation and maintenance tasks only under the supervision of a facility manager. Only a facility manager is authorized to conduct operator training.
- The operator who implements LOTO (as evidenced by lock tag) is the only person permitted to remove the LOTO. Under no circumstances is an operator allowed to unlock a LOTO device that was implemented by another operator. This includes, but is not limited to, cutting off padlocks or otherwise bypassing an LOTO device to restore machine power. Only a facility manager may grant authority to cut off a padlock after ensuring the machine is safe to energize.
- LOTO must be implemented before any machine guards are removed.
- All machine guards must be installed before a machine is energized.
- Never reach into or cross over the machine boundary of an energized machine.
- An energized machine may be observed from another machine to which LOTO has been applied.
- If a machine will be down overnight, turn off main power to the machine pair and leave a note for the next shift. LOTO is not required overnight if an operator is not inside the machine boundary. LOTO must be implemented when maintenance resumes.

A. LOTO at System Controller

The system controller main power plug is the primary location for LOTO of a machine pair. Follow the steps below.

- **1.** Turn off main power to the machine pair by switching the system controller main power switch to OFF.
- 2. Remove the system controller main power plug.
- **3.** Implement LOTO by placing the main power plug in a plug lockout. Lock the plug lockout using a padlock and secure a lock tag through the padlock shackle. See Figure A-1. Note, the lock tag must be labeled with the name of the operator implementing the LOTO.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000







Figure A-1, Single Operator LOTO



Figure A-2, Multiple Operator LOTO

- **4.** If more than one operator will be working on the machine(s), each operator must place a padlock and lock tag on the plug lockout. Additional padlocks can be locked directly through the plug lockout (if the lockout has multiple lock holes) or can be used in combination with a multi-hole lockout hasp. See Figure A-2.
- 5. TEST. Verify that the machine pair is de-energized by switching the system controller main power switch to ON. Wait 10 seconds. If the system controller display remains off (blank) and there are no signs of machine activation (e.g. beeping, clicking, LEDs on, etc.), the machine pair is de-energized. Otherwise, LOTO has not been implemented correctly. Repeat Steps 1-4 to ensure LOTO is implemented correctly. After a successful test, switch the system controller main power switch back to OFF.
- 6. Perform all required maintenance, troubleshooting, cleaning tasks.
- 7. Once all work is complete, ensure that all personnel and tools are out of the machine boundary.
- **8.** Remove all LOTO devices and re-insert the main power plug into the system controller.
- 9. Switch system controller main power switch to ON.
- 10. Press **RESET E-STOP** button on system controller.
- 11. Wait for system controller to finish booting up.
- 12. Set Odd and Even lane *Chassis Mode* to BOWL.
- **13.** Press **FULL SET**, then **PLAY** for each lane to reconnect both lanes with facility scoring system (if installed).

400-051-247 Rev. C



Page 140

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

B. LOTO at Circuit Breaker Service Panel

LOTO may also be implemented at a facility's circuit breaker service panel. This method should be used for hard-wired equipment or devices that cannot be otherwise unplugged or turned off with a lockable switch. Note, all circuit breakers must be properly marked with the machine/device that they power (see Figure A-3). Follow the steps below.

- **1.** Turn off main power to the machine pair by switching the system controller main power switch to OFF.
- 2. Turn off the service panel circuit breaker that powers the machine pair.
- **3.** Place a circuit breaker lockout over the appropriate circuit breaker. Lock the circuit breaker lockout using a padlock and secure a lock tag through the padlock shackle. See Figure A-4. Alternatively, a padlock may be used to lock the service panel door. Lock the door using a padlock and secure a lock tag through the padlock shackle. See Figure A-5. In either case, the lock tag must be labeled with the name of the operator implementing the LOTO.



Figure A-3, Circuit Breaker Labels



Figure A-4, Circuit Breaker LOTO



Figure A-5, Service Panel LOTO

- 4. If more than one operator will be working on the machine(s), each operator must place a padlock and lock tag on the lockout device. Additional padlocks can be locked directly through the circuit breaker lockout (if the lockout has multiple lock holes) or can be used in combination with a multi-hole lockout hasp.
- 5. TEST. Verify that the machine pair is de-energized by switching the system controller main power switch to ON. Wait 10 seconds. If the system controller display remains off (blank) and there are no signs of machine activation (e.g. beeping, clicking, LEDs on, etc.), the machine pair is de-energized. Otherwise, LOTO has not been implemented correctly. Repeat Steps 1-4 to ensure LOTO is implemented

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



correctly. After a successful test, switch the system controller main power switch back to OFF.

- 6. Perform all required maintenance, troubleshooting, cleaning tasks.
- 7. Once all work is complete, ensure that all personnel and tools are out of the machine boundary.
- 8. Remove all LOTO devices and switch the service panel circuit breaker to ON.
- 9. Switch system controller main power switch to ON.
- **10.** Press **RESET E-STOP** button on system controller.
- **11.** Wait for system controller to finish booting up.
- 12. Set Odd and Even lane *Chassis Mode* to BOWL.
- **13.** Press **FULL SET**, then **PLAY** for each lane to reconnect both lanes with facility scoring system (if installed).

C. LOTO of Groups of Machines

MAKING BOWLING AMAZING

It may sometimes be necessary to de-energize a large group of machines or all machines in a facility. Follow the steps below.

- 1. Turn off main power to each machine pair by switching the system controller main power switch to OFF.
- 2. Turn off all service panel circuit breakers that power the machines to be de-energized.
- **3.** Close the service panel door. Lock the door using a padlock and secure a lock tag through the padlock shackle. See Figure A-5. The lock tag must be labeled with the name of the operator implementing the LOTO.
- 4. If more than one operator will be working on the machine, each operator must place a padlock and lock tag on the service panel door. Additional padlocks can be locked directly through the door (if the door has multiple lock holes) or can be used in combination with a multi-hole lockout hasp.
- 5. TEST. Verify that each machine pair is de-energized by switching the system controller main power switch to ON. Wait 10 seconds. If the system controller display remains off (blank) and there are no signs of machine activation (e.g. beeping, clicking, LEDs on, etc.), the machine pair is de-energized. Otherwise, LOTO has not been implemented correctly. Repeat Steps 1-4 to ensure LOTO is implemented correctly. After a successful test, switch each system controller main power switch back to OFF.
- 6. Perform all required maintenance, troubleshooting, cleaning tasks.
- 7. Once all work is complete, ensure that all personnel and tools are out of the machine boundary.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



8. Remove all LOTO devices and switch the service panel circuit breakers to ON.

9. Switch each system controller main power switch to ON.

- **10.** Press **RESET E-STOP** button on each system controller.
- 11. Wait for each system controller to finish booting up.
- 12. Set Odd and Even lane *Chassis Mode* to BOWL for each system controller.
- **13.** Press **FULL SET**, then **PLAY** for each lane to reconnect all lanes with facility scoring system (if installed).

D. LOTO of Auxiliary Equipment

LOTO must be implemented on any device before performing maintenance tasks. Note that implementing LOTO on a machine pair does not de-energize all related auxiliary equipment, including the front ball return.

Depending on the design of the equipment to be LOTO, follow one of the above procedures to de-energize the device. Devices equipped with a main power plug can be LOTO using a plug lockout. Hard-wired devices must be LOTO at the circuit breaker powering the equipment. Always test to ensure that a device is fully de-energized before performing any maintenance tasks. After all work is complete, remove all LOTO devices, re-energize the equipment, and test for proper operation.

IV. LOTO Inspection Procedure

The facility manager must conduct periodic inspections of the facility's machine guards, LOTO procedures, and LOTO supplies. This inspection must cover the requirements and procedures of this document [and 29 CFR 1910.147(c) in USA]. The purpose of this inspection is to ensure that all operators understand and follow such requirements and procedures and that all machine guards and LOTO supplies are present and in working order.

During the inspection, the facility manager must confirm that every authorized operator understands and can demonstrate how to conduct all applicable LOTO procedures. This aspect of the inspection must be documented in the LOTO Procedure Inspection Form (see Page 145).

The facility manager must note any deviations or inadequacies and develop a plan to correct those deviations or inadequacies through training, improved supervision, device replacement, or otherwise.

The facility manager must certify that he/she performed the inspection using the LOTO Procedure Inspection Form. The facility manager must sign and date this form, note the center name, address, and phone number, equipment type(s), all defects or deficiencies and the plan to correct them, and the names of all operators who participated in the inspection.

Inspection frequency is set by the facility manager and depends on the center's safety and operator training programs.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 143


6.1. LOTO Procedure Inspection Form

LOTO Procedure Inspection Form					
Inspector's Full Name:					
Center Name:		Center Address:			
Center Phone Number:					
Bowling Equipment Type(s):					
Correction Plan for any Deviations or Inadequacies Identified During Inspection:					
perator Name(s): Demonstrates understanding of all LOTO proce including proper use of all LOTO devices. (Ye		nstrates understanding of all LOTO procedures, ding proper use of all LOTO devices. (Yes/ No)			
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
I hereby certify that I have conducted the LOTO Procedure Inspection to ensure that all LOTO procedures and the requirements of this section [and 29 CFR 1910.147(c) in USA] are being followed.					
Inspector's Signature:					
Date of Inspection:					

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 145



Section 7 Cleaning & Preventive Maintenance

7.1. Section Overview

This section suggests recommended cleaning and preventive maintenance (routine and non-routine) procedures for the EDGE String USBC Approved Version.

Definitions:

- **Cleaning** Regular maintenance procedure with no specific timeframe due to variations in lane conditioning or building conditions.
- **Routine Preventive Maintenance** Maintenance items that can be expected due to normal wear and tear resulting from regular use.
- **Non-Routine Preventive Maintenance** Items requiring attention due to otherwise unforeseen complications not ordinarily expected to occur.

As described in Section 3 Interventions, there are Level 1 and Level 2 Cleaning & Preventive Maintenance procedures.

LEVEL 1 PROCEDURES may be performed without shutting off system controller (LOTO not required). Follow instructions and precautions carefully, especially regarding prohibition of bowling play during maintenance.

LEVEL 2 PROCEDURES require Lockout/Tagout (see Lockout/Tagout (LOTO) Procedure Section 6) and lane barriers (see Page 16) during maintenance.

- LOCKOUT/TAGOUT PROCEDURE MUST BE PERFORMED whenever an operator crosses machine boundary to perform maintenance. Ensure that all power is off and machine cannot re-energize. Lockout/Tagout operation protects against potential entanglement and potential electrical hazard. See Section 6.
- Thrown balls and scattering pins can cause injury if bowling play is allowed during an operator intervention. Operator is responsible to perform all required safety procedures. Deploy lane barriers to protect against thrown balls during maintenance (see Page 16).
- Level 2 interventions may only be performed by qualified personnel. Owner/facility manager must verify that operators are trained to work safely and perform required safety tasks.

Applicable Safety Warnings



web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



Tools

In addition to safety tools described in Section 1 (Safety), other tools may be required for specific tasks. See each procedure for list of tools needed.

WARNING:



- High voltage is present inside the system controller. Use caution when operating or handling this equipment. Implement Lockout/Tagout (LOTO) before servicing any electrical components (see Section 6). The main circuit breaker must always be OPEN, or the power plug DISCONNECTED prior to performing any service/repair to electrical systems.
- The system controller contains no user-serviceable parts.
- The system controller includes a tamper indicator. Opening the system controller enclosure will void the warranty.

Service Intervals

This section defines the recommended preventive maintenance intervals for the EDGE String USBC Approved Version. Preventive maintenance intervals are 12,500/6 weeks, 25,000 frames/quarterly, 50,000 frames/bi-annually and 100,000 frames/annually. Preventive maintenance should be performed at the stated frame count or time interval, whichever comes first. All preventive maintenance tasks are grouped into four main services (A, B, C & D) with the corresponding service specified for each interval.

Manufacturer's Recommendations

- Always use original QubicaAMF parts with your equipment.
- Always order parts by part number and description. See Section 5 (Drawings & Parts Lists).
- Always have your equipment's serial number available when placing an order.



7.1.1. Preventive Maintenance Intervals

Perform preventive maintenance tasks according to the following chart. Recommended service intervals are specified for the first 500,000 frames/5 years of machine operation. Re-use this chart for the next 500,000 frames/5 years of machine operation.

All preventive maintenance intervals should be performed at the stated frame count or time interval, whichever comes first.

	Service					
Frames	Weeks	Months Years Ite		Item		
12,500	6	1.5	1/8	D		
25,000	12	3	1/4	D		
37,500	18	4.5	3/8	D		
50,000	24	6	1/2	A, D		
62,500	30	7.5	5/8	D		
75,000	36	9	3/4	D		
87,500	42	10.5	7/8	D		
100,000	48	12	1	B, D		
112,500	54	13.5	1 1/8	D		
125,000	60	15	1 1/4	D		
137,500	66	16.5	1 3/8	D		
150,000	72	18	1 1/2	A,D		
162,500	78	19.5	1 5/8	D		
175,000	84	21	1 3/4	D		
187,500	90	22.5	17/8	D		
200,000	96	24	2	B,D		
212,500	102	25.5	2 1/8	D		
225.000	108	27	2 1/4	D		
237.500	114	28.5	2 3/8	D		
250.000	120	30	2 1/2	A. D		
262,500	126	31.5	2 5/8	D		
275.000	132	33	2 3/4	D		
287,500	138	34.5	2 7/8	D		
300,000	144	36	3	B, D		
312,500	150	37.5	3 1/8	D		
325,000	156	39	3 1/4	D		
337,500	162	40.5	3 3/8	D		
350,000	168	42	3 1/2	A, D		
362,500	174	43.5	3 5/8	D		
375,000	180	45	3 3/4	D		
387,500	186	46.5	3 7/8	D		
400,000	192	48	4	B. D		
412,500	198	49.5	4 1/8	0, 0		
425,000	204	51	4 1/4	D		
437,500	210	52.5	4 3/8	D		
450,000	216	54	4 1/2	A, D		
462,500	222	55.5	4 5/8	D		
475,000	228	57	4 3/4	D		
487,500	234	58.5	4 7/8	D		
500,000	240	60	5	C, D		

Table 7-1, Preventive Maintenance Intervals

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 149



7.1.2. Service Type Definitions

Perform the following service types as specified in Table 7-1.

		Instruction	Service			
Maintenance Task	Component Reference	Reference	Α	В	С	D
• Check string adjustment. Perform string adjustment if needed.	-	p. 154	√**	√**	√**	
• Check drawbar chain tension. Adjust as needed.	-	p. 166		\checkmark	\checkmark	
• Check chain lift chain tension. Adjust as needed.	-	p. 176		\checkmark	\checkmark	
• Lubricate drawbar chains.	-	p. 162		\checkmark	\checkmark	
• Lubricate chain lift chain and lifter assemblies.	-	p. 163		~	~	
• Check all pins for wear. Replace or rotate pins as needed.	Item 1 (p. 79)	p. 156, 158		✓	\checkmark	\checkmark
• Check all string sleeves for wear. Replace as needed.	Item 2 (p. 79)	p. 156		\checkmark	\checkmark	
• Check all pin strings for wear. Replace as needed.	Item 3 (p. 79)	p. 155; 157		\checkmark	\checkmark	
Check double division rail covers for wear. Replace or rotate as needed.	Item 2 (p. 118)	p. 162		\checkmark	\checkmark	
Check cushion rivets for wear. Replace as needed.	Item 6 (p. 101); Item 6 (p. 105)	p. 161		\checkmark	\checkmark	
Check shield actuation & hard-stop string. Replace as needed.	Item 10 (p. 96); Item 25 (p. 97)	p. 175		\checkmark	\checkmark	
• Check pit cushion assembly (including cushion facing) for worn components. Replace as needed.	All Items (p. 101 & 105)	p. 181			\checkmark	
Check pit cushion blocks for wear. Replace as needed.	Item 2 (p. 108); Item 2 (p. 109)	p. 180			\checkmark	
• Check pit cushion shocks for proper operation. Replace as needed.	Item 2 (p. 107)	p. 180			\checkmark	
• Check pit curtain for wear or curling. Replace as needed.	Item 16 (p. 101); Item 16 (p. 105)	p. 161			\checkmark	
• Check pit floor assembly for worn components. Replace as needed.	All Items (p. 99 & 103)	p. 182			\checkmark	
Check chain lift rest rail covers for wear. Replace as needed.	Items 46 & 47 (p. 111)	p. 179			\checkmark	
Check chain lift lifter assembly wear pads for wear. Replace as needed.	Item 5 (p. 111)	p. 179			\checkmark	
Check chain lift lower sprocket bushings for wear. Replace as needed.	Item 3 (p. 111)	p. 179			\checkmark	
• Check chain lift lower cam roller for wear. Replace as needed.	Item 14 (p. 111)	p. 179			\checkmark	
Check cross sweep rail covers for wear. Replace as needed.	Item 2 (p. 119)	-			\checkmark	
• Check reel arm assemblies for excess play. Replace bushings or assemblies as needed.	Item 3 (p. 93)	p. 165			\checkmark	
Check drawbar and chain lift coupling spiders for wear. Replace as needed.	Item 11 (p. 85); Item 49 (p. 111)	p. 169; 178			\checkmark	
Check upper table pulleys for wear. Replace as needed.	Item 5 (p. 94)	p. 170			\checkmark	

**If the machine control box indicates that a string is too tight (indicator LED blinking), string adjustment must be performed immediately. If the machine control box indicates that a string is too loose (indicator LED ON), string adjustment can be performed according to Table 7-1, above.

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com

Page 151



WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

7.2. Cleaning

JBICA

MAKING BOWLING AMAZING

Due to differences in lane conditions, linage and other factors, these procedures should be done on an "as needed basis".

7.2.1. Clean Pit Floor

Precautions: LOTO, Lane Barriers **Tools:**

• Soft mop or broom **Location:** Front of machine

NOTE: If entering pit for cleaning, LOTO and lane barriers are required.

- 1. Press PINS UP.
- 2. Open pit hinged top cover and clean pit floor with soft mop or broom.
- **3.** Close all open covers.
- 4. Press PLAY.

7.2.2. Clean Pindeck and Lane with Lane Machine

- 1. Press PINS UP.
- 2. If cleaning or oiling lane, run lane machine.
- 3. Press PLAY.

7.2.3. Clean Ball Wiper Cloths

Precautions: LOTO, Lane Barriers **Tools:**

- None
- A spare set of ball wipes for entire center is suggested.

Location: Front of machine

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove ball wiper and hoops from rear and front above cross sweep.
- **3.** Remove ball wiper from hoops and clean using laundry detergent in washing machine or sink.
- 4. Insert hoops into clean ball wipe and reinstall in brackets on machine over cross sweep.
- 5. Remove LOTO and lane barriers. Return machine to service.









EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



7.3. Routine Maintenance Procedures

7.3.1. Perform String Adjustment



- 1. Press STRING ADJ.
- 2. Open reel arm cover.
- **3.** Adjust strings. Pull spool on each reel arm and rotate as needed to tighten or loosen strings (see Figure 7-1).
- 4. Adjust each spool until bowling pin is held in the stabilizing ring and the top of reel arm is in contact with the hard stop bracket, then loosen spool by one or two holes.
- 5. Press FULL SET to check string adjustment.
 - a. Once machine spots pins on pindeck, machine control box 1 10 pin indicator LEDs will light red after a few seconds.
 - b. If all LEDs are OFF, string adjustment is correct.
 - c. If any LEDs are *solid* ON, the corresponding strings are too loose.
 - d. If any LEDs are *blinking* ON, the corresponding strings are too tight.
 - e. String adjustment is required immediately for any strings that are too tight.
- 6. If further adjustment is necessary, press STRING ADJ and continue adjustment.
- 7. When finished, close reel arm cover and press PLAY.



QUEICAVAME POWER STATUS 🦳 1 (2(3 4 5 6 Indicator LEDs 7 8 10 **DPEN** CLOSE ALL DOO 0

0

Figure 7-1, Reel Arm Spool

Figure 7-2, Machine Control Box Lights

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





7.3.2. Repair Worn String Above Pin

Precautions: LOTO, Pin Hook, Lane Barriers **Tools:**

- #2 Phillips Screwdriver
- Diagonal Cutters
- Pin Hook

Location: Operator Access Area (behind machine) Est. Time: 5 min

Note:

• A string adjustment may be needed after this procedure.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Open machine rear cover.
- 3. Unlatch (by pulling handle rearward) and pull curtain fully rearward.
- 4. Retrieve pin with pin hook and place on top of pit hinged top cover.
- 5. Insert screwdriver into small hole on side of pin. Push string knot out through large hole on side of pin.
- **6.** Pull string through pin until all worn or frayed sections have been pulled through.
- 7. Cut off worn section of string.
- 8. Tie a "Figure 8" knot at end of string and pull knot into pin. See Figure 7-4.
- 9. Return pin to pit.
- **10.** Open reel arm cover.
- **11.** Unwind string from reel arm spool. Unwound string length should be equal to length of worn string that was cut.
- **12.** Push curtain fully forward until latched.
- 13. Close reel arm cover and machine rear cover.
- 14. Remove LOTO and lane barriers. Return machine to service.



Figure 7-3, String Routing

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000









7.3.3. Replace Pin and/or String Sleeve



Precautions: LOTO, Pin Hook, Lane Barriers **Tools:**

- #2 Phillips Screwdriver •
- Pin Hook •
- String Sleeve Tool • (051 - 200 - 700)

Location: Operator Access Area (behind machine) Est. Time: 5 min for 1 Pin OR 30 min for All



Figure 7-4, "Figure 8" Knot

Note:

A string adjustment may be needed after this procedure. •

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Open machine rear cover.
- 3. Retrieve pin with pin hook and place on top of pit hinged top cover.
- 4. Insert screwdriver into small hole on side of pin. Push string knot out through large hole on side of pin.
- 5. Untie knot and remove pin from string. Remove string sleeve if it needs to be replaced.
- 6. Install new sleeve (if applicable) on string using string sleeve tool. See Figure 7-5.
- 7. Pass string through hole on top of pin and out through large hole on side of pin. See Figure 3-3.
- 8. Tie a "Figure 8" knot at end of string and pull knot into pin. See Figure 7-4.
- 9. Return pin to pit.
- **10.** Close machine rear cover.
- 11. Remove LOTO and lane barriers. Return machine to service.





400-051-247 Rev. C



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



7.3.4. Replace Pin String

Precautions: LOTO, Pin Hook, Lane Barriers **Tools:**

- #2 Phillips Screwdriver
- Diagonal Cutters
- Pin Hook
- Electrical Tape
- String. See String Length Table page 183 for length and part numbers
- String Sleeve Tool (051-200-700)

Location: Operator Access Area (behind machine)

Est. Time: 10 min for 1 Pin OR 60 min for All

Note:

• This procedure assumes string has not broken inside pinspotter frame.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Open machine rear cover.
- 3. Retrieve pin with pin hook and place on top of pit hinged top cover.
- 4. Insert screwdriver into small hole on side of pin. Push string knot out through large hole on side of pin.
- 5. Untie knot and remove pin and sleeve from string.
- 6. Tape end of new string to end of old string. String ends must be aligned end-to-end.
- 7. Open reel arm cover. Unwind string from reel arm spool, untie string knot, and remove string from spool.
- **8.** Pull old string gently to route new string through machine. Stop when taped connection is reached.
 - **a.** If significant resistance is felt or taped connection comes apart, stop and locate snag or taped connection. New string may have to be routed through machine by hand.
- 9. Remove old string and tape.
- **10.** Route end of new string through "D"-shaped hole in reel arm spool and tie a "Figure 8" knot. See Figure 7-4.
- 11. Install sleeve onto new string using string sleeve tool. See Figure 7-5.
- **12.** Pass string through hole on top of pin and out through large hole on side of pin. See Figure 7-3.
- 13. Tie a "Figure 8" knot at end of string and pull knot into pin. See Figure 7-4.
- **14.** Return pin to pit.
 - **a.** Wait until performing string adjustment to wind string onto reel arm spool.
- 15. Remove LOTO.
- 16. Perform a string adjustment.
- **17.** Close all open covers.
- 18. Remove lane barriers. Return machine to service.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



Figure 7-6, String Path (5-Pin Shown in Red)

7.3.5. Rotate Pins

MAKING BOWLING AMAZING

It is possible that unequal pin wear can occur on EDGE String

USBC Approved Version pinspotters. This is due to the pins on these machines always being set

on the same pin spot. As a result, some pins (especially the 1, 3, 5 and 9 pins) will wear more quickly than other pins, due to more frequent ball strikes (Figure 7-7a).

It is recommended to replace or rotate pins as needed as part of the preventive maintenance (PM) schedule. The recommended pin rotation sequence frequency is every 12,500 frames/1.5 months. After completing the rotation shown below (Figure 7-7b), continue repeating the rotation sequence or replace pins as needed.

Precautions: LOTO, Pin Hook, Lane Barriers **Tools:**

- #2 Phillips Screwdriver
- Pin Hook
- String Sleeve Tool (051-200-700)

Location: Operator Access Area (behind machine) **Est. Time:** 20 min for 4 Pins





Figure 7-7a Pin Wear

400-051-247 Rev. C WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000 P

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 158



Note:

• A string adjustment may be needed after this procedure.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Open machine rear cover.
- 3. Retrieve pin with pin hook and place on top of pit hinged top cover.
- 4. Insert screwdriver into small hole on side of pin. Push string knot out through large hole on side of pin.
- 5. Untie knot and remove pin from string. Remove string sleeve if it needs to be replaced.
- 6. Install new sleeve (if applicable) on string using string sleeve tool. See Figure 7-5.
- 7. Pass string through hole on top of pin and out through large hole on side of pin. See Figure 7-3.
- 8. Tie a "Figure 8" knot at end of string and pull knot into pin. See Figure 7-4.
- 9. Return pin to pit.
- **10.** Close machine rear cover.
- 11. Remove LOTO and lane barriers. Return machine to service.

Recommended Pin Rotation Sequence



BEFORE PIN ROTATION

AFTER PIN ROTATION

Figure 7-7b, Pin Rotation Sequence

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 159



7.3.6. Adjust Drawbar Chain Tension

Precautions: LOTO, Lane Barriers, Slip Hazard, Trip Hazard **Tools:**

• ¹/₂" Wrench Location: Front of Machine Est. Time: 10 min

Procedure:

- **1.** Implement LOTO and deploy lane barriers.
- 2. On one side of pinspotter, loosen bolts (2) holding bearing housing to side of pinspotter. Do not remove bolts. Repeat on opposite side. See Figure 7-9.
 - **a.** Drawbar tension is now maintained only by tensioning bolts and spring tension.
- **3.** Turn tensioning bolt to compress spring until arrow tip lines up with straight flange. See Figure 7-9.
 - **a.** Bearing housing may be stuck to painted side frame. If so, loosen tensioning bolt and push on bearing housing to free from pinspotter side frame.
- 4. Repeat Step 3 on opposite side of pinspotter.
- 5. Tighten bearing housing bolts on both sides of pinspotter.
- 6. Remove LOTO and lane barriers. Return machine to service.



Figure 7-8, Bearing Housing

Figure 7-9, Chain Tension Adjustment

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Tensioning Bolt



BICA MAKING BOWLING AMAZING



7.3.7. Replace Pit Cushion Rivet

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver
- ¹/₂" Socket
- Diagonal Cutters
- Vice Grips

Location: Operator Access Area (behind machine), Pit

Est. Time: 5 min

Note:

• Replace all removed cable ties before returning machine to service.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove pit rear guard.
- 3. Use vice grips to pull end of rivet. Cut rivet underneath barb.
- 4. Remove pieces of rivet and install a new rivet.
- 5. Use vice grips to stretch rivet. Then use rivet tool to pull barb of rivet through cushion plank.
- 6. Cut off tail of rivet about 2" [50mm] past barb.
- 7. Reinstall pit rear guard and double division guard.
- 8. Remove LOTO and lane barriers. Return machine to service.

7.3.8. Replace Pit Curtain

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver
- $7/_{16}$ " Socket
- $7/_{16}$ " Wrench

Location: Operator Access Area (behind machine), Pit Est. Time: 15 min

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Open pit hinged top cover.
- 3. Loosen and remove nuts and bolts holding pit curtain and clamp bar to curtain weldment.
- 4. Remove pit curtain and clamp bar.
- 5. Follow above steps in reverse order to install pit curtain and clamp bar.
- 6. When installing pit curtain, smooth side faces toward lane, and textured side faces toward cushion.
- 7. Remove LOTO and lane barriers. Return machine to service.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 161



7.3.9. Replace Double Division Rail Covers

Precautions: LOTO, Lane Barriers **Tools:**

Silicone Lubricant Chamois Swab 1.5" PVC Spacer Utility Knife Degreaser/Shop Towels Ratchet or Impact Driver ½" Socket ½" Wrench

Location: Operator Access Area (behind machine) Est. Time: 20 min

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove pit rear guards (both pits) and double division guard.
- 3. Loosen and remove nut and bolt holding ball rail to support bracket.
- 4. Pull ball rail off chain lift rest rail.
- 5. Using a utility knife, remove vinyl tubing from ball rail.
- 6. Follow procedure outlined in document 400-051-223 to install new ramp rail tubing.
- 7. Remove LOTO and lane barriers. Return machine to service.

7.3.10. Lubricate Drawbar Chain

Precautions: LOTO, Lane Barriers, Slip Hazard, Trip Hazard

Tools:

- Ratchet or Impact Driver
- 3/8" and 1/2" Sockets
- #2 Phillips Screwdriver
- General Purpose Bearing Grease 715-010-307 (NLGI 1 or 2) and Brush
- Shop Towel or Paper Towel

Location: Pindeck, Front of Machine Est. Time: 30 min

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove ground screws (2) and mounting bolts (4) for pinspotter front panel.
- 3. Remove pinspotter front panel and set aside.
- 4. Remove sprocket guards (2) on front end of pinspotter.
 - **a.** Sprocket guard mounting screws are removed from outside of pinspotter.
- 5. Use brush to apply grease to both drawbar chains. Remove any excess grease.
- 6. Reposition drawbar as needed to access and grease entire chain.
- 7. Reinstall sprocket guards and end panel.
- 8. Remove LOTO and lane barriers. Return machine to service.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000







7.3.11. Lubricate Chain Lift Chain & Lifter Assemblies



Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver •
- ¹/₂" Socket
- General Purpose Bearing Grease 715-010-307 (NLGI 1 or 2) and Brush
- Shop Towel or Paper Towel •

Location: Pit

Est. Time: 30 min

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove chain lift gearmotor (see Page 178).
- 3. Remove side panel of chain lift guarding.
- 4. Use brush to apply grease to chain links and lifter hinges. Remove any excess grease.
- 5. Move chain manually to lubricate entire chain and both lifter hinges.
- 6. Reinstall guarding and gearmotor.
- 7. Remove LOTO and lane barriers. Return machine to service.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



7.4. Non-Routine Maintenance Procedures

7.4.1. Ball Detector Alignment

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

Phillips Screwdriver •

JBICAVA

MAKING BOWLING AMAZING

- 051-200-779/051-200-784 Alignment/Cover Tools
- 051-203-119 Ball Sensor Tester

Location: Front of Machine Est. Time: 5 min

- 1. Implement LOTO and deploy lane barriers.
- 2. Disconnect Ball Detector connector at rear of system controller.
- **3.** Plug Ball Sensor Tester 12 pin connector to removed cable. Ensure batteries are installed and tester power switch is ON.
- 4. Loosen the screws that secure the cover to the ball detector assembly on the sides of the unit and remove the cover.
- 5. If available, secure the ball trigger cover tool (051-200-784) to one reflector (front or rear) and the ball trigger alignment tool (051-200-779) to the other reflector.
- 6. For the sensor with the 779 tool attached, loosen the four (4) small phillips head screws that secure the top half of the sensor housing, just enough to allow the sensor to be adjusted.
- 7. Adjust the detector as necessary so that the beam is reflected back and detected, indicated by the LED on the tail end of the sensor going out.
- **8.** Once the light is out, tighten the four screws.
- 9. Swap the alignment tools between the front and rear reflectors and repeat steps 6 & 7.
- **10.** Optional To confirm the adjustment, lay a sheet of black construction paper on the lane across from where the ball Figure 7-10d detector is located and slide it from gutter to gutter. The light should stay off. If the light comes on, that means the signal is bouncing off the lane instead of being just above the lane. Repeat the above steps angling the detector up and then repeat this step.
- 11. Repeat from step 5 on the adjacent lane of the pair.
- 12. Replace cover.
- 13. Remove alignment tools.
- 14. Remove ball sensor tester and replace ball detector cable to rear of system controller.
- 15. Remove LOTO and lane barriers.





Figure 7-10a Ball **Detector Plug**



Figure 7-10b ON-OFF Switch



Figure 7-10c 784 Cover Tool



779 Alignment Tool

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 164



7.4.2. Replace Reel Arm Assembly

Precautions: LOTO, Lane Barriers **Tools:**

- Ratchet or Impact Driver
- ¹/₂" Socket
- Diagonal Cutters
- Masking Tape
- Permanent Marker

Location: Operator Access Area (behind machine) Est. Time: 15 min

Note:

• Replace all removed cable ties before returning machine to service.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Open reel arm cover.
- **3.** Unwind strings from reel arm spools, untie retaining knots, and label strings using masking tape and marker.
- **4.** Unplug cable to tangle switch emitter board and cut cable ties holding cable to side frame.
- 5. Remove bolts (4) attaching reel arm assembly to pinspotter frame.
- 6. Slide reel arm assembly out of pinspotter frame.
 - **a.** If repairing reel arm assembly, remove springs with spring puller before disassembling unit.
- 7. Follow above steps in reverse order to install reel arm assembly.
- 8. Remove LOTO and lane barriers. Return machine to service.



Figure 7-11, Reel Arm Assembly

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 165





7.4.3. Replace Brake/Encoder Unit

Precautions: LOTO, Lane Barriers **Tools:**

- Ratchet or Impact Driver
- ¹/₂" Socket
- Location: Operator Access Area (behind machine)

Est. Time: 5 min

Procedure:

- 1. Before implementing LOTO, press FULL SET.
- 2. Implement LOTO and deploy lane barriers.
- 3. Open reel arm cover and locate brake/encoder unit number on C-channel.
- 4. Disconnect brake/encoder electrical cable (see Figure 7-13).
- 5. Using a ratchet or impact driver with a ¹/₂" socket, remove flange nuts (2) holding brake/encoder unit to C-channel. While removing second nut, hold brake/encoder unit to prevent unit from falling.
- 6. Holding brake/encoder unit, remove string from all string retainers (see Figures 7-12, 7-13).
- 7. Follow above steps in reverse order to install brake/encoder unit.
- 8. After installation, remove LOTO and press **PINS UP**. Wait for machine to lift pins, then press **FULL SET** to confirm pin brake is operating correctly.
- 9. Remove lane barriers and return machine to service.



Figure 7-12, Brake/Encoder String Retainers



Figure 7-13, Brake/Encoder String Retainer & Electrical Cable

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



7.4.4. Replace Drawbar Chains

Precautions: LOTO, Lane Barriers, Slip Hazard, Trip Hazard **Tools:**

- Ratchet or Impact Driver
- $3/_8$ " and $1/_2$ " Sockets

MAKING BOWLING AMAZING

- #2 Phillips Screwdriver
- Needle-Nose Pliers

Location: Operator Access Area (behind machine), Front of Machine **Est. Time:** 60 min

Note:

• Both drawbar chains should be replaced as a set.

Procedure:

- 1. Before implementing LOTO, press PINS UP.
- 2. Implement LOTO and deploy lane barriers.
- 3. Remove drawbar gearmotor and set aside.
- 4. At front of machine, reach under pinspotter front panel and unclip shield panel carabiner from drawbar.
- 5. Loosen bearing housing bolts (4) and tensioning bolts (2) to relieve drawbar chain tension.
- 6. Remove ground screws (2) and mounting bolts (4) for pinspotter front panel.
- 7. Remove pinspotter front panel and set aside.
- 8. Remove all sprocket guards (4) inside pinspotter.
 - a. Sprocket guard mounting screws are removed from outside of pinspotter.
- **9.** Using needle-nose pliers, remove locking clip from all chain master links (4) and remove master link side plates.
 - **a.** There are 2 master links for each drawbar chain.
 - **b.** Reposition drawbar at any time if better access is required.
 - **c.** The body of each master link will be trapped between drawbar carriage and drawbar guide bar.
- 10. Remove both chains from master links by sliding chain off master link pin.
- 11. Remove drawbar chains from sprockets. Inspect sprockets for wear.
- 12. Follow above steps in reverse order to install replacement drawbar chains.
 - **a.** Both drawbar chains must be properly seated in sprockets for drawbar to move correctly. Drawbar must be square to pinspotter side frame. If drawbar is angled, chains are not seated correctly.
- 13. Remove LOTO and lane barriers. Return machine to service.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000









7.4.5. Replace Drawbar

Precautions: LOTO, Lane Barriers, Slip Hazard, Trip Hazard **Tools:**

- Ratchet or Impact Driver
- $\frac{3}{8}$ " and $\frac{1}{2}$ " Sockets
- Needle-Nose Pliers
- Masking Tape
- Permanent Marker

Location: Operator Access Area (behind machine), Front of Machine **Est. Time:** 60 min

Notes:

• It is recommended to have replacement chain master links (P/N: M0690011) available. Locking clip or master link may be damaged or lost during removal.

Procedure:

- 1. Before LOTO, press PINS UP.
- 2. Implement LOTO and deploy lane barriers.
- **3.** Unwind all strings from reel arm spools, untie retaining knot, and label strings using masking tape and marker.
- **4.** At front of machine, reach under pinspotter front panel and unclip shield panel carabiner from drawbar.
- 5. Loosen bearing housing bolts (4) and tensioning bolts (2) to relieve drawbar chain tension.
- **6.** Remove ground screws (2) and mounting bolts (4) for pinspotter front panel.
- 7. Remove pinspotter front panel and set aside.
- 8. Pull all strings through drawbar pulleys to remove them from drawbar.
- **9.** Using needle-nose pliers, remove locking clip from all chain master links (4) and remove master link side plates.
 - a. There are 2 master links for each drawbar chain.
 - **b.** Reposition drawbar at any time if better access is required.
 - **c.** The body of each master link will be trapped between drawbar carriage and drawbar guide bar.
- 10. Remove both chains from master links by sliding chain off master link pin.
- **11.** Remove drawbar by pushing one end away and pulling on other end. Drawbar will slide off drawbar guide bars. Set aside all chain master links, locking clips, and side plates.
- **12.** Follow above steps in reverse order to install drawbar.
- **13.** Remove LOTO and lane barriers. Return machine to service.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000







7.4.6. Replace Drawbar Gearmotor

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver •
- ¹/₂" Socket •
- **Diagonal** Cutters •

Location: Pit

Est. Time: 20 min

Note:

Replace all removed cable ties before returning machine to service. •

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Disconnect drawbar motor plugs from machine control box.
- 3. Cut all cable ties holding motor cable to machine.
- 4. Remove bolts (2) from gearmotor mounting plate. Support gearmotor as needed.
- 5. Remove gearmotor. Inspect coupling spider for wear.
- 6. Follow above steps in reverse order to install drawbar gearmotor.
- 7. Remove LOTO and lane barriers. Return machine to service.



Figure 7-14, Drawbar Gearmotor

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



7.4.7. Replace Gearmotor Drive Coupling



Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver
- ¹/₂" Socket
- 1/8" Allen Key
- Diagonal Cutters

Location: Pit

Est. Time: 30 min

Note:

- It is recommended to have replacement shaft keys (P/N: 907-237-080) available. Shaft keys may be lost during removal.
- Replace all removed cable ties before returning machine to service.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove all cable ties holding gearmotor cable to machine. Unplug gearmotor cables from control box.
- 3. Remove bolts (2) from gearmotor mounting plate. Support gearmotor as needed.
- 4. Remove gearmotor and set aside. Inspect coupling spider for wear.
- 5. Loosen coupling hub setscrew and remove coupling hub. Keep track of shaft key.
- 6. Follow above steps in reverse order to install replacement drive coupling.
 - **a.** Gearmotor coupling hub must sit against output shaft shoulder.
 - **b.** Inside face of drive shaft coupling hub must be flush with shaft end.
 - c. Install coupling hub set screws with threadlocker.
- 7. Remove LOTO and lane barriers. Return machine to service.

7.4.8. Replace Table Pulley

Precautions: LOTO, Lane Barriers, Slip Hazard

Tools:

- ³/₄" Wrench OR ³/₄" Socket and Ratchet
- #3 Phillips Screwdriver Location: Pindeck

Est. Time: 30 min

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Insert screwdriver into small hole on side of pin. Push string knot out through large hole on side of pin.
- 3. Untie knot. Remove pin and sleeve from string.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





Figure 7-15, Table Pulley Hardware

EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

Page 170

9

- 4. Remove pin and sleeve from string.
- 5. Pull string up and out of table pulley.
- 6. Remove bolt holding table pulley to upper table.
- 7. Remove table pulley.

JBICAV

MAKING BOWLING AMAZING

- 8. Follow above steps in reverse order to install table pulley. Align pin in table pulley to hole in upper table. See Figure 7-15.
- 9. Route string around table pulley and through table pulley bolt.
- 10. Re-install sleeve on string. Pass string through hole on top of pin and out through large hole on side of pin. See Figure 7-16.
- 11. Tie a "Figure 8" knot at end of string and pull knot into pin. See Figure 7-17.
- 12. Remove LOTO and lane barriers. Return machine to service.





Figure 7-17, "Figure 8" Knot

Figure 7-16, String Routing

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



7.4.9. Rotate Pin Centering Ring

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- $7/_{16}$ " Wrench
- #3 Phillips Screwdriver OR #3 Phillips Bit and Impact Driver

Location: Pindeck

Est. Time: 5 min for 1 Centering Ring OR 30 min for All

Note:

- The estimated time assumes an impact driver is used.
- Centering rings may be rotated in 90° increments if wear is observed to extend service life.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove hardware holding centering ring to lower table.
- 3. Rotate centering ring to a new position.
- 4. Reinstall hardware.
- 5. Remove LOTO and lane barriers. Return machine to service.



Figure 7-18, Centering Ring Hardware

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000







7.4.10. Replace Pin Centering Ring

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- $7/_{16}$ " Wrench
- #3 Phillips Screwdriver OR #3 Phillips Bit and Impact Driver

Location: Pindeck

Est. Time: 10 min for 1 Centering Ring OR 60 min for All

Note:

- The estimated time assumes an impact driver is used.
- A string adjustment may be needed after this procedure.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Insert screwdriver into small hole on side of pin. Push string knot out through large hole on side of pin.
- 3. Untie knot and remove pin from string. Sleeve can remain on string.
- 4. Remove hardware holding centering ring to lower table.
- 5. Replace centering ring.
- 6. Reinstall hardware.
- 7. Pass string through hole on top of pin and out through large hole on side of pin. See Figure 7-16.
- 8. Tie a "Figure 8" knot at end of string and pull knot into pin. See Figure 7-17.
- 9. Remove LOTO and lane barriers. Return machine to service.



WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



7.4.11. Replace Shield Actuation String

Precautions: LOTO, Lane Barriers, Slip hazard, Trip Hazard **Tools:**

• ⁷/₁₆" Wrench Location: Front of Machine Est. Time: 30 min

BICAV

MAKING BOWLING AMAZING

Procedure:

- 1. Before LOTO, press FULL SET, as soon as shield is all the way down, turn off system controller.
- 2. Implement LOTO and deploy lane barriers.
- 3. Remove string from quick-link on shield.
- 4. At front of machine, reach under pinspotter front panel and remove string from quick-link attached to drawbar. It may be necessary to pull drawbar closer to front of pinspotter for access.
- 5. Pull actuation string through pinspotter front panel pulley assembly.
- 6. Follow above steps in reverse order to install new actuation string.
- 7. Remove LOTO and lane barriers. Return machine to service.



Figure 7-19, Shield Actuation String Path (Shown in Red)

Table 7-2, Actuation String

String Length	QubicaAMF Part Number
70.19" [17 cm]	051-202-226



WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000







7.4.12. Replace Shield Hard-Stop String

Precautions: LOTO, Lane Barriers, Slip Hazard, Trip Hazard **Tools:**

• ⁷/₁₆" Wrench Location: Front of Machine Est. Time: 30 min

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove string from quick-link on shield.
- 3. Remove string from quick-link attached to hard stop string bracket.
- 4. Follow above steps to install new hard stop string.
- 5. Remove LOTO and lane barriers. Return machine to service.



Figure 7-20, Shield Stop String Path (Shown in Red)



WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000







7.4.13. Replace Shield Panel

Precautions: LOTO, Lane Barriers, Slip Hazard, Trip Hazard **Tools:**

• $3/_8$ " Wrench

MAKING BOWLING AMAZING

JBICA

- #2 Phillips Screwdriver
- Location: Front of Machine

Est. Time: 15 min

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove quick-link from back of shield panel.
- 3. Remove hardware securing shield hinges to hanger bracket.
- 4. To install shield panel, reinstall hardware and attach quick-link to shield panel.
- **5.** Remove LOTO and lane barriers. Return machine to service.

7.4.14. Adjust Chain Lift Chain Tension

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- $\frac{1}{2}$ " Wrench
- Chain Lift Tension Tool (051-201-265) Location: Pit

Est. Time: 30 min

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove chain lift guarding side panels.
- **3.** If lifter assembly is in the way, move chain so it does not interfere with tensioning tool.
- **4.** Check chain adjustment with gauge. Position the gauge on the opposite side of the lift against the lift frame. The chain is properly tensioned when the chain can be pulled out to the notched area of the gauge (Figure 7-21a). The lift will operate normally with the chain pulled anywhere in that zone.
- **5.** See Figure 7-21b. Assemble tool by inserting the tensioner bridge (3) into the center slot of the lifter gauge bracket (2). Fasten the tensioning knob (1) into nut of lift tensioner bridge. Lift tensioner bridge should be at lowest point of slots in lifter gauge bracket (2).







Figure 7-21a - Check Chain Tension



Figure 7-21b Assemble Tool

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





6. Loosen the 4 upper pulley assembly fasteners on both sides at the top of the lift (Figure 7-21c).

BICA

MAKING BOWLING AMAZING

7. Install the assembled tool in the saddle cutouts on the ball lift assembly (Figure 7-21d). Ensure the tensioner channel (light grey) is below the pulley channel (dark grey). The lift tensioner bridge will extend through the slots on the other side. It may be necessary to remove the wire tie securing the data cable (Figure 7-21e).



Figure 7-21d - Mount tool

- 8. Re-position the gauge on the opposite side of the lift against the lift frame. Turn the tensioning knob to obtain the correct chain tension on the gauge. When properly adjusted, chain will sit within the notched part of the gauge when moved away from the frame (see Figure 7-21a). If it is within the high part closest to the ball lift bracket, the chain is too tight (lower upper pulley) (Figure 7-21f). If the chain can extend to the opposite high part, the chain is too loose (raise upper pulley).
- **9.** Once proper tension is reached, tighten the upper pulley hardware and remove the adjusting tool. Replace any wire ties that were removed.
- **10.** Re-install all guarding.
- 11. Remove LOTO and lane barriers. Return machine to service.



Figure 7-21c - Loosen Upper Pulley Assy



Figure 7-21e - Wire Tie



Figure 7-21f - Chain too tight

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051,4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



7.4.15. Replace Chain Lift Gearmotor



Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver •
- ¹/₂" Socket •
- **Diagonal Cutters** •

Location: Pit

Est. Time: 10 min

Note:

Replace all removed cable ties before returning machine to service. •

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Disconnect chain lift motor plugs from chain lift control box.
- 3. Cut all cable ties holding motor cable to chain lift ground wire.
- 4. Remove bolts (2) from gearmotor mounting plate. Support gearmotor as needed.
- 5. Remove gearmotor. Inspect coupling spider for wear.
- 6. Follow above steps in reverse order to install chain lift gearmotor.
- 7. Remove LOTO and lane barriers. Return machine to service.



Figure 7-22, Chain Lift Gearmotor

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



7.4.16. Replace Chain Lift

MAKING BOWLING AMAZING

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver
- $\frac{7}{16}$ " and $\frac{1}{2}$ " Sockets
- $7/_{16}$ " and $1/_2$ " Wrenches
- #2 Phillips Screwdriver
- Chain Lift Service Lock (051-200-532)

Location: Operator Access Area (behind machine), Pit Est. Time: 90 min

Note:

• The estimated time assumes an impact driver is used.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove pit rear guards (both pits) and double division guard.
- 3. Remove ball rails, ball stop, and support bracket.
- 4. Remove system controller guard.
- 5. Disconnect chain lift gearmotor cable from chain lift control box.
- 6. Remove chain lift ground wire from chain lift control box.
- 7. Remove bolts (2) from gearmotor mounting plate and remove chain lift gearmotor.
- 8. Install chain lift service lock (051-200-532). See Figure 7-24.
- **9.** Remove chain lift guarding.
- **10.** Loosen nut and bolt connecting system controller wireway to cross machine wireway. Do not remove hardware.
- 11. Remove system controller from its mount and set aside.
 - **a.** System controller cables do not need to be unplugged. Place system controller on pit hinged top cover of even machine.
- 12. Remove system controller mount.
- **13.** Loosen jam nuts on chain lift bumpers, screw bumpers into chain lift.
- 14. Wrap ground wire around gearmotor mount.
- **15.** Remove bolts (2) attaching cross sweep to top of chain lift. Support chain lift as needed.
- **16.** Lift up on chain lift to slide it off foundation posts (2).
- **17.** Carefully carry or slide chain lift out from between pit side frames.
 - **a.** If chain is stuck or caught on something, do not pull. Free any obstruction first.
 - **b.** Use caution to avoid damaging chain lift ball sensors and cables.
- **18.** Follow above steps in reverse order to install chain lift.
- **19.** Adjust bumpers on both sides of chain lift the center lift between kickbacks.
- **20.** Remove LOTO and lane barriers. Return machine to service.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000







Figure 7-23, Chain Lift



Figure 7-24, Chain Lift Service Lock



7.4.17. Replace Pit Cushion Block

Precautions: LOTO, Lane Barriers and Slip Hazard **Tools:**

- Ratchet or Impact Driver
- ¹/₂" Socket

MAKING BOWLING AMAZING

• $\frac{1}{2}$ " Wrench

Location: Operator Access Area (behind machine), Pit

Est. Time: 10 min

Note:

• The estimated time assumes an impact driver is used to remove rear guards.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove pit rear guard.
- **3.** Unclip bowtie cotter pin from bottom of cushion shock. Remove pin and flat washer and set aside.
- 4. Remove pin retaining each cushion block.
- 5. Slide cushion blocks and cushion forward. Set cushion assembly on pit floor.
- **6.** Replace cushion block and reinstall following above steps in reverse order. Ensure shield plate is installed in each cushion block.
- 7. Remove LOTO and lane barriers. Return machine to service.

7.4.18. Replace Pit Cushion Shock

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver
- ¹/₂" Socket

Location: Operator Access Area (behind machine), Pit Est. Time: 5 min

Note:

• The estimated time assumes an impact driver is used to remove rear guards.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove pit rear guards (both pits) and double division guard.
- 3. Unclip bowtie cotter pins from cushion shock.
- 4. Remove pins and flat washers at top and bottom of shock and set aside.
- 5. Follow above steps in reverse order to install cushion shock.
- 6. Remove LOTO and lane barriers. Return machine to service.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000










7.4.19. Replace Pit Cushion Assembly



Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver
- ¹/₂" Socket
- $\frac{1}{2}$ " Wrench

Location: Operator Access Area (behind machine), Pit

Est. Time: 20 min

Note:

• The estimated time assumes an impact driver is used to remove rear guards.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove pit rear guards (both pits) and double division guard.
- **3.** Unclip bowtie cotter pin from bottom of shock and remove pin attaching shock to cushion. Set hardware aside.
- 4. Remove pin retaining opposite ball door side cushion block.
- 5. Slide cushion block and cushion forward.
- 6. Set aside cushion block and shield plate.
- 7. Rotate cushion to pull out of other cushion block.
- 8. Remove cushion assembly from pit.
- **9.** Follow above steps in reverse order to install cushion assembly. Ensure shield plate is installed in each cushion block.
- 10. Remove LOTO and lane barriers. Return machine to service.

7.4.20. Replace Pit Cushion Components

Precautions: None, Assumes cushion assembly has been removed (see 7.4.19) **Tools:**

- Wire cutters
- Pit removal/rivet tool
- Vice Grip pliers

Location: Operator Access Area (behind machine), workbench **Est. Time:** 20 min

Procedure:

- 1. Cut the cable ties (770-011-232) securing the Cushion Cover (051-200-254) to the Tube Weldment.
- 2. Remove all urethane rivets using vice grip pliers and replace any worn or broken components of the cushion assembly.
- **3.** Install rivets (000-028-529) in the 6 lower holes of the cushion rubber (000-024-807 or 000-024-808) and the middle holes <u>not</u> at the ends.
- **4.** Place the Cushion Cover on top of the cushion rubber. Note orientation odd versus even.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





- **5.** Pull new urethane cushion rivets through 6 upper holes in stack of Cushion Cover and Rubber Cushion.
- 6. Note Using a mild soap on the urethane cushion rivets will ease assembly. Suggest doing this before next step.
- 7. Place Sponge Rubber Cushion Pad (000-022-770) and Plank (000-024-795 or 000-024-796) on stack and pull tails of urethane rivets through all holes.
- 8. DO NOT PULL RIVETS ALL THE WAY THROUGH ASSEMBLY UNTIL ALL RIVET TAILS ARE THROUGH PLANK.
- **9.** Working from the center of the plank to the ends, pull the urethane rivets through the cushion plank using the pit removal/rivet tool (784-003-000). Note Using vice grips to pre-stretch the rivets will aid in this procedure.
- 10. Secure the cable ties to the top of the Tube Weldment.

7.4.21. Replace Pit Floor

Precautions: LOTO, Lane Barriers, Slip Hazard **Tools:**

- Ratchet or Impact Driver
- Flat Pry Bar(s)
- ¹/₂" Socket

Location: Operator Access Area (behind machine), Pit Est. Time: 20 min

Note:

• The estimated time assumes an impact driver is used.

Procedure:

- 1. Implement LOTO and deploy lane barriers.
- 2. Remove pit rear guards (both pits) and double division guard.
- 3. Remove cushion assembly (see Page 181).
- 4. Remove Pit Floor assembly by using lifting the assembly from the metal pit joists. The flat pry bars may need to be used for additional leverage.
- 5. Check condition of sheet metal joists while pit floor is out. Check and tighten hardware. Inspect Velcro attachment to joists.
- 6. Follow above steps in reverse order to install pit floor.
- 7. Remove LOTO and lane barriers. Return machine to service.



400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 182



7.5. Reference Tables

7.5.1. Bolt Torque Table

Table 8-1 shows typical bolt tightening torque values for reference in inch-pounds, footpounds and Newton-meters. If a different torque value is specified in this or another manual, then follow the specification given.

Bolt Size	lb-in	lb-ft	Nm
# 10	20 - 30	1.6 - 2.5	2.2 - 3.4
¹ / ₄ "	144 - 180	12 - 15	16 - 20
⁵ / ₁₆ "	216 - 240	18 - 20	24 - 27
³ / ₈ "	276 - 300	23 - 25	31 - 34
¹ / ₂ "	336 - 360	28 - 30	38 - 41

Table 8-1, Bolt Torques

7.5.2. String Length Table

String length is different for each row of pins as follows:

Table 8-2, String Lengths

Pin	String Length	QubicaAMF Part Number
1	17'11" [546 cm]	051-202-181
2, 3	17'2" [523 cm]	051-202-182
4, 5, 6	16'5" [500 cm]	051-202-183
7, 8, 9, 10	15'8" [478 cm]	051-202-184

String is wound on each reel arm to be used as spare string.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS

Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611



Section 8 Declarations of Conformity

Note: The following section contains copies of documents 400-051-237-01 and 400-051-238-01, current revision. These declarations reference multiple models for Tenpin and Duckpin products.

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



Page 184



8.1. EU Declaration of Conformity

Document Number: 400-051-237-01_D Original Document in English

QUBICAVAME						
EU DECLARATION OF CONFORMITY						
(According to Machinery Directive 2000/42/EC, Almex 2A)						
We hereby declare that the machinery described below complies with the essential machine health and safety requirements of Directive 2006/42/EC and the electromagnetic compatibility requirements of Directive 2014/30/EU.						
Conforming Machinery:	EDGE String with System Controller 0512009XX-YY					
Type/Function:	Bowling machine / String Pinspotter					
Model Number:	051-202-000-XX, 051-202-001-XX, 051-202-002-XX 051-202-100, 051-202-101, 051-202-102 051-201-005-XX, 051-201-006-XX, 051-201-007-XX Provided as part of Systems Numbered: 612-051-112, 612-051-113, 612-051-114, 612-051-117, 612-051-127 612-051-128, 612-051-209, 612-051-210, 612-051-211, 612-051-212					
Serial Number(s):						
Manufacturer:	QubicaAMF Worldwide, LLC 8100 AMF Drive Mechanicsville, Virginia 23111 USA					
Subject Authorized to Compile the Technical File:	QubicaAMF Europe S.p.A. Via della Croce Coperta 15 40128 Bologna, Italy					
Date of Issue:	25 January, 2024					
Place of Issue:	Via della Croce Coperta 15 40128 Bologna, Italy					
Signed:						
Signatory:	Roberto Vaioli Technical Director					

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000





8.2. UK Declaration of Conformity

Document Number: 400-051-238-01_D Original Document in English

We hereby declare that the machiner Requirements of UK Supply of Mach Metrology Regulations 2019 and UK E Safety and Metrology Regulations 201	y described below complies with the Essential machine Health and Safety ninery (Safety) Regulations 2008 as amended by the Product Safety and Electromagnetic Compatibility Regulations 2016 as amended by the Product 19.				
Conforming Machinery:	EDGE String with System Controller 0512009XX-YY				
Type/Function:	Bowling machine / String Pinspotter				
Model Number:	051-202-000-XX, 051-202-001-XX, 051-202-002-XX 051-202-100, 051-202-101, 051-202-102 051-201-005-XX, 051-201-006-XX, 051-201-007-XX Provided as part of Systems Numbered: 612-051-112, 612-051-113, 612-051-114, 612-051-117, 612-051-127 612-051-128, 612-051-209, 612-051-210, 612-051-211, 612-051-212				
Serial Number(s):					
Manufacturer:	QubicaAMF Worldwide, LLC 8100 AMF Drive Mechanicsville, Virginia 23111 USA				
Subject Authorized to Compile the Technical File:	QubicaAMF Europe S.p.A. Via della Croce Coperta 15 40128 Bologna, Italy				
Date of Issue:	25 January, 2024				
Place of Issue:	Via della Croce Coperta 15 40128 Bologna, Italy				
Signed:					
Signatory:	Roberto Vaioli Technical Director				

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000



EUROPEAN HEADQUARTERS Via della Croce Coperta, 15 - 40128 Bologna - Italy Tel: +39 051.4192.611

web: www.qubicaamf.com - email: info@qubicaamf.com - eshop: eshop.qubicaamf.com



Section 9 EDGE String USBC Approved Version Product Matrix

Section Overview

The following product matrix outlines all released EDGE String USBC Approved product models along with associated descriptions and certifications. Installation manual information is also included for each product model.

Table 10-1, EDGE String USBC Approved Version Product Matrix

Product Model			Operator's Manual		Installation Manual	
Part Number	Description	Certification	Part Number	Rev.	Part Number	Rev.
051-202-100	10-Pin, Pair	CE/UKCA,	400-051-247	A or	400-051-261	D
		MET		later		
051-202-101	10-Pin, Single, Odd	CE, UKCA,	400-051-247	A or	400-051-261	D
		MET		later		
051-202-102	10-Pin, Single, Even	CE, UKCA,	400-051-247	A or	400-051-261	D
		MET		later		

400-051-247 Rev. C

WORLDWIDE HEADQUARTERS 8100 AMF Drive - Mechanicsville, Va 23111 - USA Tel: (804) 569-1000

