

# Table of Contents

SECTION	TITLE	PAGE	SECTION	TITLE	PAGE
	<b>List of Figures &amp; Illustrations</b> .....iv	iv			
<b>1</b>	<b>Introduction</b> .....1	1	<b>7</b>	<b>Drive Connections</b> .....25	25
1.1	General Description .....1	1	7.1	Power Wiring.....25	25
1.2	Equipment Identification .....1	1	7.1.1	Incoming Power Requirements .....25	25
1.3	Model #/Rating Label location .....2	2	7.1.2	Power Distribution Requirements...25	25
1.3.1	Quantum III Models .....3	3	7.2	Output Power Connections .....26	26
<b>2</b>	<b>Electrical Specifications</b> .....5	5	7.2.1	Size 1 Power Connections .....27	27
2.1	Electrical Specifications .....5	5	7.2.2	Size 2 Power Connections .....28	28
2.1.1	Main AC Supply—3 Phase, 3 Wire, Jumper Selectable .....5	5	7.2.3	Size 3 Power Connections .....29	29
2.1.2	Speed Resolution .....5	5	7.2.4	Field Connections for Quantum III Size 2 or Size 3.....30	30
2.1.3	Response Times .....5	5	7.3	Control Logic Wiring.....31	31
2.2	Environment.....5	5	7.4	Signal Wiring.....35	35
2.3	Power Circuit.....6	6	7.5	Post Wiring Checks.....36	36
2.4	Status Relay Outputs .....6	6	<b>8</b>	<b>Drive Start-Up</b> .....37	37
2.5	Control Inputs & Outputs .....6	6	8.1	General Start-up Procedures.....37	37
2.6	Configuration Software .....9	9	8.2	Hardware Pre-Start Checks.....37	37
<b>3</b>	<b>Safety</b> .....11	11	8.2.1	General Checks .....37	37
	<b>Drive Sizes</b> .....14	14	8.2.2	Installation Checks.....37	37
3.1	General Safety Precautions .....11	11	8.2.3	Motor Checks.....38	38
3.2	Installation Safety.....11	11	8.2.4	Drive and Enclosure Checks.....38	38
3.3	Shielded Wiring.....12	12	8.2.5	Grounding Checks .....38	38
3.4	Start-up Safety.....12	12	8.3	Setup .....39	39
3.5	Safety Warnings.....13	13	8.3.1	Motor Nameplate .....39	39
3.6	Initial Checks .....13	13	8.3.2	Setting the Power Transformer.....40	40
<b>4</b>	<b>Rating Table</b> .....15	15	8.3.3	Parameter Security and Storage .....40	40
<b>5</b>	<b>Dimensions</b> .....17	17	8.3.4	Jumper and Switch Programming...40	40
<b>6</b>	<b>Mounting the Drive</b> .....23	23	8.3.5	Horsepower Setup for Size 1 .....41	41
6.1	9500-8302, 8303 9500-8602, 8603.....23	23	8.4	Armature Voltage Feedback.....43	43
6.2	9500-8305, 8306 9500-8605, 8606.....23	23	8.5	Tachometer Feedback .....43	43
6.3	9500-8307 through -8311 9500-8607 through -8611 .....23	23	8.5.1	AC or DC Tach Feedback.....43	43
6.4	9500-8315 through -8320 .....23	23	8.5.2	Setting the Max Tach Range.....44	44
6.5	Determining the Control Location ...23	23	8.5.3	AC or DC Tach Feedback Setup ....45	45
6.6	Installing Chassis Mount Controls ..24	24	8.6	Pulse Tach Feedback.....46	46
			8.6.1	Encoder/ Digital Pulse Tach Setup..47	47
			8.6.2	Encoder or Digital Pulse Tach Feedback.....48	48
			8.6.3	Scaling the Quantum for Encoder...48	48
			8.7	Current Limit Setup.....49	49
			8.8	Field Current Regulator .....50	50
			8.8.1	Quantum III MDA3 Field Regulator Range Jumper .....51	51
			8.8.2	Field Current Setup.....52	52
			8.9	Field Economy .....53	53
			8.10	Field Weakening .....53	53
			8.11	Current Loop Self-Tuning.....53	53
			8.11.1	Other Jumper Selections on 9500-4030 Interface Board .....58	58

# Table of Contents

SECTION	TITLE	PAGE	SECTION	TITLE	PAGE
<b>9</b>	<b>Logic Interface Circuitry .....</b>	<b>59</b>	10.7.4	MENU 04—	
9.1	NF—No Fault .....	60		Current Selection and Limits.....	106
9.2	FR—Fault Relay.....	60	10.7.5	MENU 05—Current Loop.....	111
9.3	PGM#1—		10.7.6	MENU 06—Field Control .....	117
	Programmable Relay #1 .....	60	10.7.7	MENU 07—	
9.4	PGM#2—			Analog Inputs & Outputs.....	120
	Programmable Relay #2 .....	60	10.7.8	MENU 08—Logic Inputs .....	124
9.5	Run/Stop Contactor Logic.....	60	10.7.9	MENU 09—Status Outputs.....	128
9.6	Run Logic.....	61	10.7.10	MENU 10—Status Logic	
9.7	Jog Logic .....	61		& Diagnostic Information.....	131
9.8	Additional Circuitry		10.7.11	MENU 11—Miscellaneous.....	134
	on the 9500-4030 Board.....	61	10.7.12	MENU 12—	
9.8.1	AC/DC Tachometer Select .....	61		Programmable Thresholds.....	136
9.8.2	HP Shunt Circuit .....	62	10.7.13	MENU 13—Digital Lock .....	136
9.8.3	Optional Motor Thermal		10.7.14	MENU 14—	
	Connection.....	62		Optional MD21 System Set-up .....	140
<b>10</b>	<b>Keypad, Displays,</b>		10.7.15	MENU 15—	
	<b>&amp; Drive Parameters .....</b>	<b>65</b>		Optional Application Menu 1 .....	141
10.1	Keypad.....	65	10.7.16	MENU 16—	
10.2	Displays .....	66		Optional Application Menu 2.....	143
10.3	Drive Parameters .....	67	<b>11</b>	<b>Serial Communications.....</b>	<b>145</b>
10.4	Types of Parameters .....	67	11.1	Communication Packages .....	145
10.4.1	Visible and Invisible Parameters.....	67	11.1.1	MentorSoft .....	145
10.4.2	Default Values.....	68	11.1.2	SystemWise.....	146
10.4.3	Organization .....	68	11.1.3	Factory Field Bus	
10.4.4	Adjustment.....	68		Communication Options .....	146
10.4.5	Access to Parameters.....	68	11.2	Fundamentals .....	147
10.4.6	Procedure .....	68	11.3	Preliminary Adjustments	
10.4.7	Saving Values .....	70		to the Drive .....	148
10.5	Security.....	71	11.4	Resolution.....	150
10.5.1	Power On .....	71	11.5	Components of Messages .....	150
10.5.2	Level 1 Security to Access the		11.5.1	Control Characters.....	150
	Visible R/W Parameters.....	71	11.5.2	Serial Address .....	150
10.5.3	Level 2 Security to Access the		11.5.3	Parameter Identification .....	150
	Invisible R/W Parameters.....	71	11.5.4	Data Field .....	150
10.5.4	To Enable and Inhibit Free Access		11.5.5	Block Checksum (BCC) .....	151
	to ALL Parameters .....	72	11.6	Structure of Messages.....	151
10.5.5	Level 3 Security .....	72	11.6.1	Host to Drive .....	151
10.5.6	Basic Keypad/Display Operations...	73	11.6.2	Drive to Host.....	151
10.5.7	Changing a Parameter Value .....	74	11.6.3	Multiple Drives .....	151
10.6	Menu Index .....	76	11.7	Sending Data .....	151
10.6.1	Menus List .....	76	11.8	Reading Data.....	152
10.6.2	Parameters—Names, Range &		11.8.1	Repeat Enquiry.....	152
	Default Values.....	76	11.8.2	Next Parameter .....	152
10.7	Description of Parameters .....	93	11.8.3	Previous Parameter .....	152
10.7.0	MENU 00—User Menu .....	95	11.8.4	Invalid Parameter Number .....	152
10.7.1	MENU 01—Speed Reference.....	95	11.9	Block Checksum (BCC) .....	152
10.7.2	MENU 02—Ramps .....	99			
10.7.3	MENU 03—Feedback				
	Selection and Speed Loop.....	101			

# Table of Contents

SECTION	TITLE	PAGE	SECTION	TITLE	PAGE
<b>12</b>	<b><i>Options</i></b> .....	<b>155</b>	<b>15</b>	<b><i>Recommended Spare Parts</i></b> .....	<b>181</b>
12.1	CTIU Interface Units .....	155	15.1	Quantum III Spare Parts Kits.....	181
12.2	Field Control Card MDA3.....	156	15.2	Quantum III Spare Parts Kits.....	182
12.3	Field Control Unit FXM5 .....	157	15.3	Replacement Parts Information .....	183
<b>13</b>	<b><i>Fault Finding</i></b> .....	<b>161</b>	15.4	Size 1 Non-Regen Spares .....	184
13.1	Important Safeguards .....	161	15.5	Size 1 Regen Spares.....	186
13.2	Troubleshooting Overview.....	161	15.6	Size 2 Non-Regen Spares .....	188
13.2.1	Suggested Training .....	161	15.7	Size 2 Regen Spares.....	190
13.2.2	Maintenance Records.....	161	15.8	Size 3 Non-Regen Spares .....	192
13.2.3	General Troubleshooting.....	161	15.9	Size 3 Regen Spares.....	194
13.2.4	Notes for a Troubleshooting Technician.....	161			
13.3	Fault Finding .....	162	<b>Appendix: A</b>		
13.3.1	Fault Finding Chart .....	168		<b><i>Interconnect Diagrams</i></b> .....	<b>196</b>
<b>14</b>	<b><i>Repair &amp; Maintenance</i></b> .....	<b>173</b>	<b>Appendix: B</b>		
14.1	Replacing Components on the Drive Unit .....	173		<b><i>Jumper Programming Chart</i></b> .....	<b>205</b>
14.2	Routine Maintenance.....	173	<b>Appendix: C</b>		
14.3	Personality Board MDA-2 Removal (All Models).....	174		<b><i>Application Notes</i></b> .....	<b>207</b>
14.4	Control Board MDA-1 Removal (All Models).....	174		Increase/Decrease MOP Function.....	207
14.5	Inspection of the Contactor/Fuse Chassis (Models 9500-8X02 through 9500-8X06).....	174		Quantum III/Mentor II with Field Boost Transformer .....	208
14.6	Removal of the Contactor/Fuse Chassis from the Molded Base (Models 9500-8X02 through 9500-8X06) .....	175		Zero Reference Start Circuit Interlock .....	209
14.7	Field Rectifier—Changing.....	175		E-Stop without External Trip .....	210
14.8	Replacement of Fuses.....	175		Separate Jog Accel & Decel Ramps .....	212
14.8.1	Low HP Model 9500-8X02 to 9500-8X06.....	175		“Contactor-Less” Jog Delayed Motor Contactor Hold-In .....	215
14.8.2	Medium HP Models 9500-8X07 to 9500-8X11.....	175		A Simple Ratio Control Scheme .....	216
14.8.3	High HP Models 9500-8315 to 9500-8320 .....	176		Programmable Logic Gates .....	217
14.8.4	High HP Models 9500-8315 to 9500-8320 and 9500-8112 to 9500-8114 .....	176		Programmable Time Delays.....	219
			<b>Appendix: D</b>		
				<b><i>Analog Parameters</i></b> .....	<b>220</b>
			<b>Appendix: E</b>		
				<b><i>Menu Diagrams</i></b> .....	<b>221</b>
			<b>Appendix: F</b>		
				<b><i>Security Code</i></b> .....	<b>233</b>

# List of Figures & Illustrations

---

TITLE	PAGE	TITLE	PAGE
1-1 Quantum III Fully Microprocessor-controlled 3-Phase 6-Pulse SCR Drive.....	1	11-1 Serial Address 11.11.....	147
1-2 Size 1 9500-8X02 thru 8X06.....	2	12-1 Control Techniques Interface Unit.....	155
1-3 Size 2 9500-8X07 thru 8X11.....	2	12-2 MDA3 Card and Connections.....	156
1-4 Quantum III Label.....	2	12-3 MDA3 Card Attached to the Heat Sink Behind the Power Board.....	157
1-5 Quantum III Size 1.....	3	12-4 FXM5 Ribbon Connector Location on Size 2 and Size 3 Quantums 9500-8X07 thru 9500-8X20.....	158
1-6 Quantum III Size 2.....	3	12-5 FXM5 overall and Mounting Dimensions ..	159
1-7 Quantum III Size 3.....	3		
3-1 Recommended Oscilloscope Connection ..	13		
5-1 Quantum III Dimensions.....	17	14-1 5-100 HP Quantum III Unit.....	177
5-2 Quantum III Dimensions.....	17	14-2 75-400 HP Quantum III Unit.....	178
5-3 Quantum III Panel Mounting Using Supplied Brackets.....	18	14-3 250-1000 HP Quantum III Unit.....	179
5-4 Quantum III Surface Mounting.....	19	14-4 9300-5308 MDA5 Snubber Board.....	180
5-5 500 HP - 1000 HP Non-Regenerative.....	20	14-5 9300-1014 Board.....	180
5-6 500 HP - 1000 HP Regenerative.....	21		
7-1 Quantum III Size 1 Bottom End View.....	32	<b>APPENDIX A: - Interconnect Diagrams</b>	
7-2 Quantum III Size 2 Bottom End View.....	33	A-1 5-100 HP/9500-1300-I, Sheet 1.....	197
7-3 Quantum III Size 3 Bottom End View.....	34	A-2 75-400 HP/9500-1300-I, Sheet 2.....	199
8-1 Logic Interface and AC Interface Boards ..	54	A-3 500-1000 HP Non-Regen/ 9500-1300-I, Sheet 1.....	201
8-2 Location of Main Components.....	55	A-4 5-1000 HP/9500-1300-I, Sheet 2.....	203
8-3 Location of Principal Components on PCB MDA2, Revision 2.....	56	<b>APPENDIX C: Application Note Figures</b>	
8-4 MDA210 Power Board.....	57	Basic Flow Diagram of Increase/Decrease Logic ..	207
8-5 MDS3 Field Regulator PCB.....	57	Quantum III/Mentor II Field Boost Transformer...	208
9-1 Quantum III Interconnect Diagram 9500-1300-I.....	63	Zero Reference Start Circuit Interlock/ Two Wire Control.....	209
10-1 Quantum III Decal.....	65	Zero Reference Start Circuit Interlock/ Three Wire Control.....	209
10-2 Adjustment of Parameters and Level 1 Security.....	69	E-Stop without External Trip/ Three Wire Control - Run/Stop Pushbuttons.....	210
10-3 Parameter Logic Overview.....	94	E-Stop without External Trip/ Two Wire Control - Run/Ramp Stop + DB Stop ....	210
10-4 Menu 01 - Speed Reference Selection & Limits.....	96	Separate Jog Accel & Decel Rates.....	213
10-5 Menu 02- Ramp Selection.....	100	Contactless Jog Delayed Motor Contactor Hold-In.....	215
10-6 Menu 03 - Feedback Selection & Speed Loop.....	104	Simple Ratio Control Scheme.....	216
10-7 Torque Control with Speed Override. Positive Torque Reference.....	106	Logic Gates.....	217
10-8 Torque Control with SSpeed Override. Negative Torque Reference.....	106	Time Delays.....	218
10-9 Coiler Deceleration and Uncoiler Acceleration.....	106	<b>APPENDIX E:</b>	
10-10 Menu 04 - Current Selection & Limits.....	108	E-1 through E-13	
10-11 Calculation of Current Taper Gradients 1 & 2.....	109	Parameter Logic & Menu Diagrams....	221-232
10-12 Menu 05 - Current Loop.....	112		
10-14 Menu 06 - Field Control.....	116		
10-15 Menu 07 - Analog Inputs & Outputs.....	123		
10-16 Menu 08 - Logic Inputs.....	126		
10-17 Menu 09 - Status Outputs.....	129		
10-18 Menu 12 - Programmable Thresholds.....	137		
10-19 Menu 13 - Digital Lock.....	139		