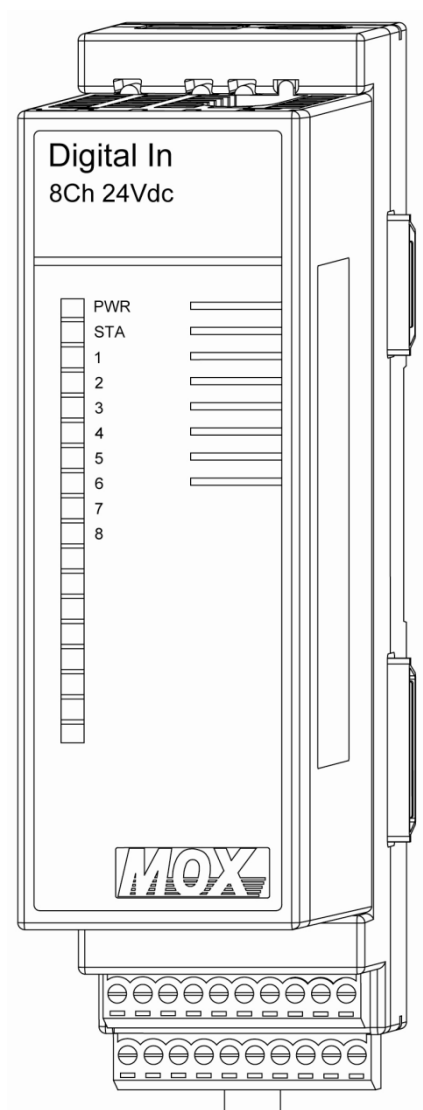


MOX 603 Rack Base I/O

User Guide

0742-603-2301-001



Preface

Scope of the User Guide

This MOX 603 Rack Base I/O User's Guide contains operation information for rack base MOX 603 I/O modules:

Part Number	Module Description
MX603-0104-123	4 CNT 24VDC
MX603-0108-173	8 CNT Front-wiring
MX603-0108-113	8 DI 24VDC
MX603-0108-143	8 SOE 24VDC
MX603-0112-143	12 SOE Front-wiring
MX603-0116-133	16 DI Dry Contact
MX603-0116-253	16 DI 115VAC Front-wiring
MX603-0116-263	16 DI 230VAC Front-wiring
MX603-0116-273	16 DI Dry Contact Front-wiring
MX603-0132-133	32 DI Dry Contact Front-wiring
MX603-0132-233	32 DI Front-wiring
MX603-0208-313	8 DO Relay
MX603-0212-113	12 DO Relay Front-wiring
MX603-0216-123	16 DO 24VDC Module Power
MX603-0216-133	16 DO 24VDC Module Power
MX603-0232-123	32 DO 24VDC Module Power Front-wiring
MX603-0308-423	8 AI 1-5VDC
MX603-0308-613	8 AI 4-20mA Isolated
MX603-0308-633	8 AI 4-20mA Module Power
MX603-0308-643	8 AI 4-20mA
MX603-0312-113	12 AI 4-20mA Front-wiring
MX603-0312-123	12 AI 1-5VDC Front-wiring
MX603-0312-133	12 AI 4-20mA Front-wiring
MX603-0312-143	12 AI 1-5VDC Front-wiring
MX603-0508-813	8 TC
MX603-0512-823	12 TC Front-wiring
MX603-0604-913	4 RTD
MX603-0612-923	12 RTD Front-wiring
MX603-0408-123	8 AO 4-20mA Isolated Module Power Front-wiring
MX603-0408-613	8 AO 4-20mA Isolated
MX603-0701-xxx	Mixed I/O

This guide has been organized for the operator, and it is expected that the user is an engineer, technician, electrician or similar with an understanding of the operating and programming requirements of the MOX 603 I/O modules.

Related Documents

All MOX network architectures contain a collection of MOX equipment and several software packages. For this reason, a number of related documents should be read in conjunction with this user guide.

The related documents are noted below:

- MOX Open Controller User Guide
- MOX Unity Field Controller User Guide
- MOX 603 CP User Guide
- MOX 603 CPP User Guide
- MOXGRAF Online Help

Conventions Used



When you see the “exclamation mark” icon in the left-hand margin, the text to its immediate right will be a special note. Please ensure that you read this information to increase your understanding of the systems operation.



When you see the “stop sign” icon in the left-hand margin, the text to its immediate right will be a warning. This information could prevent injury loss of property or even death (in extreme cases). It is very important that you stop and read this information and ensure that you have complete understanding before continuing with the procedures.

Contents

1	OVERVIEW.....	1
2	GENERAL SETTINGS	2
2.1	STATION ADDRESS ASSIGNMENT	2
2.2	SAFETY KEYING.....	4
3	RACK BASES	6
3.1	MX603-2008-01.....	7
3.2	MX603-2020-01.....	8
3.3	MX603-2022-01.....	9
3.4	MX603-2023-01.....	10
4	I/O MODULES	11
4.1	4 CHANNEL COUNTER 24VDC.....	11
4.1.1	<i>Familiarization.....</i>	<i>11</i>
4.1.2	<i>Datasheet</i>	<i>11</i>
4.1.3	<i>Equivalent Circuit Diagram.....</i>	<i>12</i>
4.1.4	<i>Indication LEDs</i>	<i>12</i>
4.1.5	<i>Cabling Guide.....</i>	<i>13</i>
4.1.6	<i>Safety Keying.....</i>	<i>14</i>
4.1.7	<i>Configurable Channel Parameters</i>	<i>14</i>
4.2	8 CHANNEL COUNTER FRONT-WIRING	17
4.2.1	<i>Familiarization.....</i>	<i>17</i>
4.2.2	<i>Datasheet</i>	<i>17</i>
4.2.3	<i>Equivalent Circuit Diagram.....</i>	<i>18</i>
4.2.4	<i>Indication LEDs</i>	<i>18</i>
4.2.5	<i>Cabling Guide.....</i>	<i>19</i>
4.2.6	<i>Safety Keying.....</i>	<i>20</i>
4.2.7	<i>Configurable Channel Parameters</i>	<i>20</i>
4.3	8 CHANNEL DIGITAL INPUT 24VDC	24
4.3.1	<i>Familiarization.....</i>	<i>24</i>
4.3.2	<i>Datasheet</i>	<i>24</i>
4.3.3	<i>Equivalent Circuit Diagram.....</i>	<i>25</i>
4.3.4	<i>Indication LEDs</i>	<i>25</i>
4.3.5	<i>Cabling Guide.....</i>	<i>26</i>
4.3.6	<i>Safety Keying.....</i>	<i>27</i>
4.3.7	<i>Configurable Channel Parameters</i>	<i>27</i>
4.4	8 CHANNEL SOE 24VDC.....	29
4.4.1	<i>Familiarization.....</i>	<i>29</i>
4.4.2	<i>Datasheet</i>	<i>29</i>
4.4.3	<i>Equivalent Circuit Diagram.....</i>	<i>30</i>
4.4.4	<i>Indication LEDs</i>	<i>30</i>
4.4.5	<i>Cabling Guide.....</i>	<i>31</i>
4.4.6	<i>Safety Keying.....</i>	<i>31</i>
4.4.7	<i>Configurable Channel Parameters</i>	<i>31</i>
4.5	12 CHANNEL SOE FRONT-WIRING	33
4.5.1	<i>Familiarization.....</i>	<i>34</i>
4.5.2	<i>Datasheet</i>	<i>34</i>

4.5.3	Equivalent Circuit Diagram.....	35
4.5.4	Indication LEDs	35
4.5.5	Cabling Guide.....	35
4.5.6	Safety Keying.....	36
4.5.7	Configurable Channel Parameters	37
4.6	16 CHANNEL DIGITAL INPUT DRY CONTACT	38
4.6.1	Familiarization.....	38
4.6.2	Datasheet	38
4.6.3	Equivalent Circuit Diagram.....	39
4.6.4	Indication LEDs	39
4.6.5	Cabling Guide.....	39
4.6.6	Safety Keying.....	41
4.6.7	Configurable Channel Parameters	41
4.7	16 CHANNEL DIGITAL INPUT 115VAC FRONT-WIRING.....	43
4.7.1	Familiarization.....	43
4.7.2	Datasheet	43
4.7.3	Equivalent Circuit Diagram.....	44
4.7.4	Indication LEDs	44
4.7.5	Cabling Guide.....	45
4.7.6	Safety Keying.....	45
4.7.7	Configurable Channel Parameters	45
4.8	16 CHANNEL DIGITAL INPUT 230VAC FRONT-WIRING.....	47
4.8.1	Familiarization.....	47
4.8.2	Datasheet	47
4.8.3	Equivalent Circuit Diagram.....	48
4.8.4	Indication LEDs	48
4.8.5	Cabling Guide.....	48
4.8.6	Safety Keying.....	49
4.8.7	Configurable Channel Parameters	49
4.9	16 CHANNEL DIGITAL INPUT DRY CONTACT FRONT-WIRING	51
4.9.1	Familiarization.....	51
4.9.2	Datasheet	51
4.9.3	Equivalent Circuit Diagram.....	52
4.9.4	Indication LEDs	52
4.9.5	Cabling Guide.....	53
4.9.6	Safety Keying.....	54
4.9.7	Configurable Channel Parameters	54
4.10	32 CHANNEL DIGITAL INPUT DRY CONTACT FRONT-WIRING	55
4.10.1	Familiarization.....	55
4.10.2	Datasheet	55
4.10.3	Equivalent Circuit Diagram.....	56
4.10.4	Indication LEDs	56
4.10.5	Cabling Guide.....	56
4.10.6	Safety Keying.....	57
4.10.7	Configurable Channel Parameters	57
4.11	32 CHANNEL DIGITAL INPUT FRONT-WIRING	59
4.11.1	Familiarization.....	59
4.11.2	Datasheet	59
4.11.3	Equivalent Circuit Diagram.....	60
4.11.4	Indication LEDs	60

4.11.5	Cabling Guide.....	61
4.11.6	Safety Keying.....	65
4.11.7	Configurable Channel Parameters	65
4.12	8 CHANNEL DIGITAL OUTPUT RELAY	67
4.12.1	Familiarization.....	67
4.12.2	Datasheet	67
4.12.3	Equivalent Circuit Diagram.....	68
4.12.4	Indication LEDs	68
4.12.5	Cabling Guide.....	68
4.12.6	Safety Keying.....	70
4.12.7	Configurable Channel Parameters	70
4.13	12 CHANNEL DIGITAL OUTPUT RELAY FRONT-WIRING	72
4.13.1	Familiarization.....	72
4.13.2	Datasheet	72
4.13.3	Equivalent Circuit Diagram.....	73
4.13.4	Indication LEDs	73
4.13.5	Cabling Guide.....	74
4.13.6	Safety Keying.....	74
4.13.7	Configurable Channel Parameters	75
4.14	16 CHANNEL DIGITAL OUTPUT 24VDC	76
4.14.1	Familiarization.....	76
4.14.2	Datasheet	76
4.14.3	Equivalent Circuit Diagram.....	77
4.14.4	Indication LEDs	77
4.14.5	Cabling Guide.....	78
4.14.6	Safety Keying.....	79
4.14.7	Configurable Channel Parameters	79
4.15	32 CHANNEL DIGITAL OUTPUT 24VDC FRONT-WIRING	81
4.15.1	Familiarization.....	81
4.15.2	Datasheet	81
4.15.3	Equivalent Circuit Diagram.....	82
4.15.4	Indication LEDs	82
4.15.5	Cabling Guide.....	83
4.15.6	Safety Keying.....	83
4.15.7	Configurable Channel Parameters	84
4.16	8 CHANNEL ANALOG INPUT 1-5VDC	85
4.16.1	Familiarization.....	85
4.16.2	Datasheet	85
4.16.3	Equivalent Circuit Diagram.....	86
4.16.4	Indication LEDs	86
4.16.5	Cabling Guide.....	86
4.16.6	Safety Keying.....	88
4.16.7	Configurable Channel Parameters	88
4.17	8 CHANNEL ANALOG INPUT 4-20MA ISOLATED.....	90
4.17.1	Familiarization.....	90
4.17.2	Datasheet	90
4.17.3	Equivalent Circuit Diagram.....	91
4.17.4	Indication LEDs	91
4.17.5	Cabling Guide.....	91
4.17.6	Safety Keying.....	93

4.17.7	Configurable Channel Parameters	93
4.18	8 CHANNEL ANALOG INPUT 4-20MA MODULE POWER	95
4.18.1	Familiarization.....	95
4.18.2	Datasheet	95
4.18.3	Equivalent Circuit Diagram.....	96
4.18.4	Indication LEDs	96
4.18.5	Cabling Guide.....	96
4.18.6	Safety Keying.....	98
4.18.7	Configurable Channel Parameters	98
4.19	8 CHANNEL ANALOG INPUT 4-20MA	100
4.19.1	Familiarization.....	100
4.19.2	Datasheet	100
4.19.3	Equivalent Circuit Diagram.....	101
4.19.4	Indication LEDs	101
4.19.5	Cabling Guide.....	101
4.19.6	Safety Keying.....	103
4.19.7	Configurable Channel Parameters	103
4.20	12 CHANNEL ANALOG INPUT 4-20MA FRONT-WIRING	105
4.20.1	Familiarization.....	105
4.20.2	Datasheet	105
4.20.3	Equivalent Circuit Diagram.....	106
4.20.4	Indication LEDs	106
4.20.5	Cabling Guide.....	107
4.20.6	Safety Keying.....	107
4.20.7	Configurable Channel Parameters	108
4.21	12 CHANNEL ANALOG INPUT 1-5VDC FRONT-WIRING	109
4.21.1	Familiarization.....	109
4.21.2	Datasheet	109
4.21.3	Equivalent Circuit Diagram.....	110
4.21.4	Indication LEDs	110
4.21.5	Cabling Guide.....	110
4.21.6	Safety Keying.....	111
4.21.7	Configurable Channel Parameters	112
4.22	12 CHANNEL ANALOG INPUT 4-20MA FRONT-WIRING	113
4.22.1	Familiarization.....	113
4.22.2	Datasheet	113
4.22.3	Equivalent Circuit Diagram.....	115
4.22.4	Indication LEDs	115
4.22.5	Cabling Guide.....	116
4.22.6	Safety Keying.....	116
4.22.7	Configurable Channel Parameters	117
4.23	12 CHANNEL ANALOG INPUT 1-5VDC FRONT-WIRING	118
4.23.1	Familiarization.....	118
4.23.2	Datasheet	118
4.23.3	Equivalent Circuit Diagram.....	120
4.23.4	Indication LEDs	120
4.23.5	Cabling Guide.....	121
4.23.6	Safety Keying.....	122
4.23.7	Configurable Channel Parameters	122
4.24	8 CHANNEL TC	124

4.24.1	<i>Familiarization.....</i>	124
4.24.2	<i>Datasheet</i>	124
4.24.3	<i>Equivalent Circuit Diagram.....</i>	125
4.24.4	<i>Indication LEDs</i>	125
4.24.5	<i>Cabling Guide.....</i>	126
4.24.6	<i>Safety Keying.....</i>	127
4.24.7	<i>Configurable Channel Parameters</i>	127
4.25	12 CHANNEL TC FRONT-WIRING	129
4.25.1	<i>Familiarization.....</i>	129
4.25.2	<i>Datasheet</i>	129
4.25.3	<i>Equivalent Circuit Diagram.....</i>	130
4.25.4	<i>Indication LEDs</i>	130
4.25.5	<i>Cabling Guide.....</i>	131
4.25.6	<i>Safety Keying.....</i>	131
4.25.7	<i>Configurable Channel Parameters</i>	132
4.26	4 CHANNEL RTD	133
4.26.1	<i>Familiarization.....</i>	133
4.26.2	<i>Datasheet</i>	133
4.26.3	<i>Equivalent Circuit Diagram.....</i>	134
4.26.4	<i>Indication LEDs</i>	134
4.26.5	<i>Cabling Guide.....</i>	134
4.26.6	<i>Safety Keying.....</i>	136
4.26.7	<i>Configurable Channel Parameters</i>	137
4.27	12 CHANNEL RTD FRONT-WIRING.....	138
4.27.1	<i>Familiarization.....</i>	138
4.27.2	<i>Datasheet</i>	138
4.27.3	<i>Equivalent Circuit Diagram.....</i>	139
4.27.4	<i>Indication LEDs</i>	139
4.27.5	<i>Cabling Guide.....</i>	140
4.27.6	<i>Safety Keying.....</i>	140
4.27.7	<i>Configurable Channel Parameters</i>	141
4.28	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED MODULE POWER FRONT-WIRING	142
4.28.1	<i>Familiarization.....</i>	142
4.28.2	<i>Datasheet</i>	142
4.28.3	<i>Equivalent Circuit Diagram.....</i>	143
4.28.4	<i>Indication LEDs</i>	143
4.28.5	<i>Cabling Guide.....</i>	143
4.28.6	<i>Safety Keying.....</i>	145
4.28.7	<i>Configurable Channel Parameters</i>	145
4.29	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED	146
4.29.1	<i>Familiarization.....</i>	146
4.29.2	<i>Datasheet</i>	146
4.29.3	<i>Equivalent Circuit Diagram.....</i>	147
4.29.4	<i>Indication LEDs</i>	147
4.29.5	<i>Cabling Guide.....</i>	147
4.29.6	<i>Safety Keying.....</i>	149
4.29.7	<i>Configurable Channel Parameters</i>	149
4.30	MIXED I/O MODULES.....	151
4.30.1	<i>Familiarization.....</i>	151
4.30.2	<i>Datasheet</i>	151

4.30.3	<i>Equivalent Circuit Diagram</i>	152
4.30.4	<i>Indication LEDs</i>	153
4.30.5	<i>Cabling Guide</i>	154
4.30.6	<i>Safety Keying</i>	156
4.30.7	<i>Configurable Channel Parameters</i>	156
5	INSTALLATION, HANDLING & STORAGE CONSIDERATIONS	159
5.1	ELECTROSTATIC DISCHARGE	159
5.2	ENVIRONMENTAL PRECAUTIONS.....	159
5.3	PREVENTING EXCESSIVE HEAT	159
5.4	INSTALLATION CLEANLINESS.....	160
5.5	TERMINAL CONNECTORS	160
5.6	DIN RAIL SPECIFICATIONS	160
5.7	CABLE PATH CONSIDERATIONS	161
5.7.1	<i>Minimizing Electrical Noise on Analog Signal Lines</i>	161
5.7.2	<i>Analog Signal Cable Grounding</i>	162
5.7.3	<i>High Speed Counter Cable Grounding</i>	162
5.8	TYPICAL RACK BASE IO DIMENSIONS	162
5.9	POWER	164
5.9.1	<i>Power Requirements</i>	164
5.9.2	<i>Power Isolation</i>	164
5.9.3	<i>DC Power Wiring (User DC Source)</i>	165
5.9.4	<i>Applying Power</i>	165
5.10	RECOMMENDED OPERATING TOOLS	165
6	REDUNDANCY	168
6.1	HOW REDUNDANT I/O MODULES WORK	168
6.2	CONFIGURING REDUNDANT I/O MODULES	168
6.3	WIRING A REDUNDANT I/O PAIR	168
7	A TYPICAL SYSTEM	169
	APPENDIX A STATION ADDRESS INFORMATION	170
	APPENDIX B PRODUCT SUPPORT	171

Figures

FIGURE 1	DIP SWITCH OF BOTTOM WIRING I/O MODULES	2
FIGURE 2	ROTARY SWITCH ON THE FRONT WIRING I/O MODULES	3
FIGURE 3	SAFETY KEYING FOR MODULE TOP AND BOTTOM.....	4
FIGURE 4	SAFETY KEYING FOR BASE TOP AND BOTTOM.....	5
FIGURE 5	RACK BASE MX603-2008-01 FAMILIARIZATION.....	7
FIGURE 6	RACK BASE MX603-2020-01 FAMILIARIZATION.....	8
FIGURE 7	RACK BASE MX603-2022-01 FAMILIARIZATION.....	9
FIGURE 8	RACK BASE MX603-2023-01 FAMILIARIZATION.....	10
FIGURE 9	4 CHANNEL COUNTER FAMILIARIZATION	11
FIGURE 10	4 CHANNEL COUNTER EQUIVALENT CIRCUIT DIAGRAM.....	12
FIGURE 11	4 CHANNEL COUNTER CABLING DIAGRAM	13
FIGURE 12	8 CHANNEL COUNTER FAMILIARIZATION	17
FIGURE 13	8 CHANNEL COUNTER EQUIVALENT CIRCUIT DIAGRAM.....	18
FIGURE 14	8 CHANNEL COUNTER PIN DEFINITIONS.....	19
FIGURE 15	8 CHANNEL COUNTER CABLING DIAGRAM	20
FIGURE 16	8 CHANNEL DIGITAL INPUT 24VDC FAMILIARIZATION	24
FIGURE 17	8 CHANNEL DIGITAL INPUT EQUIVALENT CIRCUIT DIAGRAM	25
FIGURE 18	8 CHANNEL DIGITAL INPUT 24VDC WIRING DIAGRAM	26
FIGURE 19	8 CHANNEL DIGITAL INPUT 24VDC REDUNDANCY WIRING DIAGRAM	27
FIGURE 20	8 CHANNEL SOE FAMILIARIZATION.....	29
FIGURE 21	8 CHANNEL SOE EQUIVALENT CIRCUIT DIAGRAM.....	30
FIGURE 22	8 CHANNEL SOE WIRING DIAGRAM	31
FIGURE 23	12 CHANNEL SOE FRONT-WIRING FAMILIARIZATION	34
FIGURE 24	12 CHANNEL SOE FRONT-WIRING EQUIVALENT CIRCUIT DIAGRAM.....	35
FIGURE 25	12 CHANNEL SOE FRONT-WIRING WIRING DIAGRAM	36
FIGURE 26	16 CHANNEL DIGITAL INPUT DRY CONTACT FAMILIARIZATION.....	38
FIGURE 27	16 CHANNEL DIGITAL INPUT DRY CONTACT EQUIVALENT CIRCUIT DIAGRAM	39
FIGURE 28	16 CHANNEL DIGITAL INPUT DRY CONTACT WIRING DIAGRAM.....	40
FIGURE 29	16 CHANNEL DIGITAL INPUT DRY CONTACT EXAMPLE REDUNDANCY WIRING DIAGRAM	41
FIGURE 30	16 CHANNEL DIGITAL INPUT 115VAC FAMILIARIZATION	43
FIGURE 31	16 CHANNEL DIGITAL 115VDC EQUIVALENT CIRCUIT DIAGRAM	44
FIGURE 32	16 CHANNEL DIGITAL INPUT 115VAC PIN DEFINITIONS.....	45
FIGURE 33	16 CHANNEL DIGITAL INPUT 115VAC CABLING DIAGRAM.....	45
FIGURE 34	16 CHANNEL DIGITAL INPUT 230VAC FAMILIARIZATION	47
FIGURE 35	16 CHANNEL DIGITAL INPUT 230VAC EQUIVALENT CIRCUIT DIAGRAM.....	48
FIGURE 36	16 CHANNEL DIGITAL INPUT 230VAC PIN DEFINITIONS.....	49
FIGURE 37	16 CHANNEL DIGITAL INPUT 230VAC CABLING DIAGRAM.....	49
FIGURE 38	16 CHANNEL DIGITAL INPUT DRY CONTACT FRONT-WIRING FAMILIARIZATION.....	51
FIGURE 39	16 CHANNEL DIGITAL INPUT DRY CONTACT FRONT-WIRING EQUIVALENT CIRCUIT DIAGRAM	52
FIGURE 40	16 CHANNEL DIGITAL INPUT DRY CONTACT FRONT-WIRING PIN DEFINITIONS	53
FIGURE 41	16 CHANNEL DIGITAL INPUT DRY CONTACT FRONT-WIRING CABLING GUIDE	53
FIGURE 42	32 CHANNEL DIGITAL INPUT MODULE	55
FIGURE 43	32 CHANNEL DIGITAL INPUT EQUIVALENT CIRCUIT DIAGRAM	56
FIGURE 44	32 CHANNEL DIGITAL INPUT PIN DEFINITIONS	57
FIGURE 45	32 CHANNEL DIGITAL INPUT CABLING DIAGRAM.....	57
FIGURE 46	32 CHANNEL DIGITAL INPUT MODULE	59
FIGURE 47	32 CHANNEL DIGITAL INPUT EQUIVALENT CIRCUIT DIAGRAM	60
FIGURE 48	32 CHANNEL DIGITAL INPUT PIN DEFINITIONS	61
FIGURE 49	32 CHANNEL DIGITAL INPUT CABLING DIAGRAM FOR DRY CONTACT INPUT	61
FIGURE 50	32 CHANNEL DIGITAL INPUT CABLING DIAGRAM FOR VOLTAGE INPUT (COMMON NEGATIVE)	62
FIGURE 51	32 CHANNEL DIGITAL INPUT CABLING DIAGRAM FOR VOLTAGE INPUT (COMMON POSITIVE)	62
FIGURE 52	32 CHANNEL DIGITAL INPUT CABLING DIAGRAM FOR 2-WIRING PROXIMITY SWITCHES	63
FIGURE 53	32 CHANNEL DIGITAL INPUT CABLING DIAGRAM FOR 3-WIRING NPN PROXIMITY SWITCHES (NO)	64
FIGURE 54	32 CHANNEL DIGITAL INPUT CABLING DIAGRAM FOR 3-WIRING PNP PROXIMITY SWITCHES (NO)	64
FIGURE 55	8 CHANNEL DIGITAL OUTPUT RELAY FAMILIARIZATION	67
FIGURE 56	8 CHANNEL DIGITAL OUTPUT RELAY EQUIVALENT CIRCUIT DIAGRAM.....	68

FIGURE 57	8 CHANNEL DIGITAL OUTPUT RELAY WIRING DIAGRAM	69
FIGURE 58	8 CHANNEL DIGITAL OUTPUT RELAY REDUNDANCY WIRING DIAGRAM	69
FIGURE 59	12 CHANNEL DIGITAL OUTPUT RELAY FAMILIARIZATION	72
FIGURE 60	12 CHANNEL DIGITAL OUTPUT RELAY EQUIVALENT CIRCUIT DIAGRAM.....	73
FIGURE 61	12 CHANNEL DIGITAL OUTPUT RELAY PIN DEFINITIONS	74
FIGURE 62	12 CHANNEL DIGITAL OUTPUT RELAY WIRING DIAGRAM	74
FIGURE 63	16 CHANNEL DIGITAL OUTPUT FAMILIARIZATION	76
FIGURE 64	16 CHANNEL DIGITAL OUTPUT EQUIVALENT CIRCUIT DIAGRAM.....	77
FIGURE 65	16 CHANNEL DIGITAL OUTPUT CABLING DIAGRAM	78
FIGURE 66	16 CHANNEL DIGITAL OUTPUT REDUNDANCY WIRING DIAGRAM	79
FIGURE 67	32 CHANNEL DIGITAL OUTPUT FAMILIARIZATION	81
FIGURE 68	32 CHANNEL DIGITAL OUTPUT EQUIVALENT CIRCUIT DIAGRAM.....	82
FIGURE 69	32 CHANNEL DIGITAL OUTPUT PIN DEFINITIONS	83
FIGURE 70	32 CHANNEL DIGITAL OUTPUT CABLING DIAGRAM	83
FIGURE 71	8 CHANNEL ANALOG INPUT 1-5VDC FAMILIARIZATION	85
FIGURE 72	8 CHANNEL ANALOG INPUT 1-5VDC EQUIVALENT CIRCUIT DIAGRAM.....	86
FIGURE 73	8 CHANNEL ANALOG INPUT 1-5V CABLING DIAGRAM.....	87
FIGURE 74	8 CHANNEL ANALOG INPUT 1-5V REDUNDANCY WIRING DIAGRAM.....	88
FIGURE 75	8 CHANNEL ANALOG INPUT ISOLATED 4-20mA FAMILIARIZATION.....	90
FIGURE 76	8 CHANNEL ANALOG INPUT 4-20mA ISOLATED EQUIVALENT CIRCUIT DIAGRAM	91
FIGURE 77	8 CHANNEL ANALOG INPUT 4-20mA ISOLATED WIRING DIAGRAM.....	92
FIGURE 78	8 CHANNEL ANALOG INPUT 4-20mA ISOLATED REDUNDANCY WIRING DIAGRAM.....	93
FIGURE 79	8 CHANNEL ANALOG INPUT 4-20mA MODULE POWER FAMILIARIZATION	95
FIGURE 80	8 CHANNEL ANALOG INPUT 4-20mA MODULE POWER EQUIVALENT CIRCUIT DIAGRAM	96
FIGURE 81	8 CHANNEL ANALOG INPUT 4-20mA MODULE POWER CABLING DIAGRAM	97
FIGURE 82	8 CHANNEL ANALOG INPUT 4-20mA MODULE POWER REDUNDANCY WIRING DIAGRAM	98
FIGURE 83	8 CHANNEL ANALOG INPUT 4-20mA FAMILIARIZATION	100
FIGURE 84	8 CHANNEL ANALOG INPUT 4-20mA EQUIVALENT CIRCUIT DIAGRAM.....	101
FIGURE 85	8 CHANNEL ANALOG INPUT 4-20mA WIRING DIAGRAM	102
FIGURE 86	8 CHANNEL ANALOG INPUT 4-20mA REDUNDANCY WIRING DIAGRAM	103
FIGURE 87	12 CHANNEL ANALOG INPUT 4-20mA FAMILIARIZATION	105
FIGURE 88	12 CHANNEL ANALOG INPUT 4-20mA EQUIVALENT CIRCUIT DIAGRAM.....	106
FIGURE 89	12 CHANNEL ANALOG INPUT 4-20mA PIN DEFINITIONS	107
FIGURE 90	12 CHANNEL ANALOG INPUT 4-20mA WIRING DIAGRAM	107
FIGURE 91	12 CHANNEL ANALOG INPUT 1-5V FAMILIARIZATION	109
FIGURE 92	12 CHANNEL ANALOG INPUT 1-5V EQUIVALENT CIRCUIT DIAGRAM.....	110
FIGURE 93	12 CHANNEL ANALOG INPUT 1-5V PIN DEFINITIONS.....	111
FIGURE 94	12 CHANNEL ANALOG INPUT 1-5V WIRING DIAGRAM	111
FIGURE 95	12 CHANNEL ANALOG INPUT 4-20mA FAMILIARIZATION	113
FIGURE 96	12 CHANNEL ANALOG INPUT 4-20mA EQUIVALENT CIRCUIT DIAGRAM.....	115
FIGURE 97	12 CHANNEL ANALOG INPUT 4-20mA PIN DEFINITIONS	116
FIGURE 98	12 CHANNEL ANALOG INPUT 1-5V FAMILIARIZATION	118
FIGURE 99	12 CHANNEL ANALOG INPUT 1-5V EQUIVALENT CIRCUIT DIAGRAM.....	120
FIGURE 100	12 CHANNEL ANALOG INPUT 1-5V PIN DEFINITIONS	121
FIGURE 101	12 CHANNEL ANALOG INPUT 1-5V WIRING DIAGRAM	122
FIGURE 102	8 CHANNEL TC FAMILIARIZATION	124
FIGURE 103	8 CHANNEL TC EQUIVALENT CIRCUIT DIAGRAM	125
FIGURE 104	8 CHANNEL TC PIN DEFINITIONS	126
FIGURE 105	8 CHANNEL TC WIRING DIAGRAM	126
FIGURE 106	8 CHANNEL TC REDUNDANCY WIRING DIAGRAM	127
FIGURE 107	12 CHANNEL TC FAMILIARIZATION	129
FIGURE 108	12 CHANNEL TC EQUIVALENT CIRCUIT DIAGRAM	130
FIGURE 109	12 CHANNEL TC PIN DEFINITIONS	131
FIGURE 110	12 CHANNEL TC CABLING DIAGRAM	131
FIGURE 111	4 CHANNEL ANALOG INPUT RTD FAMILIARIZATION	133
FIGURE 112	4 CHANNEL RTD EQUIVALENT CIRCUIT DIAGRAM.....	134
FIGURE 113	4 CHANNEL RTD WIRING DIAGRAM	135
FIGURE 114	4 CHANNEL RTD REDUNDANCY WIRING DIAGRAM.....	136
FIGURE 115	12 CHANNEL RTD FAMILIARIZATION	138
FIGURE 116	12 CHANNEL RTD EQUIVALENT CIRCUIT DIAGRAM.....	139
FIGURE 117	12 CHANNEL RTD PIN DEFINITIONS.....	140

FIGURE 118	12 CHANNEL RTD WIRING DIAGRAM	140
FIGURE 119	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED FAMILIARIZATION.....	142
FIGURE 120	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED EQUIVALENT CIRCUIT DIAGRAM	143
FIGURE 121	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED PIN DEFINITIONS	144
FIGURE 122	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED CABLING DIAGRAM.....	144
FIGURE 123	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED FAMILIARIZATION.....	146
FIGURE 124	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED EQUIVALENT CIRCUIT DIAGRAM	147
FIGURE 125	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED WIRING DIAGRAM.....	148
FIGURE 126	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED REDUNDANCY WIRING DIAGRAM.....	149
FIGURE 127	MIXED I/O MODULES FAMILIARIZATION.....	151
FIGURE 128	6-CHANNEL DIGITAL INPUT EQUIVALENT CIRCUIT DIAGRAM	153
FIGURE 129	6-CHANNEL DIGITAL OUTPUT EQUIVALENT CIRCUIT DIAGRAM	153
FIGURE 130	6-CHANNEL ANALOG INPUT EQUIVALENT CIRCUIT DIAGRAM	153
FIGURE 131	4-CHANNEL ANALOG OUTPUT EQUIVALENT CIRCUIT DIAGRAM.....	153
FIGURE 132	DIGITAL INPUT CABLING DIAGRAM	154
FIGURE 133	DIGITAL OUTPUT CABLING DIAGRAM.....	155
FIGURE 134	ANALOG INPUT CABLING DIAGRAM.....	155
FIGURE 135	4 CH ANALOG OUTPUT 4-20MA CABLING DIAGRAM	156
FIGURE 136	DIN RAIL EN 50022	161
FIGURE 137	RACK BASE I/O DIMENSIONS (BASE MX603-2020-01).....	163
FIGURE 138	RACK BASE I/O DIMENSIONS (BASE MX603-2022-01/MX603-2008-01).....	163
FIGURE 139	RACK BASE I/O DIMENSIONS (BASE MX603-2023-01).....	164
FIGURE 140	SCREWDRIVER FOR 2.5MM PIN SPACING TERMINAL STRIPS.....	166
FIGURE 141	WIRE SPECIFICATIONS FOR 2.5MM PIN SPACING TERMINAL STRIPS.....	166
FIGURE 142	SCREWDRIVER FOR 3.5MM PIN SPACING TERMINAL STRIPS.....	166
FIGURE 143	WIRE SPECIFICATIONS FOR 3.5MM PIN SPACING TERMINAL STRIPS.....	166
FIGURE 144	EXAMPLE MOX OPEN CONTROLLER TO CP & I/O NETWORK	169

Tables

TABLE 1	KEYING CODE FOR 8 DIGITAL INPUT 24VDC MODULE TOP AND BOTTOM	4
TABLE 2	KEYING CODE FOR 32 DIGITAL INPUT 24VDC MODULE TOP AND BOTTOM	4
TABLE 3	KEYING CODE FOR 8 DIGITAL INPUT 24VDC BASE TOP AND BOTTOM	5
TABLE 4	KEYING CODE FOR 32 DIGITAL INPUT 24VDC BASE TOP AND BOTTOM	5
TABLE 5	RACK BASE DESCRIPTION	6
TABLE 6	I/O MODULES NEEDING EXTERNAL POWER	9
TABLE 7	4 CHANNEL COUNTER DATASHEET	12
TABLE 8	4 CHANNEL COUNTER LED DEFINITIONS	13
TABLE 9	4 CHANNEL COUNTER PIN DEFINITIONS	13
TABLE 10	4 CHANNEL COUNTER SAFETY KEYING	14
TABLE 11	8 CHANNEL COUNTER DATASHEET	18
TABLE 12	8 CHANNEL COUNTER LED DEFINITIONS	19
TABLE 13	8 CHANNEL COUNTER SAFETY KEYING	20
TABLE 14	8 CHANNEL DIGITAL INPUT DATASHEET	25
TABLE 15	8 CHANNEL DIGITAL INPUT 24VDC LED DEFINITIONS	25
TABLE 16	8 CHANNEL DIGITAL INPUT 24VDC MODULE PIN DEFINITIONS	26
TABLE 17	8 CHANNEL DIGITAL INPUT 24VDC SAFETY KEYING	27
TABLE 18	8 CHANNEL SOE DATASHEET	30
TABLE 19	8 CHANNEL SOE LED DEFINITIONS	30
TABLE 20	8 CHANNEL SOE PIN DEFINITIONS	31
TABLE 21	8 CHANNEL SOE SAFETY KEYING	31
TABLE 22	12 CHANNEL SOE FRONT-WIRING DATASHEET	35
TABLE 23	12 CHANNEL SOE FRONT-WIRING LED DEFINITIONS	35
TABLE 24	12 CHANNEL SOE FRONT-WIRING PIN DEFINITIONS	36
TABLE 25	12 CHANNEL SOE FRONT-WIRING SAFETY KEYING	36
TABLE 26	16 CHANNEL DIGITAL INPUT DRY CONTACT MODULE DATASHEET	39
TABLE 27	16 CHANNEL DIGITAL INPUT DRY CONTACT LED DEFINITIONS	39
TABLE 28	16 CHANNEL DIGITAL INPUT DRY CONTACT PIN DEFINITIONS	40
TABLE 29	16 CHANNEL DIGITAL INPUT DRY CONTACT SAFETY KEYING	41
TABLE 30	16 CHANNEL DIGITAL INPUT 115VAC DATASHEET	44
TABLE 31	16 CHANNEL DIGITAL INPUT 115VAC LED DEFINITIONS	44
TABLE 32	16 CHANNEL DIGITAL INPUT 110VAC SAFETY KEYING	45
TABLE 33	16 CHANNEL DIGITAL INPUT 230VAC DATASHEET	48
TABLE 34	16 CHANNEL DIGITAL INPUT 230VAC LED DEFINITIONS	48
TABLE 35	16 CHANNEL DIGITAL INPUT 230VAC SAFETY KEYING	49
TABLE 36	16 CHANNEL DIGITAL INPUT DRY CONTACT FRONT-WIRING DATASHEET	52
TABLE 37	16 CHANNEL DIGITAL INPUT DRY CONTACT FRONT-WIRING LED DEFINITIONS	52
TABLE 38	16 CHANNEL DIGITAL INPUT DRY CONTACT FRONT-WIRING SAFETY KEYING	54
TABLE 39	32 CHANNEL DIGITAL INPUT DATASHEET	56
TABLE 40	32 CHANNEL DIGITAL INPUT LED DEFINITIONS	56
TABLE 41	32 CHANNEL DIGITAL INPUT SAFETY KEYING	57
TABLE 42	32 CHANNEL DIGITAL INPUT DATASHEET	60
TABLE 43	32 CHANNEL DIGITAL INPUT LED DEFINITIONS	61
TABLE 44	32 CHANNEL DIGITAL INPUT SAFETY KEYING	65
TABLE 45	8 CHANNEL DIGITAL OUTPUT RELAY DATASHEET	68
TABLE 46	8 CHANNEL DIGITAL OUTPUT RELAY LED DEFINITIONS	68
TABLE 47	8 CHANNEL DIGITAL OUTPUT RELAY PIN DEFINITIONS	69
TABLE 48	8 CHANNEL DIGITAL OUTPUT RELAY SAFETY KEYING	70
TABLE 49	12 CHANNEL DIGITAL OUTPUT RELAY DATASHEET	73
TABLE 50	12 CHANNEL DIGITAL OUTPUT RELAY LED DEFINITIONS	73
TABLE 51	12 CHANNEL DIGITAL OUTPUT RELAY SAFETY KEYING	74
TABLE 52	16 CHANNEL DIGITAL OUTPUT AND 16 CHANNEL DIGITAL OUTPUT READBACK DATASHEET	77
TABLE 53	16 CHANNEL DIGITAL OUTPUT LED DEFINITIONS	78
TABLE 54	16 CHANNEL DIGITAL OUTPUT PIN DEFINITIONS	78
TABLE 55	16 CHANNEL DIGITAL OUTPUT SAFETY KEYING	79
TABLE 56	32 CHANNEL DIGITAL OUTPUT DATASHEET	82

TABLE 57	32 CHANNEL DIGITAL OUTPUT LED DEFINITIONS.....	82
TABLE 58	32 CHANNEL DIGITAL OUTPUT SAFETY KEYING	83
TABLE 59	8 CHANNEL ANALOG INPUT 1-5VDC DATASHEET.....	86
TABLE 60	8 CHANNEL ANALOG INPUT 1-5V LED DEFINITIONS	86
TABLE 61	8 CHANNEL ANALOG INPUT 1-5V PIN DEFINITIONS.....	87
TABLE 62	8 CHANNEL ANALOG INPUT 1-5V SAFETY KEYING.....	88
TABLE 63	8 CHANNEL ANALOG INPUT 4-20MA ISOLATED DATASHEET	91
TABLE 64	8 CHANNEL ANALOG INPUT 4-20MA ISOLATED LED DEFINITIONS	91
TABLE 65	8 CHANNEL ANALOG INPUT 4-20MA ISOLATED PIN DEFINITIONS.....	92
TABLE 66	8 CHANNEL ANALOG INPUT 4-20MA ISOLATED SAFETY KEYING	93
TABLE 67	8 CHANNEL ANALOG INPUT 4-20MA MODULE POWER DATASHEET	96
TABLE 68	8 CHANNEL ANALOG INPUT 4-20MA MODULE POWER LED DEFINITIONS.....	96
TABLE 69	8 CHANNEL ANALOG INPUT 4-20MA MODULE POWER PIN DEFINITIONS	97
TABLE 70	8 CHANNEL ANALOG INPUT 4-20MA MODULE POWER SAFETY KEYING	98
TABLE 71	8 CHANNEL ANALOG INPUT 4-20MA DATASHEET	101
TABLE 72	8 CHANNEL ANALOG INPUT 4-20MA LED DEFINITIONS.....	101
TABLE 73	8 CHANNEL ANALOG INPUT 4-20MA PIN DEFINITIONS	102
TABLE 74	8 CHANNEL ANALOG INPUT 4-20MA SAFETY KEYING	103
TABLE 75	12 CHANNEL ANALOG INPUT 4-20MA DATASHEET	106
TABLE 76	12 CHANNEL ANALOG INPUT 4-20MA LED DEFINITIONS.....	106
TABLE 77	12 CHANNEL ANALOG INPUT 4-20MA SAFETY KEYING	107
TABLE 78	12 CHANNEL ANALOG INPUT 1-5V DATASHEET.....	110
TABLE 79	12 CHANNEL ANALOG INPUT 1-5V LED DEFINITIONS	110
TABLE 80	12 CHANNEL ANALOG INPUT 1-5V SAFETY KEYING.....	111
TABLE 81	12 CHANNEL ANALOG INPUT 4-20MA DATASHEET	114
TABLE 82	12 CHANNEL ANALOG INPUT 4-20MA LED DEFINITIONS.....	116
TABLE 83	12 CHANNEL ANALOG INPUT 4-20MA SAFETY KEYING	117
TABLE 84	12 CHANNEL ANALOG INPUT 1-5V DATASHEET.....	119
TABLE 85	12 CHANNEL ANALOG INPUT 1-5V LED DEFINITIONS	121
TABLE 86	12 CHANNEL ANALOG INPUT 1-5V SAFETY KEYING.....	122
TABLE 87	8 CHANNEL TC DATASHEET.....	125
TABLE 88	8 CHANNEL TC LED DEFINITIONS.....	125
TABLE 89	8 CHANNEL TC SAFETY KEYING.....	127
TABLE 90	12 CHANNEL TC DATASHEET.....	130
TABLE 91	12 CHANNEL TC LED DEFINITIONS.....	130
TABLE 92	12 CHANNEL TC SAFETY KEYING.....	131
TABLE 93	4 CHANNEL RTD SPECIFICATIONS	134
TABLE 94	4 CHANNEL RTD LED DEFINITIONS	134
TABLE 95	4 CHANNEL RTD PIN DEFINITIONS.....	135
TABLE 96	4 CHANNEL RTD SAFETY KEYING	136
TABLE 97	12 CHANNEL RTD DATASHEET	139
TABLE 98	12 CHANNEL RTD LED DEFINITIONS	139
TABLE 99	12 CHANNEL RTD SAFETY KEYING.....	141
TABLE 100	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED DATASHEET	143
TABLE 101	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED LED DEFINITIONS.....	143
TABLE 102	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED SAFETY KEYING	145
TABLE 103	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED DATASHEET	147
TABLE 104	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED LED DEFINITIONS.....	147
TABLE 105	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED PIN DEFINITIONS	148
TABLE 106	8 CHANNEL ANALOG OUTPUT 4-20MA ISOLATED SAFETY KEYING	149
TABLE 107	MIXED I/O MODULES DATASHEET	152
TABLE 108	MIXED I/O MODULE LED DEFINITIONS	154
TABLE 109	MIXED I/O MODULES SAFETY KEYING	156
TABLE 110	PIN SPACING FOR FRONT-WIRING I/O MODULES	166
TABLE 111	STATION NUMBER & CORRESPONDING DIP SWITCH POSITION.....	170

1 Overview

The MOX 603 I/O System offers one of the most industry capable I/O systems available today. Designed around the current needs and future desires, it will meet almost every user's needs.

The wide range of I/O modules includes digital, analog and special purpose modules. Each module type offers comprehensive configuration options and being microprocessor based allows them to manage their own communication parameters, error conditions and user options.

The MOX 603 I/O System is designed in two parts, a System Base and an I/O Module. The I/O Module may be plugged directly into the base after the base has been installed.

MOX 603 I/O modules are hot swappable. This allows the user to insert or remove a module without the need to isolate the module power or field devices. Physical guides on the module and the base, with module safety keying allow the module to slide into the correct position quickly and safely without damage to the module or base.

Each MOX 603 I/O module provides comprehensive information to the user so that the operational status can be monitored and controlled more efficiently. The wide range of module specific diagnostic information may be accessed from a PC application package such as the MOXGRAF user interface or a MODBUS capable HMI/SCADA system.

MOX 603 I/O system is available in two different configurations, standalone and rack mode.

For standalone I/O information, please refer to *MOX 603 Standalone I/O User Guide*. In applications requiring a small amount of expansion I/O, e.g. pumping stations, the standalone configuration can be utilized.

At the other situation where many I/O are required, the use of the rack base can be adopted. In this circumstance, a MOX Communications Processor (CP) is required as an I/O data collector and interface. The host controller connected to the Communications Processor may also be configured to retrieve all or part of the diagnostic information from the I/O modules. The Communication Processor uses this information to efficiently manage the complete rack of I/O modules.

This manual gives a detailed description of rack base I/O. Please refer to the following chapters for more information.

Research and development is a major focus for MOX Group resulting in new and innovative products being released continually. Please check with your local MOX Group representative to see if a desired product or feature is not listed.

2 General Settings

2.1 Station Address Assignment

The station address is the number that is used to identify each module on a rack. Each module should be assigned a unique station number within its communication rack, excluding redundant 603 I/O module configurations.

For all bottom wiring 603 I/O modules, the station address is defined by the Bit0 to Bit3 of the DIP switch located on the rack base MX603-2008/2022-01.

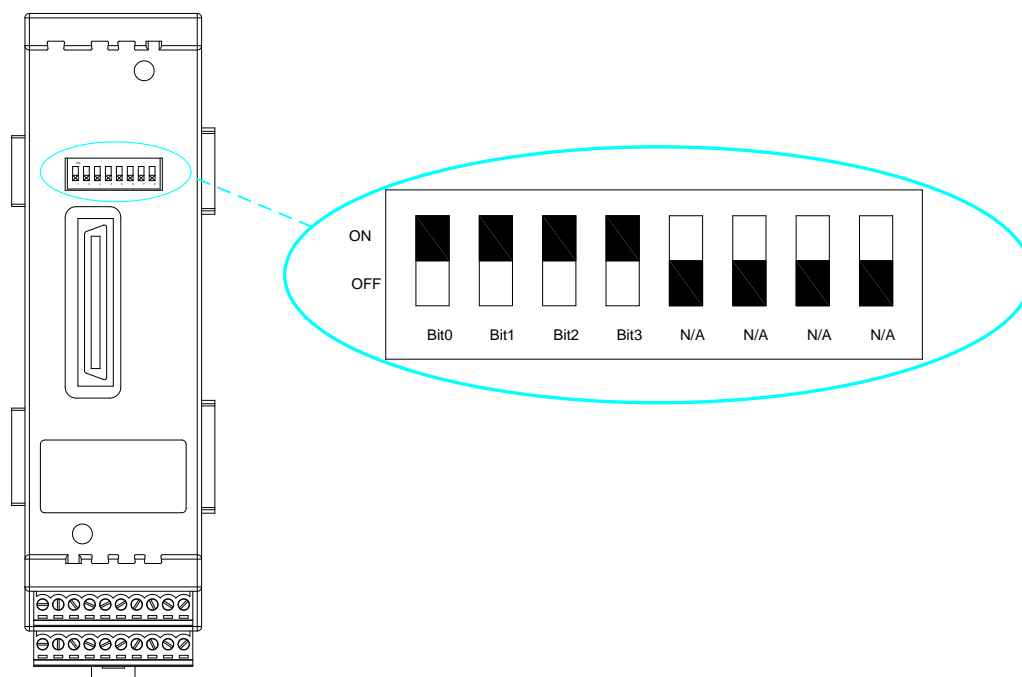


Figure 1 DIP Switch of Bottom Wiring I/O Modules

For information concerning the DIP switch position and the related address assignment, please refer to Appendix A Station Address Information.



The maximum number of I/O modules in one rack should conform to the specific requirements of the communication system installed. Station address 0 is reserved.



The N/A bits of DIP switch must be kept in OFF position.

For all front wiring 603 I/O modules, the station address is defined by the rotary switch located on the front of the I/O module case, as shown in the following figure.

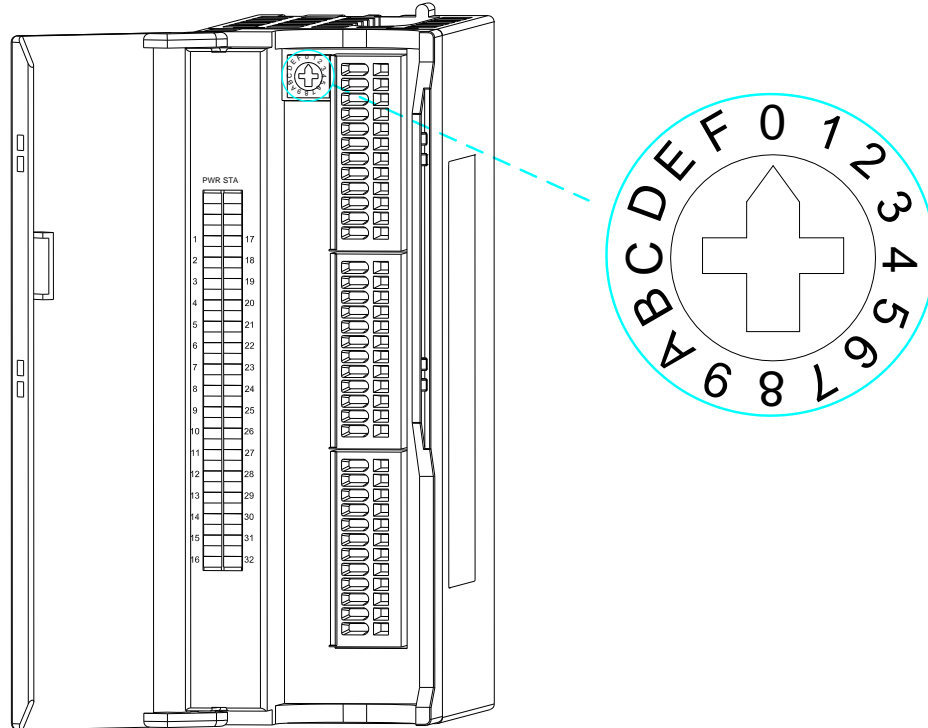


Figure 2 Rotary Switch on the Front Wiring I/O Modules

Please note that this station address switch is located on the front wiring module, not on its base.

2.2 Safety Keying

All module and base combinations are keyed to add further protection for the installer. Module and base can only be installed when their key codes match. This removes the possibility of placing an analog module into a digitally wired base, etc.

The following figure identifies the keying code for the MOX 603 I/O module. Orientate the module so that the front is facing you with the top of the module pointing up. The keys with black background in following table are permanently attached to the module.

Module Top	0	0	1	1
Module Bottom	1	0	1	1

Table 1 Keying Code for 8 Digital Input 24VDC Module Top and Bottom

Module Top	0	1	1	1
Module Bottom	1	1	0	0

Table 2 Keying Code for 32 Digital Input 24VDC Module Top and Bottom

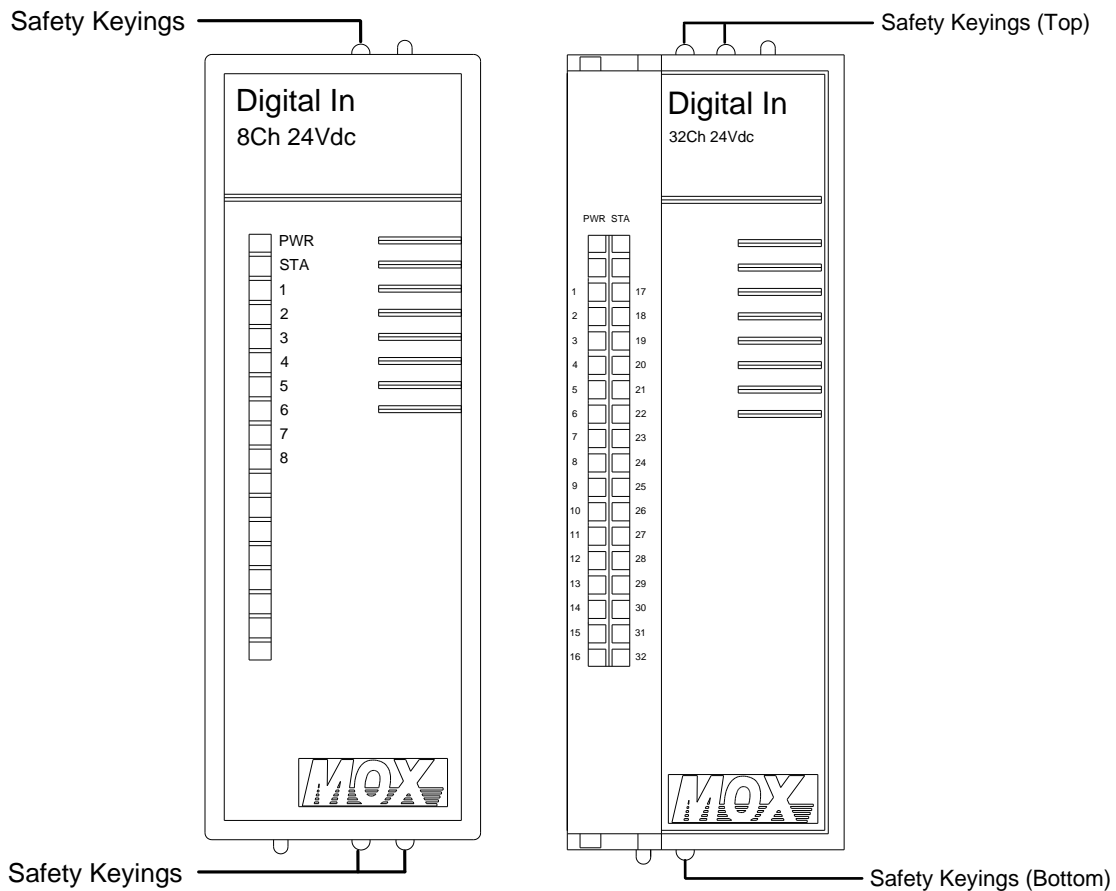


Figure 3 Safety Keying for Module Top and Bottom

The following figures identify the keying code for the MOX 603 I/O base. Orientate the top side of the base to face you.

Base Top	1	1	0	0
Base Bottom	0	1	0	0

Table 3 Keying Code for 8 Digital Input 24VDC Base Top and Bottom

Base Top	1	0	0	0
Base Bottom	0	0	1	1

Table 4 Keying Code for 32 Digital Input 24VDC Base Top and Bottom

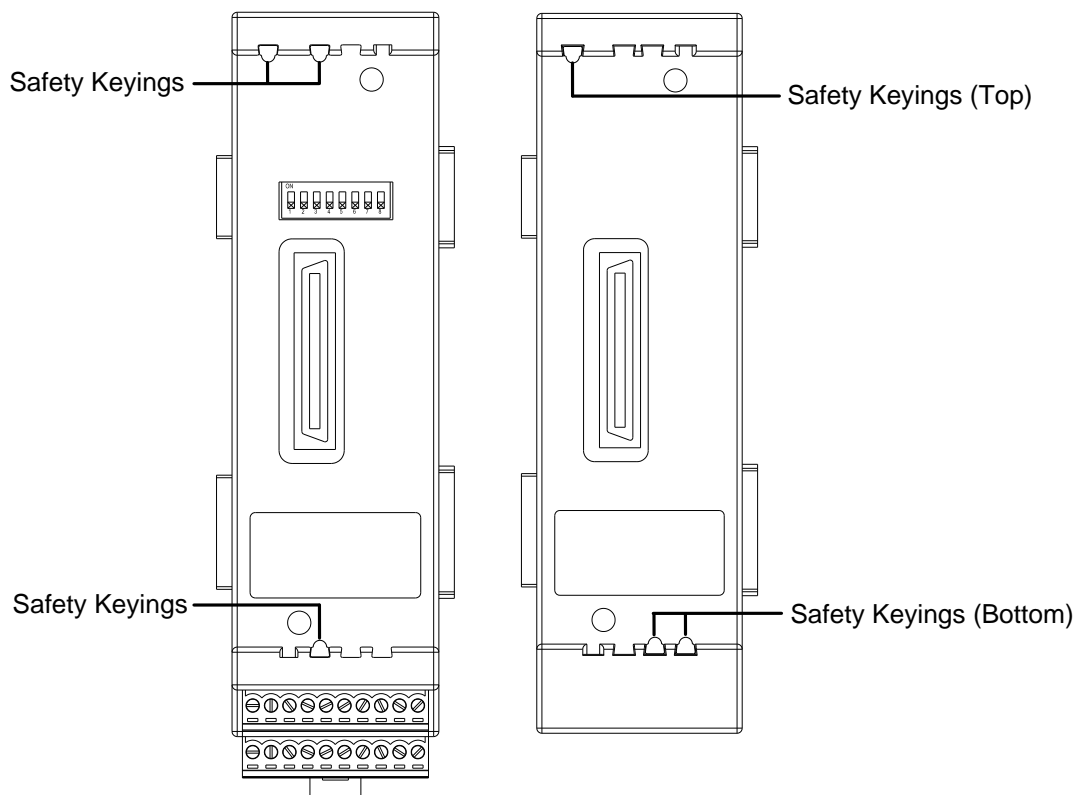


Figure 4 Safety Keying for Base Top and Bottom


3 Rack Bases

The rack base is designed to provide cascading connection for multiple MOX 603 I/O modules. The rack bases have female connectors on the left side and male connectors on the right side.

The rack bases can be identified by their product numbers, which include:

Rack Base	Description
MX603-2008-01	Dedicated to MX603-0508-813 TC module
MX603-2020-01	General base for front wiring modules
MX603-2022-01	General base for bottom wiring modules with external 24V field power
MX603-2023-01	General base for bottom wiring modules working in redundancy mode

Table 5 Rack Base Description

	<i>MX603-2022-01 does not support redundancy applications, which means any type of module using this rack base cannot provide a redundancy function.</i>
--	--

Please note that the bottom wiring base is only suitable for bottom wiring module while the front wiring base is only suitable for front wiring module.

3.1 MX603-2008-01

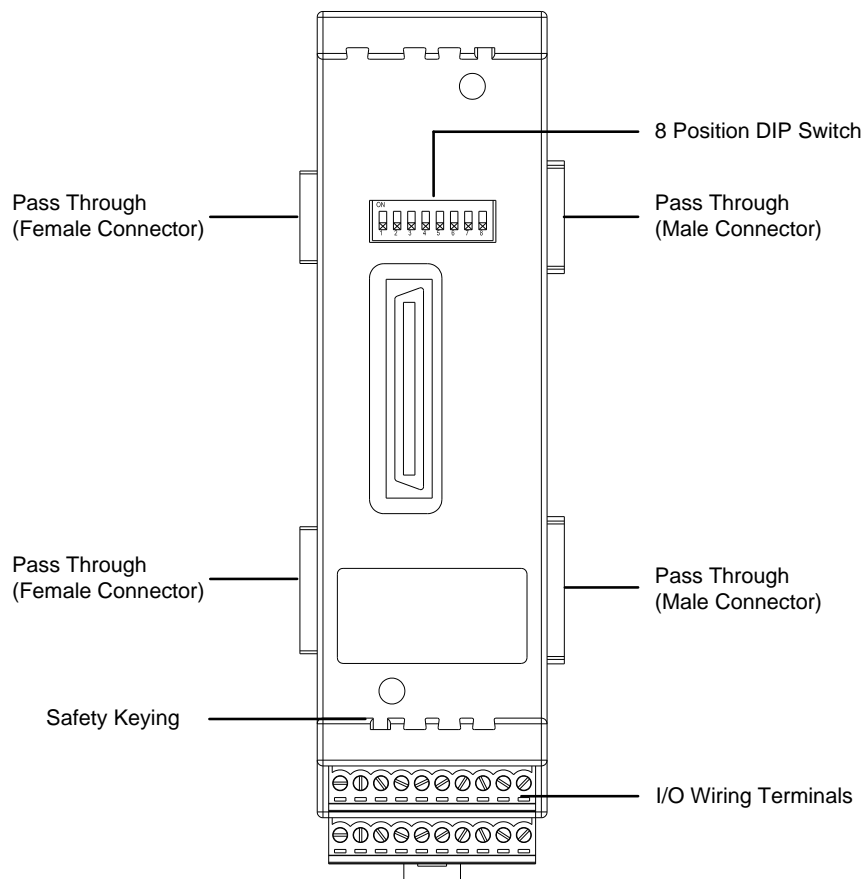


Figure 5 Rack Base MX603-2008-01 Familiarization

MX603-2008-01 is dedicated only to MX603-0508-813 TC module.

3.2 MX603-2020-01

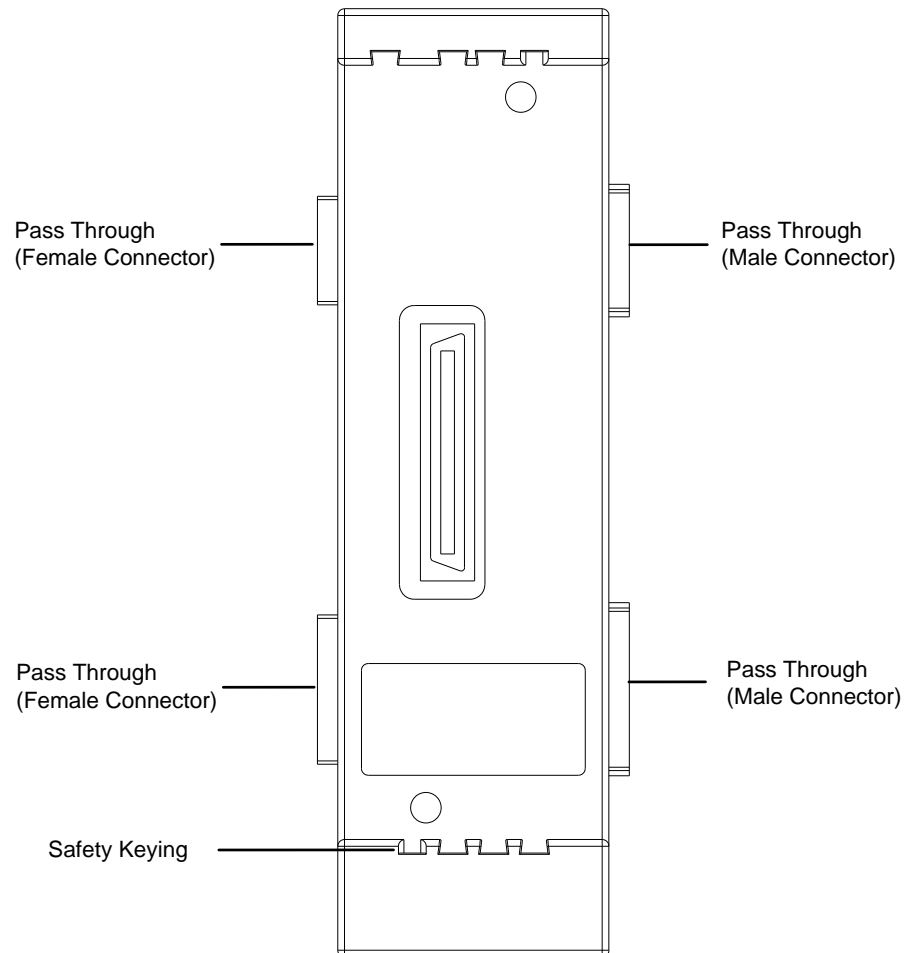


Figure 6 Rack Base MX603-2020-01 Familiarization

MX603-2020-01 supports all front-wiring I/O modules.

3.3 MX603-2022-01

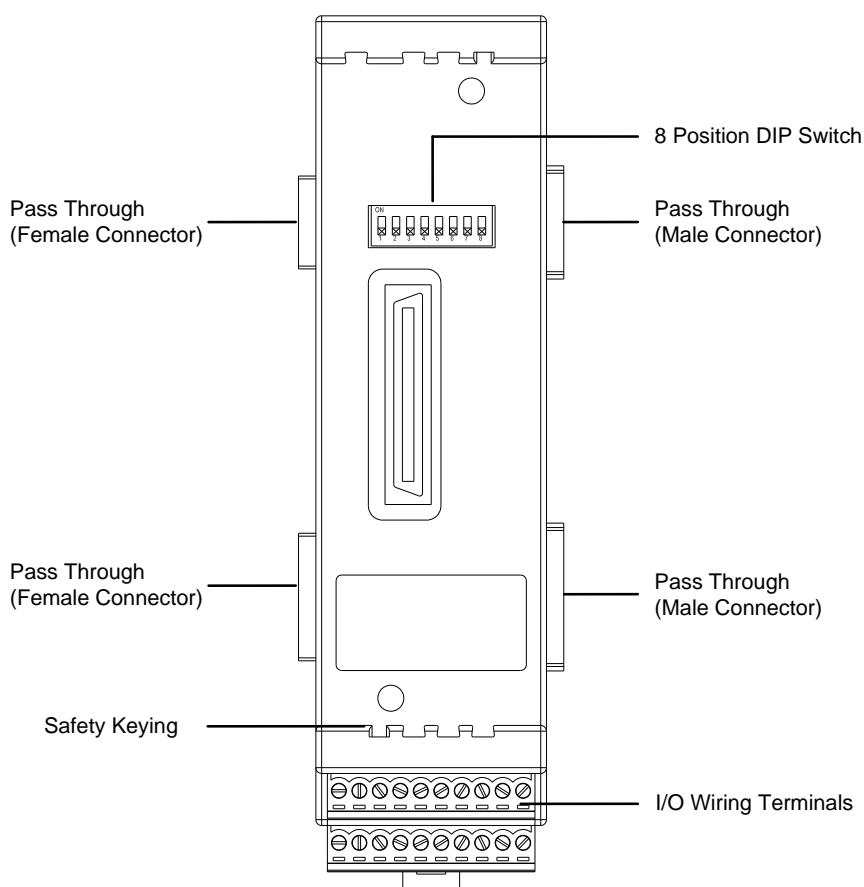


Figure 7 Rack Base MX603-2022-01 Familiarization

MX603-2022-01 supports all bottom-wiring I/O modules except MX603-0508-813 TC module. For the module-powered I/O modules, the 24VDC field power is supplied from the I/O wiring terminals and isolated from the power on the I/O rack.

For each I/O modules listed in the following table, an external 24VDC power is required to be wired to the 9th and 10th pins on the base, with 24VDC+ to the 9th pin and 24VDC- to the 10th pin.

MOX PN	Description
MX603-0216-123	16 DO 24VDC Module Power
MX603-0216-133	16 DO 24VDC Module Power
MX603-0308-423	8 AI 1-5VDC
MX603-0308-633	8 AI 4-20mA Module Power
MX603-0308-643	8 AI 4-20mA

Table 6 I/O Modules Needing External Power

3.4 MX603-2023-01

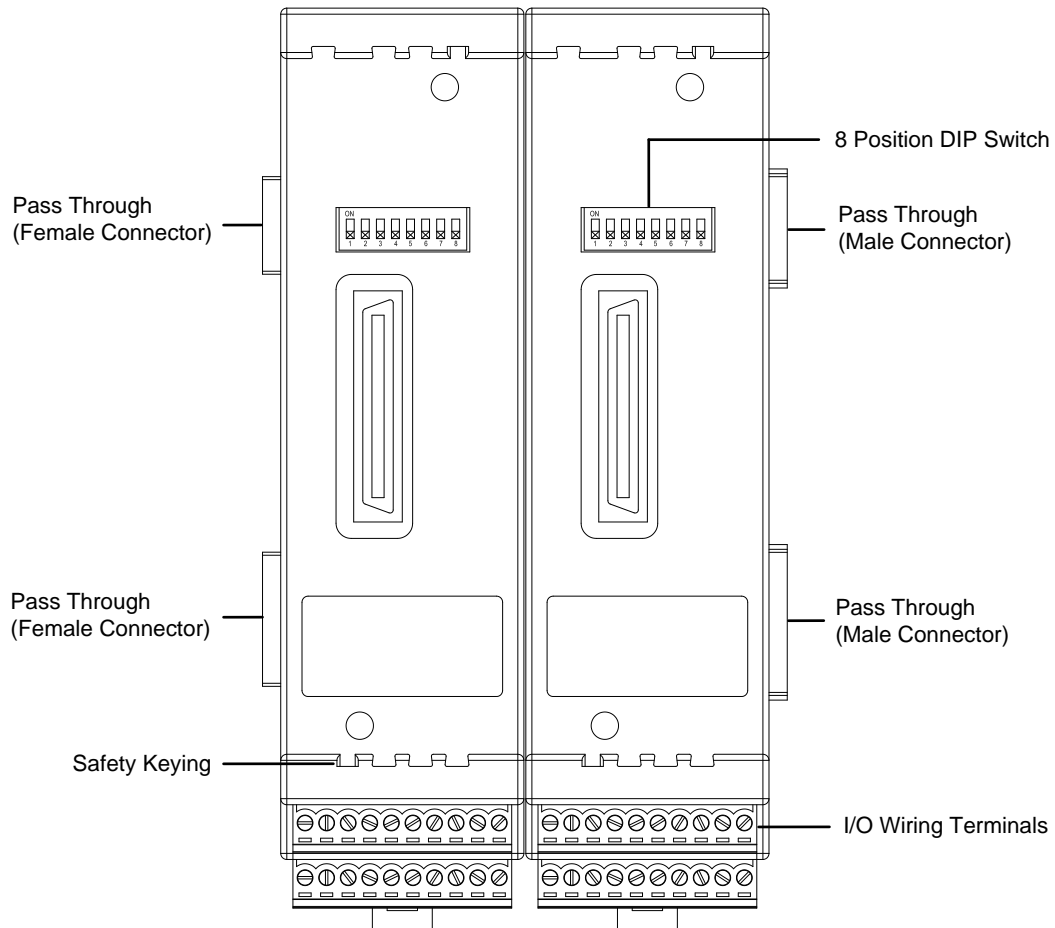


Figure 8 Rack Base MX603-2023-01 Familiarization

MX603-2023-01 is a combination of two side-by-side MX603-2022-01 bases, which is dedicated for I/O's redundancy application.

The two bottom wiring I/O modules in one redundancy base should have the same part number and version.

The I/O base of MX603-2023-01 can be cascaded with all of the other I/O bases listed before within this chapter, including MX603-2008-01, MX603-2020-01 and MX603-2022-01.

If the external 24VDC power is required, it should be wired to both of the left side and the right side of this I/O base.

4 I/O Modules

4.1 4 Channel Counter 24VDC

---MX603-0104-123

The MOX 603 4 Channel Counter module supports 4 isolated counter inputs with each channel accepting two isolated discrete inputs which are the main and auxiliary inputs.

A 24VDC voltage applied to any channel will develop a current of approximately 5.5mA through the connected channel. When the input voltage is lower than 5VDC, the channel is OFF. When the input voltage is higher than 10VDC, the channel is ON.

The counters are triggered by the user definable edges of the input pulses. The counters capture pulses with a frequency up to 100 kHz.

4.1.1 Familiarization

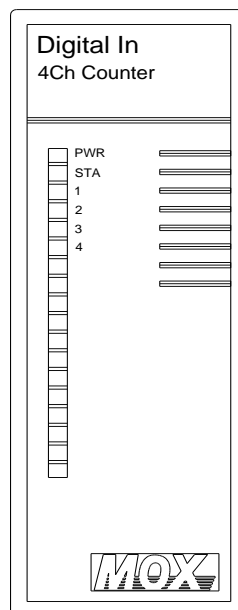


Figure 9 4 Channel Counter Familiarization

4.1.2 Datasheet

Input	
Number of channels	4
OFF voltage	<5VDC
ON voltage	>10VDC
Typical wetting current (@24VDC)	6mA
Maximum voltage input	30VDC
Maximum input frequency	100kHz
Isolation	

Channel to system	1500Vrms
Channel to channel	1500Vrms
Configurable Parameters	
Activate channel	Activate, Deactivate
Operating mode	Continuous Counter (CC), Periodic Counter (PC), Continuous Quadrature Counter (CQC), Periodic Quadrature Counter (PQC), External Start/Stop Counter (EC), Frequency Measurement (FM)
Trigger	Rising Edge, Falling Edge
Main counting direction (CC/PC/EC)	Up, Down
Auxiliary logic (CQC/PQC)	0 to Increase 1 to Decrease, 0 to Decrease 1 to Increase
External start/stop logic (EC)	0 to Stop 1 to Start, 0 to Start 1 to Stop
Counter period unit (PC/PQC)	1000ms, 100ms, 10ms, 1ms
Counter period length (PC/PQC)	User Definable
Frequency internal gate time (FM)	1000ms, 100ms, 10ms
Frequency filter times (FM)	User Definable
Predef counter value	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.3W

Table 7 4 Channel Counter Datasheet

4.1.3 Equivalent Circuit Diagram

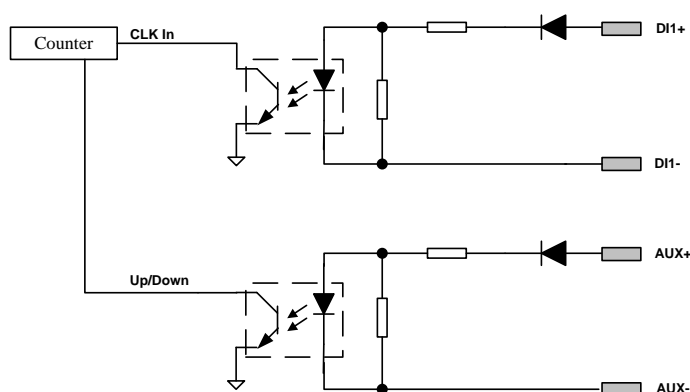


Figure 10 4 Channel Counter Equivalent Circuit Diagram

4.1.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning

		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
3	Green	ON	Channel is ON
		OFF	Channel is OFF
4	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 8 4 Channel Counter LED Definitions

4.1.5 Cabling Guide

For module base MX603-2022-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
DI1+	AUX1+	DI2+	AUX2+	DI3+	AUX3+	DI4+	AUX4+	N/A	N/A
11	12	13	14	15	16	17	18	19	20
DI1-	AUX1-	DI2-	AUX2-	DI3-	AUX3-	DI4-	AUX4-	N/A	N/A

Table 9 4 Channel Counter Pin Definitions

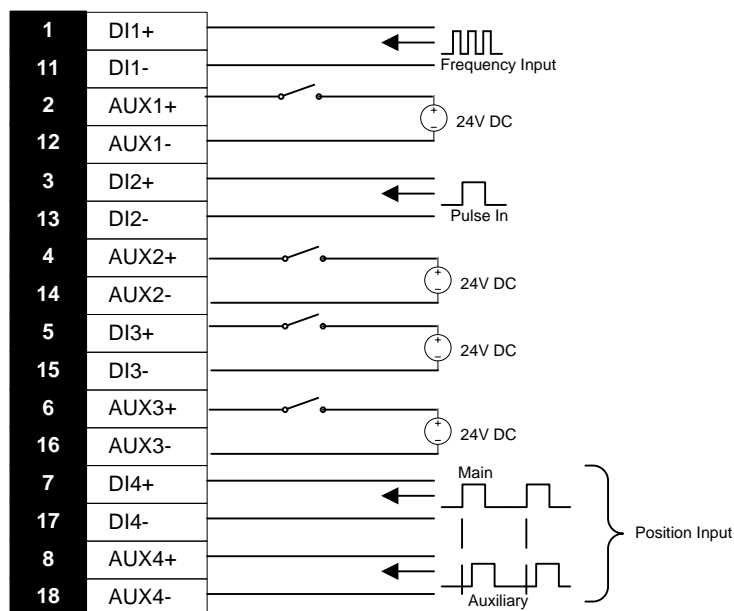


Figure 11 4 Channel Counter Cabling Diagram



Auxiliary channels do not support the counter or frequency function.

4.1.6 Safety Keying

Module Top	1	0	1	1
Base Top	0	1	0	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 10 4 Channel Counter Safety Keying

4.1.7 Configurable Channel Parameters

Using MOXGRAF the following attributes can be configured to suit the required operation of each channel of the module.

- **Activate Channel**

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- **Operating Mode**

Each channel can be configured into one of six *operating modes*:

Continuous Counter Mode (CC)

In *continuous counter mode*, after a “Start” command the counter value is increased or decreased by 1 when a pulse is received and continues until a “Stop” command is given. The counting direction is defined by the *Main Counting Direction* parameter. The default status of the counter after reset or power on is user-started.

Periodic Counter Mode (PC)

In *periodic counter mode*, after a “Start” command the counter value is increased or decreased by 1 when a pulse received and continues until a defined time span has elapsed or a “Stop” command is given. The counting direction is defined by the *Main Counting Direction* parameter. The time span ranges from 10ms to 250s with varying granularity according to the selected time unit. The default status of the counter after reset or power on is user-stopped.

Continuous Quadrature Counter Mode (CQC)

In *continuous quadrature counter mode*, after a “Start” command, the counter value is increased or decreased by 1 when a pulse is received and continues until a “Stop” command is given. The counting direction is dynamically changed by auxiliary input, which is defined by the *Auxiliary Logic* parameter. The default status of the counter after reset or power on is user-started.

Periodic Quadrature Counter Mode (PQC)

In *periodic quadrature counter mode*, after a “Start” command, the counter value is increased or decreased by 1 when a pulse is received and continues until a defined time span has elapsed or a “Stop” command is given. The counting direction is dynamically changed by auxiliary input, which is defined by the *Auxiliary Logic*. The time span ranges from 10ms to 250s. The default status of the counter after reset or power on is user-stopped.

External Start/Stop Counter Mode (EC)

In *External Start/Stop Counter mode*, the “Start/Stop” command is given from an external signal connected to the auxiliary input pins. At the same time, the user command “Start/Stop” is reserved and gives an “AND” effect to the external command, which means that the external command could

control counting only when the counter is user started. The *External Start/Stop Logic* parameter controls the command action and the *Main Counting Direction* parameter defines the counting direction. The default status of the counter after reset or power on is user-started. When the external signal has no effect on start/stop of counter, please check if user-start command was made before.

In this mode, the counter can only be continuous and non-quadrature.

Frequency Measurement Mode (FM)

In the *Frequency Measurement mode*, the counter keeps receiving pulses in a defined period and then calculates the pulse frequency. The *Inter Gate Time* parameter defines the period length. The *Filter Times* parameter defines the sliding window width to make one average frequency. The wiring of this mode is identical to continuous counter.

- **Trigger**

A trigger edge parameter is always used. The counter only changes when the module is powered on with the reception of a user defined trigger edge.

- **Main Counting Direction (CC/PC/EC)**

Counting can be up or down.

In the up counting situation, if $2^{32}-1$ is reached and another pulse is received, the counter will jump to 0 and continues counting up without missing any pulses. In the down counting situation, if 0 is reached and another pulse received, the counter will jump to $2^{32}-1$ and continues counting down without missing any pulses.

- **Auxiliary Logic (CQC/PQC)**

If a channel is configured as *Continuous Quadrature Counter Mode* or *Periodic Quadrature Counter Mode*, this parameter will define the auxiliary input logic of the channel.

“0 to Increase, 1 to Decrease”

After a Start command, when a pulse is received, the counter is increased by 1 if the auxiliary input is 0 or decreased by 1 if the auxiliary input is 1. This continues until a Stop command is given or a defined time span has elapsed.

“0 to Decrease, 1 to Increase”

After a Start command, when a pulse is received, the counter is increased by 1 if the auxiliary input is 1 or decreased by 1 if the auxiliary input is 0. This continues until a Stop command is given or a defined time span has elapsed.

The default is “0 to Increase, 1 to Decrease”.

- **External Start / Stop Logic (EC)**

In *External Start/stop Logic* mode, the auxiliary inputs are used as counter start/stop signals when the counters are enabled by the control signals from the controller. The user defines the control logic by this parameter.

“0 to Stop 1 to Start”

After a Start command, when a pulse is received, the counter is increased by 1 or decreased by 1 if the auxiliary input is 1. This continues until a Stop command is given or the auxiliary input is 0.

“0 to Start 1 to Stop”

After a Start command, when a pulse is received, the counter is increased by 1 or decreased by 1 if the auxiliary input is 0. This continues until a Stop command is given or the auxiliary input is 1.

The default is "0 to Stop 1 to Start".

- **Counter Period Unit (PC/PQC)**

In the *Periodic Counter Mode* or the *Periodic Quadrature Counter Mode*, the *Counter Period Unit* together with the *Counter Period Length*, this parameter will define the time span in which the counting action will continue. The granularity and precision of time span varies according to different time unit.

- **Counter Period Length (PC/PQC)**

An integer value ranges from 1 to 250.

If Counter Period Unit * Counter Period Length < 10ms, 10ms will take effect.

- **Frequency Interval Gate Time (FM)**

The frequency for any input is continuously measured based on pulse count in a selectable gate time period. This parameter can have the following options:

- 10ms
- 100ms
- 1000ms

The default value is "1000ms".

- **Frequency Filter Times (FM)**

The *Filter Times* parameter defines the sliding window width to make one average frequency.

- **Predefined Counter Value**

The counter will be preset with this *predefined value* after power up.

4.2 8 Channel Counter Front-wiring

---MX603-0108-173

The MOX 8 Channel Counter Front-wiring module provides 8 isolated channels for pulse signal inputs. The module can be used as a counter, frequency measurer or a rotation position measurer.

The module can accept 24VDC and 5V input signals from high speed output switching devices, quadrature encoders, pulse generators, proximity switches or similar devices.

4.2.1 Familiarization

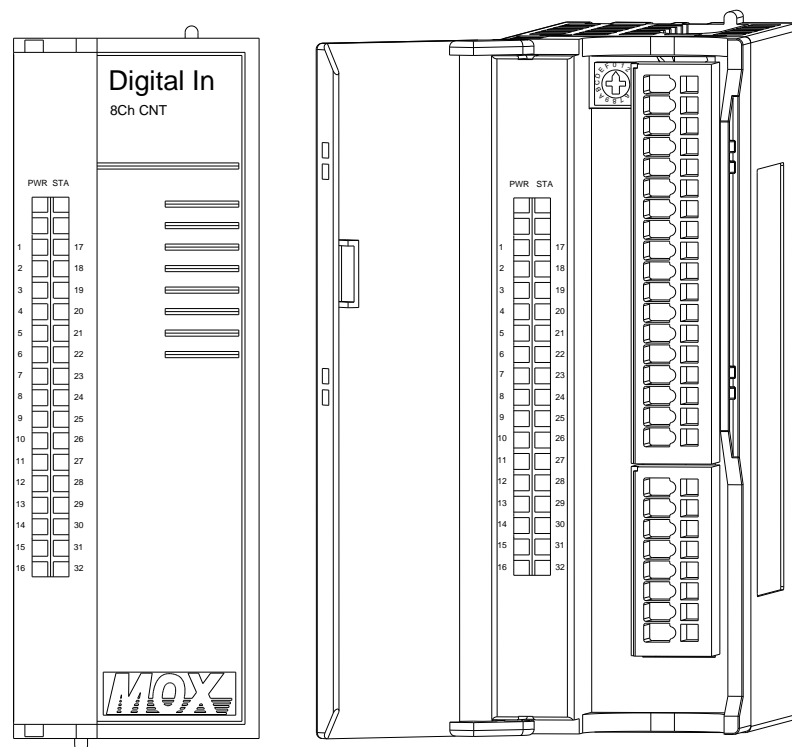


Figure 12 8 Channel Counter Familiarization

4.2.2 Datasheet

Input	
Number of channels	8
OFF voltage	24V input channel <5VDC 5V input channel <1VDC
ON voltage	24V input channel >10VDC 5V input channel >3.5VDC
Typical wetting current	24V input channel (@24VDC) 8mA 5V input channel (@5VDC) 7mA
Maximum voltage input	30VDC
Maximum input frequency	100kHz
Isolation	
Channel to system	1500Vrms

Channel to channel	1500Vrms
Configurable Parameters	
Activate channel	Activate, Deactivate
Operating mode	Continuous Counter (CC), Periodic Counter (PC), Continuous Quadrature Counter (CQC), Periodic Quadrature Counter (PQC), External Start/Stop Counter (EC), Frequency Measurement (FM)
Trigger	Rising Edge, Falling Edge
Main counting direction (CC/PC/EC)	Up, Down
Auxiliary logic (CQC/PQC)	0 to Increase 1 to Decrease, 0 to Decrease 1 to Increase
External start/stop logic (EC)	0 to Stop 1 to Start, 0 to Start 1 to Stop
Counter period unit (PC/PQC)	1000ms, 100ms, 10ms, 1ms
Counter period length (PC/PQC)	User Definable
Frequency internal gate time (FM)	1000ms, 100ms, 10ms
Frequency filter times (FM)	User Definable
Predef counter value	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<3.0W

Table 11 8 Channel Counter Datasheet

4.2.3 Equivalent Circuit Diagram

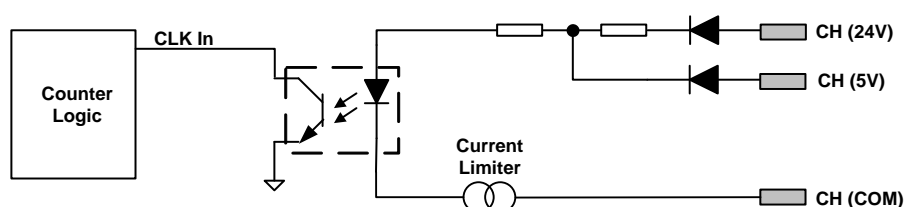


Figure 13 8 Channel Counter Equivalent Circuit Diagram

4.2.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON

		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 12 8 Channel Counter LED Definitions

4.2.5 Cabling Guide

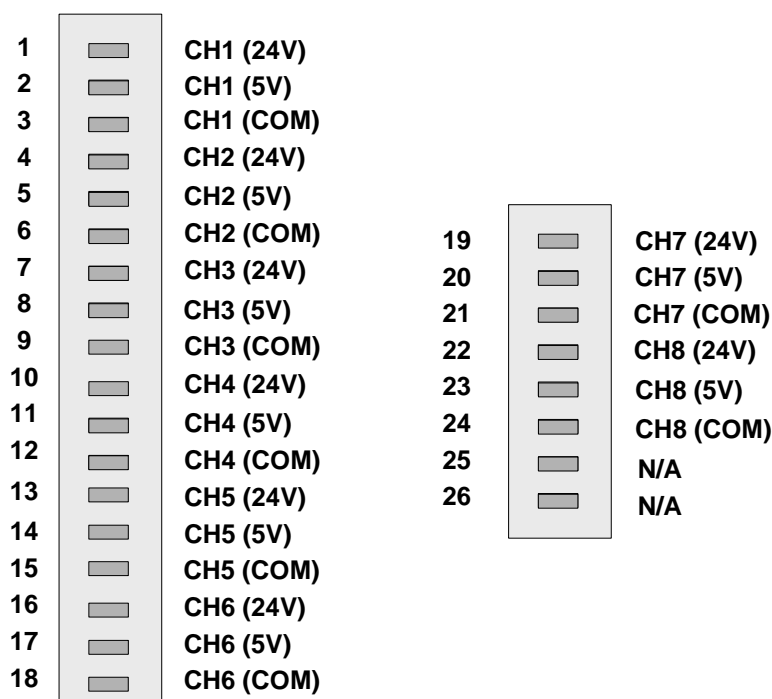


Figure 14 8 Channel Counter Pin Definitions

CH (24V): 24V signal input
CH (5V): 5V signal input
CH (COM): Common negative

Note:

- 1) Each input channel can accept 24VDC signal or 5VDC signal. However, these two types of signals cannot be connected to one channel simultaneously.
- 2) 24VDC and 5VDC signal can be accepted by different input channels at the same time. For example, the input signal to channel 1 is 24VDC and the signal to channel 2 can be either 24VDC or 5VDC.
- 3) In some operating modes, e.g. *Continuous Quadrature Counter Mode*, *Periodic Quadrature Counter Mode*, *External Start/Stop Counter Mode*, adjacent odd and even numbered channels are used as a group in which the odd is the main input and the even is auxiliary.

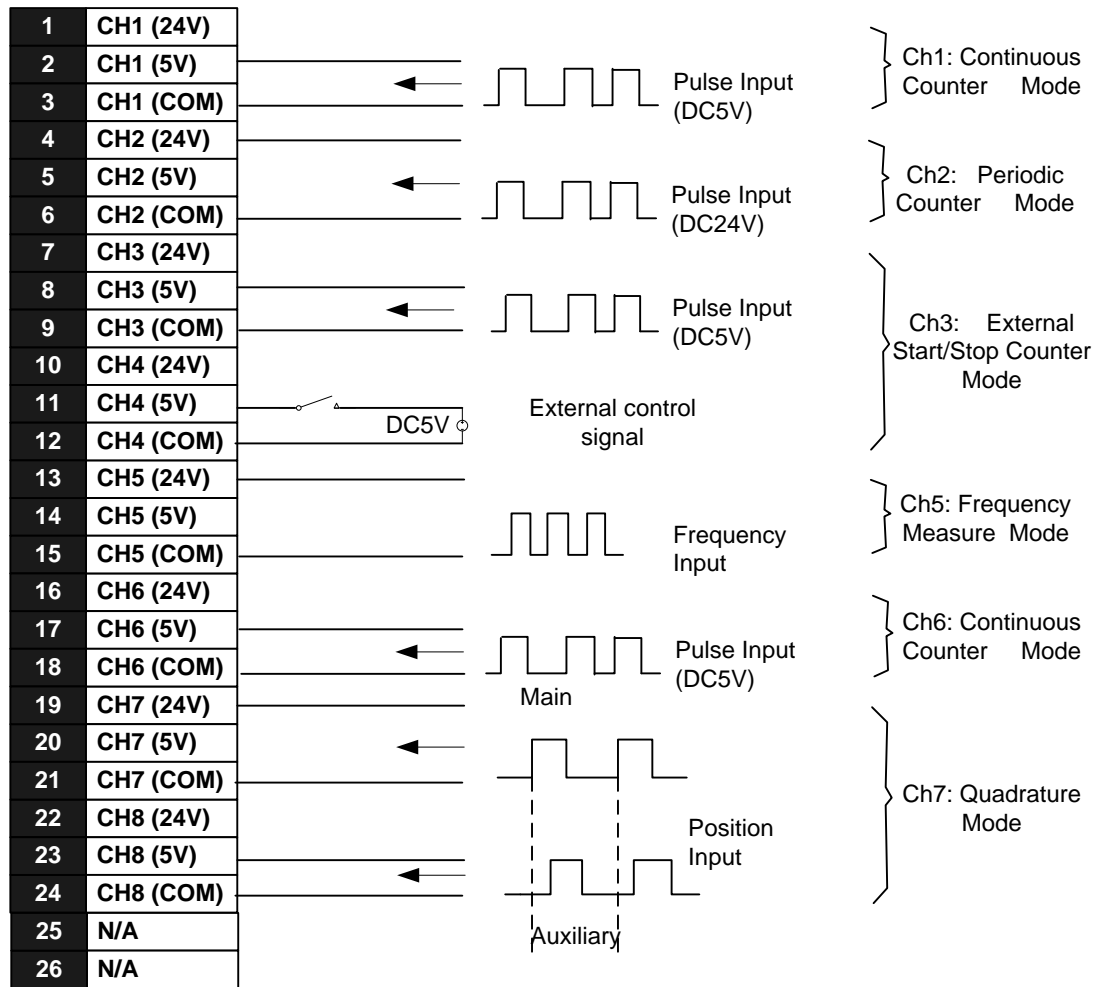


Figure 15 8 Channel Counter Cabling Diagram

4.2.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 13 8 Channel Counter Safety Keying

4.2.7 Configurable Channel Parameters

Using MOXGRAF the following attributes can be configured to suit the required operation of each channel of the module.

▪ Activate Channel

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

▪ **Operating Mode**

If the Operating Mode of an odd numbered channel is configured as *Continuous Quadrature Counter Mode*, *Periodic Quadrature Counter Mode*, *External Start/Stop Counter Mode*, the configuration of its subsequent even numbered channel is omitted.

Continuous Counter Mode (CC)

In *continuous counter mode*, after a “Start” command the counter value is increased or decreased by 1 when a pulse is received and continues until a “Stop” command is given. The counting direction is defined by the *Main Counting Direction* parameter. The default status of the counter after reset or power on is user-started.

Periodic Counter Mode (PC)

In *periodic counter mode*, after a “Start” command the counter value is increased or decreased by 1 when a pulse is received and continues until a defined time span has elapsed or a “Stop” command is given. The counting direction is defined by the *Main Counting Direction* parameter. The time span ranges from 10ms to 250s with varying granularity according to the selected time unit. The default status of the counter after reset or power on is user-stopped.

Continuous Quadrature Counter Mode (CQC)

In *continuous quadrature counter mode*, after a “Start” command, the counter value is increased or decreased by 1 when a pulse is received and continues until a “Stop” command is given. The counting direction is dynamically changed by auxiliary input, which is defined by the *Auxiliary Logic* parameter. The default status of the counter after reset or power on is user-started.

Periodic Quadrature Counter Mode (PQC)

In *periodic quadrature counter mode*, after a “Start” command, the counter value is increased or decreased by 1 when a pulse is received and continues until a defined time span has elapsed or a “Stop” command is given. The counting direction is dynamically changed by auxiliary input, which is defined by the *Auxiliary Logic*. The time span ranges from 10ms to 250s. The default status of the counter after reset or power on is user-stopped.

External Start/Stop Counter Mode (EC)

In *External Start/Stop Counter mode*, the “Start/Stop” command is given from an external signal connected to the auxiliary input pins. At the same time, the user “Start/Stop” command is reserved and gives an “AND” effect to the external command, which means that the external command could control counting only when the counter is user started. The *External Start/Stop Logic* parameter controls the command action and the *Main Counting Direction* parameter defines the counting direction. The default status of the counter after reset or power on is user-started. When the external signal has no effect on starting or stopping the counter, ensure that the user-start command had been issued.

In this mode, the counter can only be continuous and non-quadrature.

Frequency Measurement Mode (FM)

In the *Frequency Measurement mode*, the counter keeps receiving pulses in a defined period and then calculates the pulse frequency. The *Inter Gate Time* parameter defines the period length. The *Filter Times* parameter defines the sliding window width to make one average frequency calculation. The wiring of this mode is identical to the continuous counter.

▪ **Trigger**

A trigger edge parameter is always used. The counter changes when the module is powered on with the reception of a user defined trigger edge.

- **Main Counting Direction (CC/PC/EC)**

Counting can be up or down.

In the up counting situation, if $2^{32}-1$ is reached and another pulse is received, the counter will jump to 0 and continues counting up without missing any pulses. In the down counting situation, if 0 is reached and another pulse received, the counter will jump to $2^{32}-1$ and continues counting down without missing any pulses.

- **Auxiliary Logic (CQC/PQC)**

If a channel is configured as Continuous Quadrature Counter Mode or Periodic Quadrature Counter Mode, this parameter will define the auxiliary input logic of the channel.

- **“0 to Increase, 1 to Decrease”**

- After a Start command, when a pulse is received, the counter is increased by 1 if the auxiliary input is 0 or decreased by 1 if the auxiliary input is 1. This continues until a Stop command is given.

- **“0 to Decrease, 1 to Increase”**

- After a Start command, when a pulse is received, the counter is increased by 1 if the auxiliary input is 1 or decreased by 1 if the auxiliary input is 0. This continues until a Stop command is given.

The default is “0 to Increase, 1 to Decrease”.

- **External Start / Stop Logic (EC)**

In external start/stop counter mode, the auxiliary inputs are used as counter start/stop signals when the counters are enabled by the control signals from the controller. The user defines the control logic by this parameter.

- **“0 to Stop 1 to Start”**

- After a Start command, when a pulse is received, the counter is increased by 1 or decreased by 1 if the auxiliary input is 1. This continues until a Stop command is given or the auxiliary input is 0.

- **“0 to Start 1 to Stop”**

- After a Start command, when a pulse is received, the counter is increased by 1 or decreased by 1 if the auxiliary input is 0. This continues until a Stop command is given or the auxiliary input is 1.

The default is “0 to Stop 1 to Start”.

- **Counter Period Unit (PC/PQC)**

In Periodic Counter Mode or Periodic Quadrature Counter Mode, the Counter Period Unit parameter together with Counter Period Length parameter defines the time span in which the counting action will continue. The granularity and precision of time span will be variant according to different time unit.

- **Counter Period Length (PC/PQC)**

An integer value ranges from 1 to 250.

If Counter Period Unit * Counter Period Length < 10ms, 10ms will take effect.

- **Frequency Interval Gate Time (FM)**

The frequency for any input is continuously measured based on counted pulses in a selectable gate time period. This parameter can have the following options:

- 10ms
- 100ms
- 1000ms

The default value is “1000ms”.

- ***Frequency Filter Times (FM)***

The Filter Times parameter defines the sliding window width to make an average frequency calculation.

- ***Predefined Counter Value***

The user can enter in a predefined counter value.

4.3 8 Channel Digital Input 24VDC

---MX603-0108-113

The MOX 603 8 Channel Digital Input module supports 8 24VDC discrete inputs. The input voltage range is from 10VDC to 30VDC for a positive signal. The module also provides open wire detection on individual inputs.

4.3.1 Familiarization

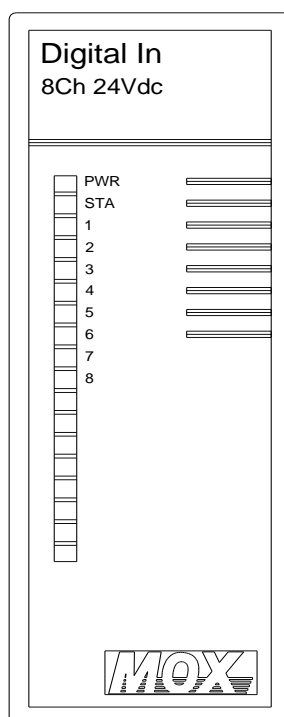


Figure 16 8 Channel Digital Input 24VDC Familiarization

4.3.2 Datasheet

Input	
Number of channels	8
OFF voltage	<5VDC
ON voltage	>10VDC
Typical wetting current (@24VDC)	12mA
Max voltage input	30VDC
Min pulse width detected	6ms
Max switching frequency (no-filtering)	80Hz
Isolation	
Channel to system	5000Vrms
Channel to channel	1500Vrms
Configurable Parameters	
Primary or standby	Primary, Standby
Type of channel	Only Discrete Input, Only Enable Counter, Enable Counter and Frequency, Only Enable

	Latch High, Only Enable Latch Low
Filter time (ms)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.2W

Table 14 8 Channel Digital Input Datasheet

4.3.3 Equivalent Circuit Diagram

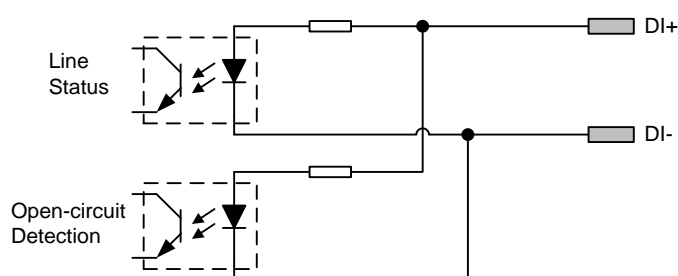


Figure 17 8 Channel Digital Input Equivalent Circuit Diagram

4.3.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Green	ON	Channel is ON
		OFF	Channel is OFF

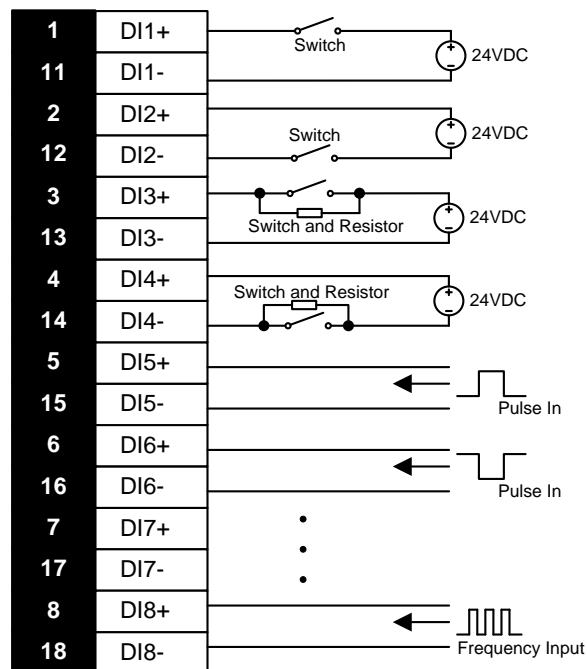
Table 15 8 Channel Digital Input 24VDC LED Definitions

4.3.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
DI1+	DI2+	DI3+	DI4+	DI5+	DI6+	DI7+	DI8+	N/A	N/A
11	12	13	14	15	16	17	18	19	20
DI1-	DI2-	DI3-	DI4-	DI5-	DI6-	DI7-	DI8-	N/A	N/A

Table 16 8 Channel Digital Input 24VDC Module Pin Definitions



Note: The resistors shown above are for open-circuit detection.

Figure 18 8 Channel Digital Input 24VDC Wiring Diagram

The resistor used for open-circuit detection is calculated according to the following expression:

$$R = (U-7)/2$$

where R is the resistor with the unit of kilohm. U is the input DC voltage with a unit of V. This input voltage should be higher than 10V and lower than 30V. Please select a standard resistor within the $\pm 5\%$ range of the calculated R value. In applications, users should choose resistors with a tolerance of $\pm 1\%$ to achieve this goal.

For applications with the base of MX603-2023-01, please refer to the following figure to wire two 8 Channel Digital Input 24VDC modules for redundancy application.

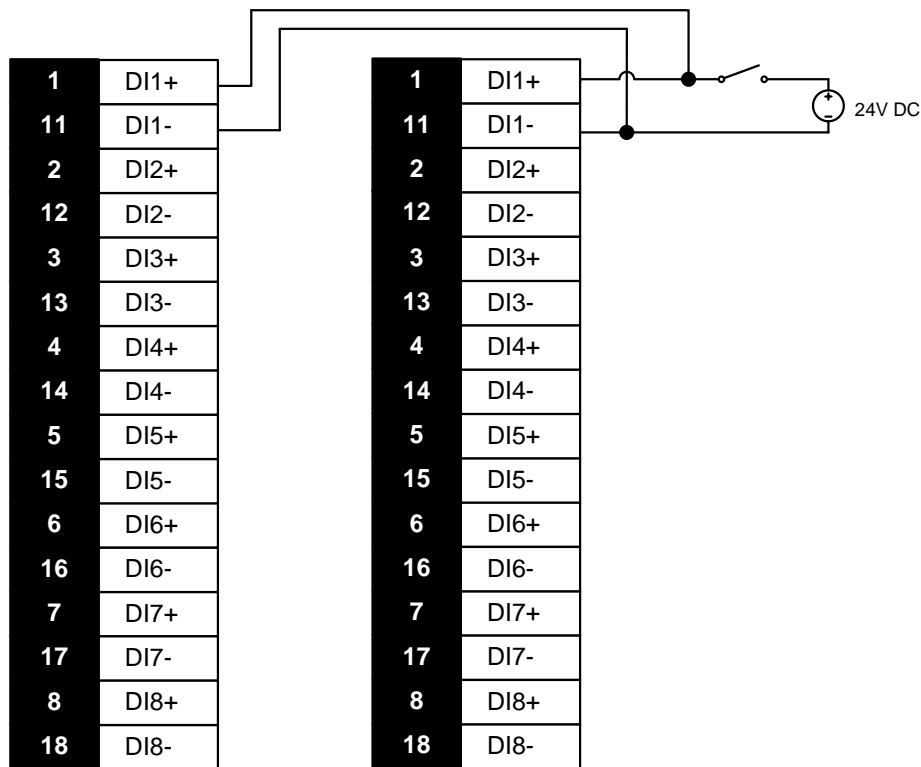


Figure 19 8 Channel Digital Input 24VDC Redundancy Wiring Diagram

4.3.6 Safety Keying

Module Top	0	0	1	1
Base Top	1	1	0	0
Module Bottom	1	0	1	1
Base Bottom	0	1	0	0

Table 17 8 Channel Digital Input 24VDC Safety Keying

4.3.7 Configurable Channel Parameters

▪ Type of Channel

This parameter allows the user to change the input type of each channel. e.g. counter or latch.

Only Discrete Input: The channel only accepts discrete input with ON or OFF indication.

Only Enable Counter: The channel gives counter value.

Enable Counter and Frequency: The channel gives counter and frequency values.

Only Enable Latch High: If the channel is OFF and unlatch register is ON, when an ON signal comes, the ON status will be latched for this channel, until both unlatch register and signal recover to OFF.

Only Enable Latch Low: If the channel is ON and unlatch register is OFF, when an OFF signal comes, the OFF status will be latched for this channel, until both unlatch register and signal recover to ON.

The factory default is “Only Discrete Input” for all channels.

- ***Filter Time (ms)***

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the *filter time* is zero, there is no filter on this channel. The factory default value is “0ms”.

4.4 8 Channel SOE 24VDC

---MX603-0108-143

The MOX 603 8 Channel Sequence of Event (SOE) module supports 8 24VDC discrete inputs, with the function of time stamping the detected events. The input voltage range is from 10VDC to 30VDC for a positive signal. This module processes the sequence of events generated from the field and transfers them to the host controller.

4.4.1 Familiarization

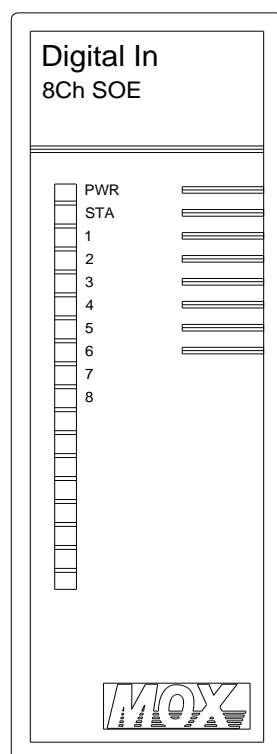


Figure 20 8 Channel SOE Familiarization

4.4.2 Datasheet

Input	
Number of channels	8
OFF voltage	<5VDC
ON voltage	>10VDC
Typical wetting current (@24VDC)	6mA
Maximum voltage input	30VDC
Resolution	0.1ms
Accuracy	±1ms
Maximum history events	256
Isolation	
Channel to system	1500Vrms
Channel to channel	1500Vrms

Configurable Parameters	
Activate Channel	Activate, Deactivate
Chatter Mode Count	User Definable
Filter Time (ms)	User Definable
Debounce Time (ms)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<3.5W

Table 18 8 Channel SOE Datasheet

4.4.3 Equivalent Circuit Diagram

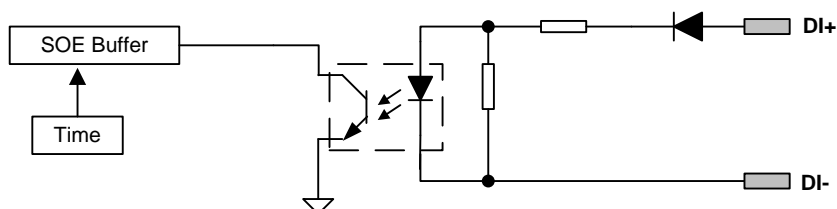


Figure 21 8 Channel SOE Equivalent Circuit Diagram

4.4.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 19 8 Channel SOE LED Definitions

4.4.5 Cabling Guide

For module base MX603-2022-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
DI1+	DI2+	DI3+	DI4+	DI5+	DI6+	DI7+	DI8+	SYN+	SYN-
11	12	13	14	15	16	17	18	19	20
DI1-	DI2-	DI3-	DI4-	DI5-	DI6-	DI7-	DI8-	N/A	N/A

Table 20 8 Channel SOE Pin Definitions



MX603-2022-01 bases only support 8 SOE 24VDC (MX603-0108-143) module with version numbers higher than 1.60.

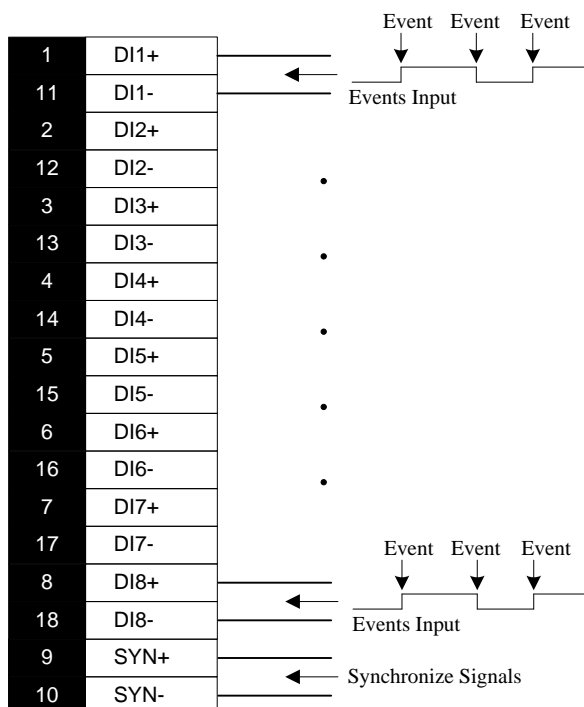


Figure 22 8 Channel SOE Wiring Diagram

4.4.6 Safety Keying

Module Top	1	0	1	1
Base Top	0	1	0	0
Module Bottom	1	1	0	0
Base Bottom	0	0	1	1

Table 21 8 Channel SOE Safety Keying

4.4.7 Configurable Channel Parameters

- **Activate Channel**

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- **Chatter Mode Count**

If the number of produced events per minute of one channel exceeds the *chatter mode count*, this channel will be disabled from further event processing. An event will be generated to indicate this time point. When the number of events per minute drops below the *chatter mode count*, the channel will be enabled and another event will be generated to indicate this time point.

It is used to prevent erroneous events caused by a faulty input. The factory default value of the *chatter mode count* is zero, which means the chatter mode is disabled for the channel.

- **Filter Time (ms)**

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the *filter time* is zero then there is no filter on this channel. The factory default value is “3ms”.

- **Debounce Time (ms)**

The *Debounce Time* is the length of time that an incoming event processing is disabled for a channel after a new event has been produced.

It is used to prevent extra events from a single contact closure. If debounce time is zero then there is no debounce on this channel. The factory default value is “3ms”.

4.5 12 Channel SOE Front-wiring

---MX603-0112-143

The MOX 603 12 Channel SOE module provides 12 isolated discrete input channels, which accept digital signal and stamps events with precise time. As one member of the MOX system, 12 SOE module maintains the sequence of the events that generate from the field, converts and transfers them to the upper controller. The module supports Extended Modbus/ModNet protocol to communicate with other devices.

The 12 channel discrete inputs are all current sink inputs. The voltage range of the inputs are 0~30VDC. If the input voltage is lower than 5VDC, the channel is off. If the input voltage is higher than 10VDC, the channel is on. The normal sink current is 6mA at 24VDC.

The module uses a synchronization channel to acquire synchronization signal from the upper controller.

The following are some features of the module.

- Record 256 history events
- Rising edge and falling edge available
- 0.1ms resolution
- Normal DI function
- Deleting the events from the SOE buffer is executed by the upper controller
- Sufficient diagnostic information
- Channel to channel, channel to system isolation
- Inverse wiring protection
- Channels independently configurable

4.5.1 Familiarization

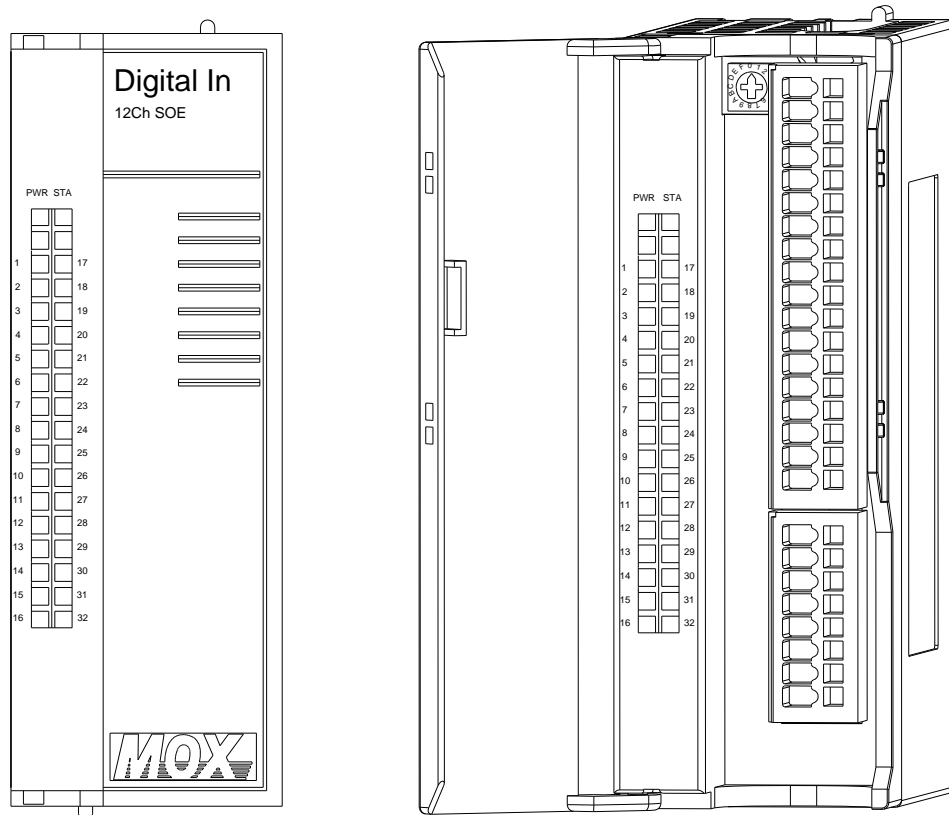


Figure 23 12 Channel SOE Front-wiring Familiarization

4.5.2 Datasheet

Input	
Number of channels	12
OFF voltage	<5VDC
ON voltage	>10VDC
Typical wetting current (@24VDC)	6mA
Maximum voltage input	30VDC
Resolution	0.1ms
Accuracy	±1ms
Maximum history events	256
Isolation	
Channel to system	3000Vrms
Channel to channel	3000Vrms
Configurable Parameters	
Activate Channel	Activate, Deactivate
Chatter Mode Count	User Definable
Filter Time (ms)	User Definable
Debounce Time (ms)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing

Hazardous location	IEC Zone 2 (IEC60079-15 “nA”)
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<3.5W

Table 22 12 Channel SOE Front-wiring Datasheet

4.5.3 Equivalent Circuit Diagram

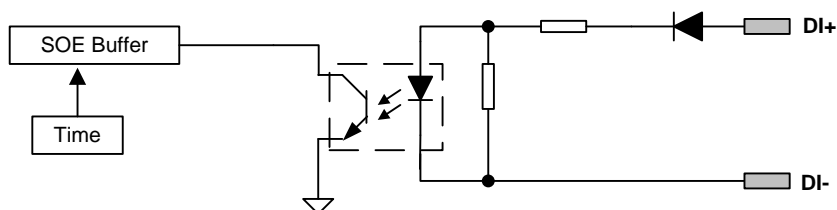


Figure 24 12 Channel SOE Front-wiring Equivalent Circuit Diagram

4.5.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
12	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 23 12 Channel SOE Front-wiring LED Definitions

4.5.5 Cabling Guide

1		Sync+			
2		Sync-			
3		DI1+			
4		DI1-			
5		DI2+			
6		DI2-			
7		DI3+			
8		DI3-			
9		DI4+			
10		DI4-			
11		DI5+			
12		DI5-			
13		DI6+			
14		DI6-			
15		DI7+			
16		DI7-			
17		DI8+			
18		DI8-			
			19		DI9+
			20		DI9-
			21		DI10+
			22		DI10-
			23		DI11+
			24		DI11-
			25		DI12+
			26		DI12-

Table 24 12 Channel SOE Front-wiring Pin Definitions

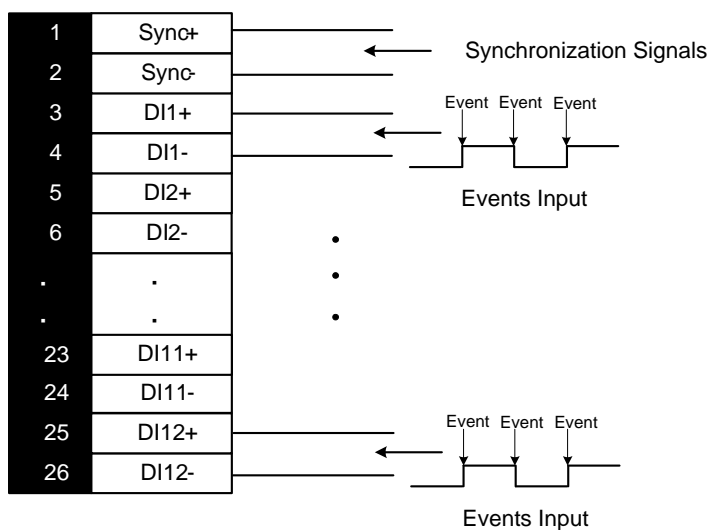


Figure 25 12 Channel SOE Front-wiring Wiring Diagram

The module adopts base MX603-2020-01.

4.5.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 25 12 Channel SOE Front-wiring Safety Keying

4.5.7 *Configurable Channel Parameters*

- **Activate Channel**

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- **Chatter Mode Count**

If the number of produced events per minute of one channel exceeds the *chatter mode count*, this channel will be disabled from further event processing. An event will be generated to indicate this time point. When the number of events per minute drops below the *chatter mode count*, the channel will be enabled and another event will be generated to indicate this time point.

It is used to prevent erroneous events caused by a faulty input. The factory default value of the *chatter mode count* is zero, which means the chatter mode is disabled for the channel.

- **Filter Time (ms)**

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the *filter time* is zero then there is no filter on this channel. The factory default value is “3ms”.

- **Debounce Time (ms)**

The *Debounce Time* is the length of time that an incoming event processing is disabled for a channel after a new event has been produced.

It is used to prevent extra events from a single contact closure. If debounce time is zero then there is no debounce on this channel. The factory default value is “3ms”.

4.6 16 Channel Digital Input Dry Contact

---MX603-0116-133

The MOX 603 16 Channel Digital Input module supports 16 non-isolated, module powered, dry contact, discrete inputs. All inputs are module-powered and only dry contact input switches are required.

4.6.1 Familiarization

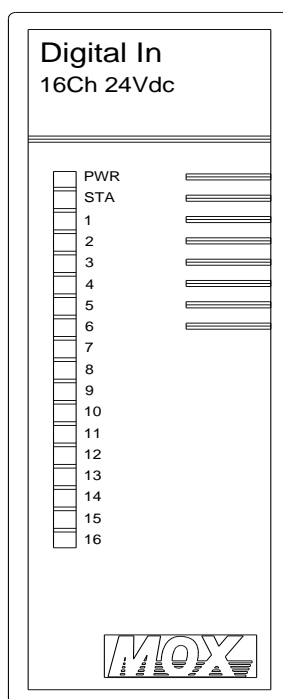


Figure 26 16 Channel Digital Input Dry Contact Familiarization

4.6.2 Datasheet

Input	
Number of channels	16
Maximum switching frequency (no-filtering)	80Hz
Minimum pulse width detected	6ms
Isolation	
Channel to system	1000Vrms
Configurable Parameters	
Primary or standby	Primary, Standby
Type of channel	Only Discrete Input, Only Enable Counter, Enable Counter and Frequency, Only Enable Latch High, Only Enable Latch Low
Filter time (ms)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C

Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.6W

Table 26 16 Channel Digital Input Dry Contact Module Datasheet

4.6.3 Equivalent Circuit Diagram

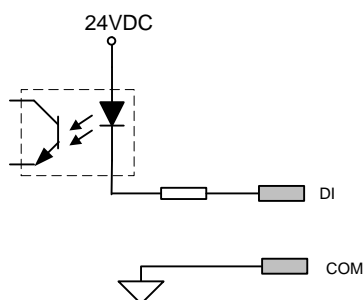


Figure 27 16 Channel Digital Input Dry Contact Equivalent Circuit Diagram

4.6.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
16	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 27 16 Channel Digital Input Dry Contact LED Definitions

4.6.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
DI1	DI3	DI5	DI7	DI9	DI11	DI13	DI15	N/A	N/A
11	12	13	14	15	16	17	18	19	20
DI2	DI4	DI6	DI8	DI10	DI12	DI14	DI16	COM	N/A

Table 28 16 Channel Digital Input Dry Contact Pin Definitions

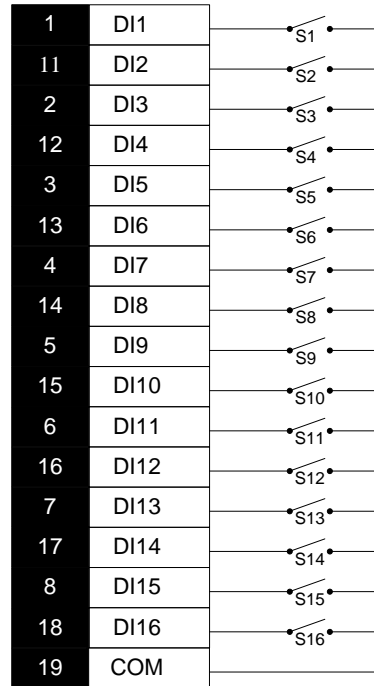


Figure 28 16 Channel Digital Input Dry Contact Wiring Diagram

For applications with the base MX603-2023-01, please refer to the following figure to sample a dry contact input with two 16 channel Digital Input Dry Contact modules for redundancy application.

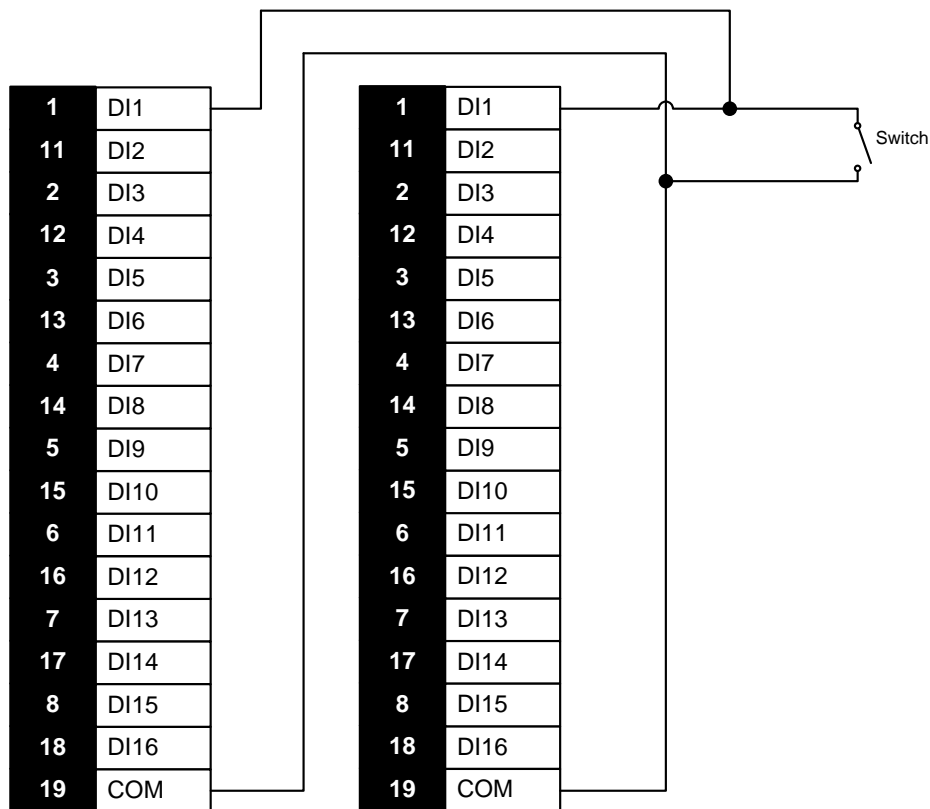


Figure 29 16 Channel Digital Input Dry Contact Example Redundancy Wiring Diagram

4.6.6 Safety Keying

Module Top	0	1	0	1
Base Top	1	0	1	0
Module Bottom	1	1	1	0
Base Bottom	0	0	0	1

Table 29 16 Channel Digital Input Dry Contact Safety Keying

4.6.7 Configurable Channel Parameters

▪ Type of Channel

This parameter allows the user to change the input type of each channel. e.g. counter or latch.

Only Discrete Input: The channel only accepts a discrete input with ON or OFF indication.

Only Enable Counter: The channel gives a counter value.

Enable Counter and Frequency: The channel gives counter and frequency values.

Only Enable Latch High: If the channel is OFF, and unlatch register is ON, when an ON signal comes, the ON status will be latched for this channel, until both unlatch register and signal recover to OFF.

Only Enable Latch Low: If the channel is ON, and unlatch register is OFF, when an OFF signal comes, the OFF status will be latched for this channel, until both unlatch register and signal recover to ON.

The factory default is “Only Discrete Input” for all channels.

- ***Filter Time (ms)***

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the *filter time* is zero then there is no filter on this channel. The factory default value is “0ms”.

4.7 16 Channel Digital Input 115VAC Front-wiring

---MX603-0116-253

The MOX 603 16 Channel Digital Input 115VAC module supports 16 isolated 115VAC discrete inputs.

4.7.1 Familiarization

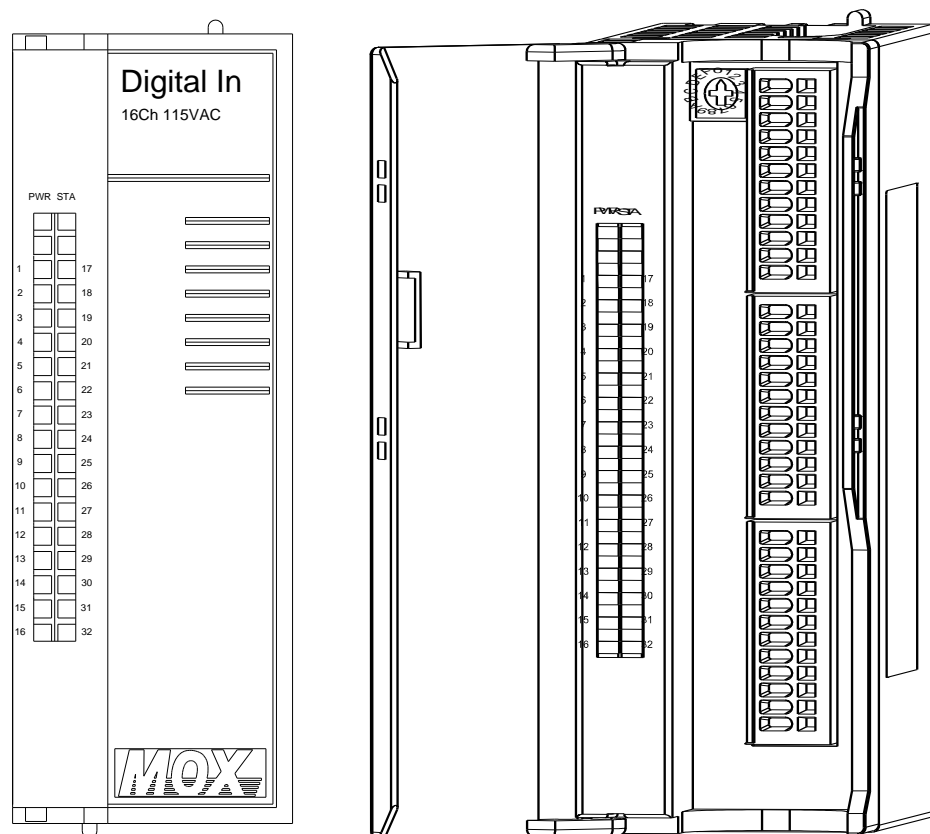


Figure 30 16 Channel Digital Input 115VAC Familiarization

4.7.2 Datasheet

Input	
Number of channels	16
OFF voltage	<30VAC
ON voltage	>80VAC
Nominal input voltage	115VAC
Maximum input voltage	250VAC
Minimum wetting current (@80VAC)	1.5mA
Maximum wetting current (@135VAC)	5mA
Minimum pulse width detected	18ms
Maximum switching frequency (no-filtering)	20Hz
Isolation	
Channel to system	1500Vrms

Channel to channel	1500Vrms
Configurable Parameters	
Type of channel	Only Discrete Input, Only Enable Counter, Enable Counter and Frequency, Only Enable Latch High, Only Enable Latch Low
Filter time (ms)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.0W

Table 30 16 Channel Digital Input 115VAC Datasheet

4.7.3 Equivalent Circuit Diagram

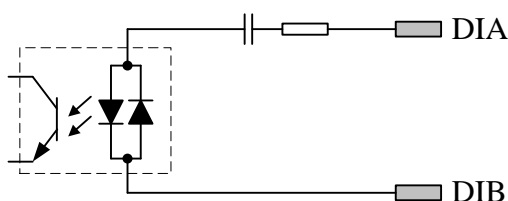


Figure 31 16 Channel Digital 115VDC Equivalent Circuit Diagram

4.7.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
16	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 31 16 Channel Digital Input 115VAC LED Definitions

4.7.5 Cabling Guide

The pins of 16 Channel Digital Input 115VAC are located on the front of the module. Their definitions are shown below:

1	DI1A	13	DI7A	25	DI13A
2	DI1B	14	DI7B	26	DI13B
3	DI2A	15	DI8A	27	DI14A
4	DI2B	16	DI8B	28	DI14B
5	DI3A	17	DI9A	29	DI15A
6	DI3B	18	DI9B	30	DI15B
7	DI4A	19	DI10A	31	DI16A
8	DI4B	20	DI10B	32	DI16B
9	DI5A	21	DI11A	33	N/A
10	DI5B	22	DI11B	34	N/A
11	DI6A	23	DI12A	35	N/A
12	DI6B	24	DI12B	36	N/A

Figure 32 16 Channel Digital Input 115VAC Pin Definitions

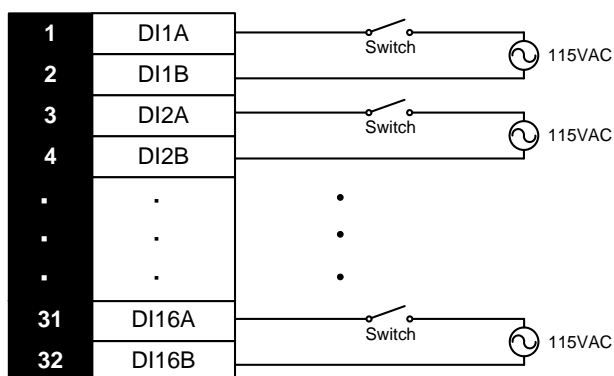


Figure 33 16 Channel Digital Input 115VAC Cabling Diagram

The module adopts base MX603-2020-01.

4.7.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 32 16 Channel Digital Input 110VAC Safety Keying

4.7.7 Configurable Channel Parameters

▪ Type of Channel

This parameter allows the user to change the input type of each channel. e.g. counter or latch.

Only Discrete Input: The channel only accepts a discrete input with ON or OFF indication.

Only Enable Counter: The channel gives a counter value.

Enable Counter and Frequency: The channel gives counter and frequency values.

Only Enable Latch High: If the channel is OFF, and unlatch register is ON, when an ON signal comes, the ON status will be latched for this channel, until both unlatch register and signal recover to OFF.

Only Enable Latch Low: If the channel is ON, and unlatch register is OFF, when an OFF signal comes, the OFF status will be latched for this channel, until both unlatch register and signal recover to ON.

The factory default is “Only Discrete Input” for all channels.

▪ **Filter Time (ms)**

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the *filter time* is zero then there is no filter on this channel. The factory default value is “0ms”.

4.8 16 Channel Digital Input 230VAC Front-wiring

---MX603-0116-263

The MOX 603 16 Channel Digital Input 230VAC module supports 16 isolated 230VAC discrete inputs.

4.8.1 Familiarization

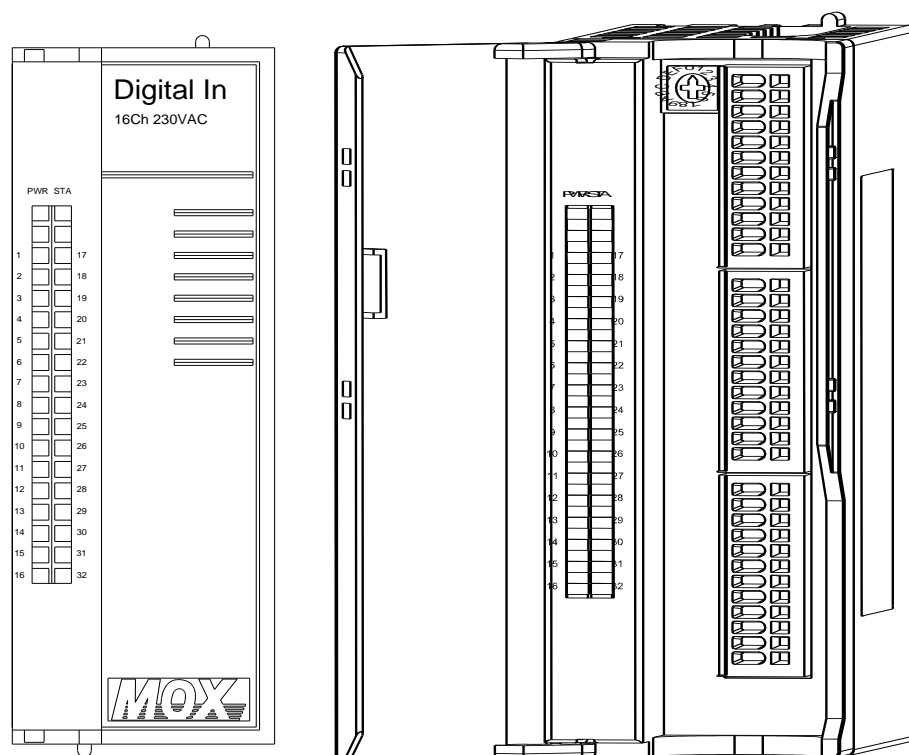


Figure 34 16 Channel Digital Input 230VAC Familiarization

4.8.2 Datasheet

Input	
Number of channels	16
OFF voltage	<68VAC
ON voltage	>168VAC
Nominal Input Voltage	230VAC
Maximum input voltage	300VAC
Minimum wetting current (@168VAC)	4mA
Maximum wetting current (@265VAC)	10mA
Minimum pulse width detected	18ms
Maximum switching frequency (no-filtering)	20Hz
Isolation	
Channel to system	1500Vrms
Channel to channel	1500Vrms
Configurable Parameters	
Type of channel	Only Discrete Input, Only Enable Counter, Enable Counter and Frequency, Only Enable

	Latch High, Only Enable Latch Low
Filter time (ms)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.0W

Table 33 16 Channel Digital Input 230VAC Datasheet

4.8.3 Equivalent Circuit Diagram

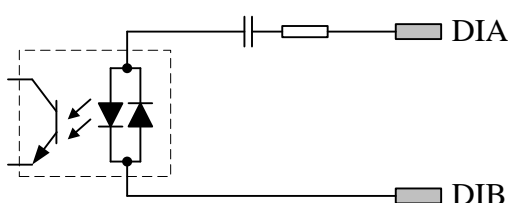


Figure 35 16 Channel Digital Input 230VAC Equivalent Circuit Diagram

4.8.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
16	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 34 16 Channel Digital Input 230VAC LED Definitions

4.8.5 Cabling Guide

The pins of 16 Channel Digital Input 230VAC are located on the front of the module. Their definitions are shown below:

1	DI1A	13	DI7A	25	DI13A
2	DI1B	14	DI7B	26	DI13B
3	DI2A	15	DI8A	27	DI14A
4	DI2B	16	DI8B	28	DI14B
5	DI3A	17	DI9A	29	DI15A
6	DI3B	18	DI9B	30	DI15B
7	DI4A	19	DI10A	31	DI16A
8	DI4B	20	DI10B	32	DI16B
9	DI5A	21	DI11A	33	N/A
10	DI5B	22	DI11B	34	N/A
11	DI6A	23	DI12A	35	N/A
12	DI6B	24	DI12B	36	N/A

Figure 36 16 Channel Digital Input 230VAC Pin Definitions

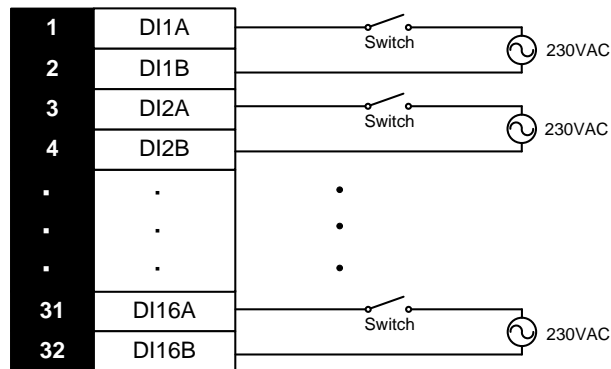


Figure 37 16 Channel Digital Input 230VAC Cabling Diagram

The module adopts base MX603-2020-01.

4.8.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 35 16 Channel Digital Input 230VAC Safety Keying

4.8.7 Configurable Channel Parameters

▪ Type of Channel

This parameter allows the user to change the input type of each channel. e.g. counter or latch.

Only Discrete Input: The channel only accepts a discrete input with ON or OFF indication.

Only Enable Counter: The channel gives a counter value.

Enable Counter and Frequency: The channel gives counter and frequency values.

Only Enable Latch High: If the channel is OFF, and unlatch register is ON, when an ON signal comes, the ON status will be latched for this channel, until both unlatch register and signal recover to OFF.

Only Enable Latch Low: If the channel is ON, and unlatch register is OFF, when an OFF signal comes, the OFF status will be latched for this channel, until both unlatch register and signal recover to ON.

The factory default is "Only Discrete Input" for all channels.

- **Filter Time (ms)**

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the *filter time* is zero then there is no filter on this channel. The factory default value is "0ms".

4.9 16 Channel Digital Input Dry Contact Front-wiring

---MX603-0116-273

The MOX 603 16 Channel Digital Input Dry Contact Front-wiring module supports 16 isolated discrete inputs.

4.9.1 Familiarization

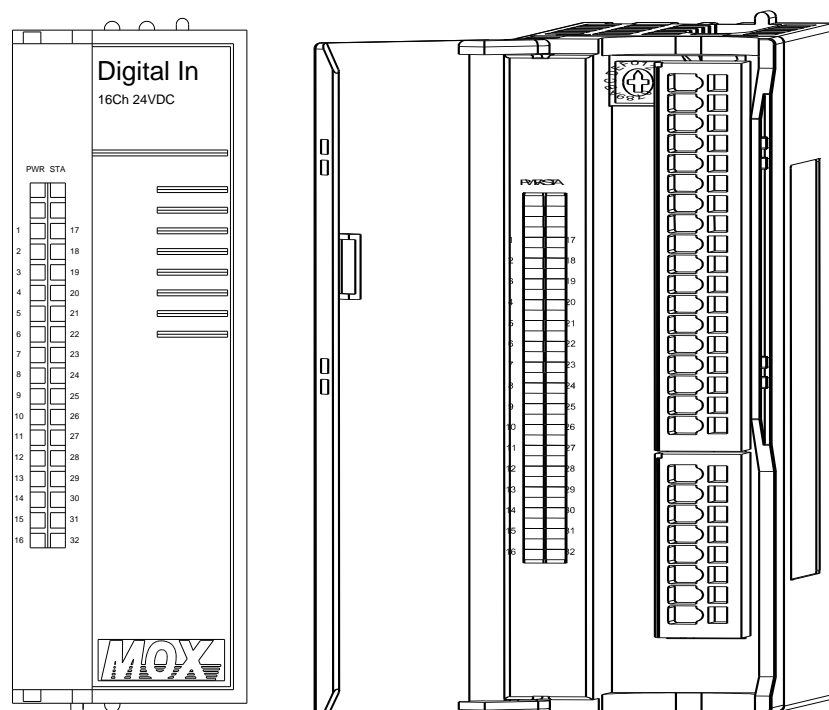


Figure 38 16 Channel Digital Input Dry Contact Front-wiring Familiarization

4.9.2 Datasheet

Input	
Number of channels	16
Minimum pulse width detected	6ms
Maximum switching frequency (no-filtering)	80Hz
Isolation	
Group* to group isolation	1000Vrms
Channels to system isolation	2500Vrms
Configurable Parameters	
Type of channel	Only Discrete Input, Only Enable Counter, Enable Counter and Frequency, Only Enable Latch High, Only Enable Latch Low
Filter time (ms)	User Definable
Diagnostic Information	
Wire break diagnostic	Configurable
Power fault diagnostic	Configurable

Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.0W
Voltage for channels	24VDC ($\pm 10\%$)
Power dissipation within channels	<3.0W

*: Four channels are defined as one Group.

Table 36 16 Channel Digital Input Dry Contact Front-wiring Datasheet

4.9.3 Equivalent Circuit Diagram

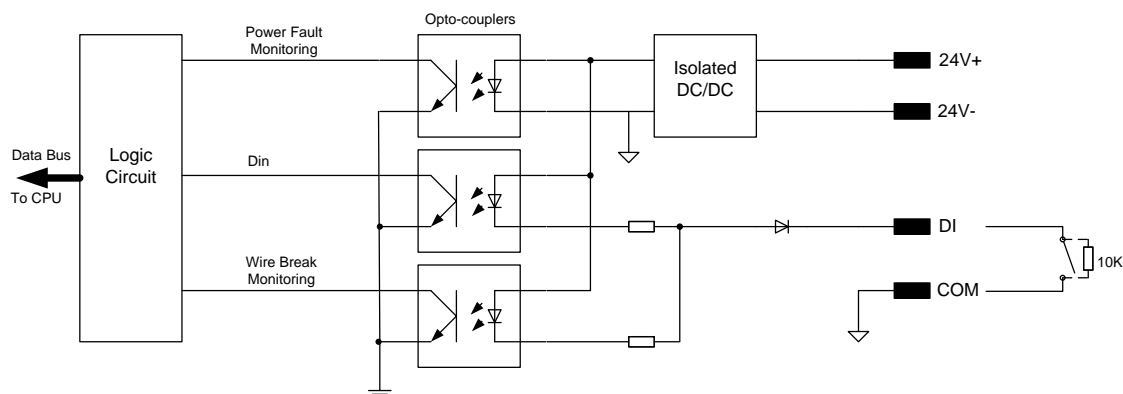


Figure 39 16 Channel Digital Input Dry Contact Front-wiring Equivalent Circuit Diagram

4.9.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
16	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 37 16 Channel Digital Input Dry Contact Front-wiring LED Definitions

4.9.5 Cabling Guide

The pins of 16 Channel Digital Input Dry Contact Front-wiring are located on the front of the module. Their definitions are shown below:

1	24V+	19	DI14
2	24V-	20	DI15
3	DI1	21	DI16
4	DI2	22	COM4
5	DI3	23	N/A
6	DI4	24	N/A
7	COM1	25	N/A
8	DI5	26	N/A
9	DI6		
10	DI7		
11	DI8		
12	COM2		
13	DI9		
14	DI10		
15	DI11		
16	DI12		
17	COM3		
18	DI13		

Figure 40 16 Channel Digital Input Dry Contact Front-wiring Pin Definitions



In the figure above, five channels are defined as one group. DI1~COM1 is Group1, DI5~COM2 is Group2, DI9~COM3 is Group3, DI13~COM4 is Group4.

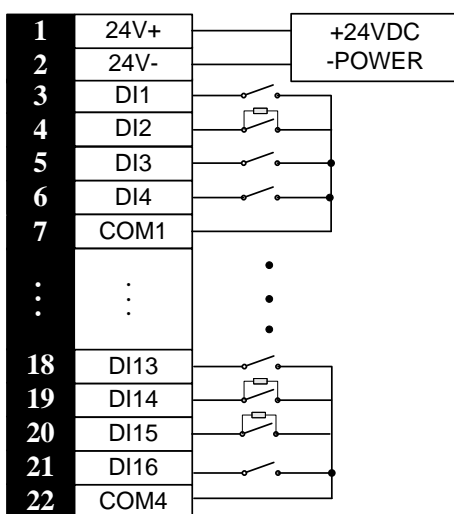


Figure 41 16 Channel Digital Input Dry Contact Front-wiring Cabling Guide

Each channel can be connected to a contact with wire break monitoring or without wire break monitoring. The contact with wire break monitoring has a 10kΩ resistor paralleled with it.

The module adopts base MX603-2020-01.

4.9.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 38 16 Channel Digital Input Dry Contact Front-wiring Safety Keying

4.9.7 Configurable Channel Parameters

▪ Type of Channel

This parameter allows the user to change the input type of each channel. e.g. counter or latch.

Only Discrete Input: The channel only accepts a discrete input with ON or OFF indication.

Only Enable Counter: The channel gives a counter value.

Enable Counter and Frequency: The channel gives counter and frequency values.

Only Enable Latch High: If the channel is OFF, and unlatch register is ON, when an ON signal comes, the ON status will be latched for this channel, until both unlatch register and signal recover to OFF.

Only Enable Latch Low: If the channel is ON, and unlatch register is OFF, when an OFF signal comes, the OFF status will be latched for this channel, until both unlatch register and signal recover to ON.

The factory default is “Only Discrete Input” for all channels.

▪ Filter Time (ms)

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the *filter time* is zero then there is no filter on this channel. The factory default value is “0ms”.

4.10 32 Channel Digital Input Dry Contact Front-wiring

---MX603-0132-133

The MOX 603 32 Channel Digital Input Dry Contact module supports 32 non-isolated dry contact inputs.

4.10.1 Familiarization

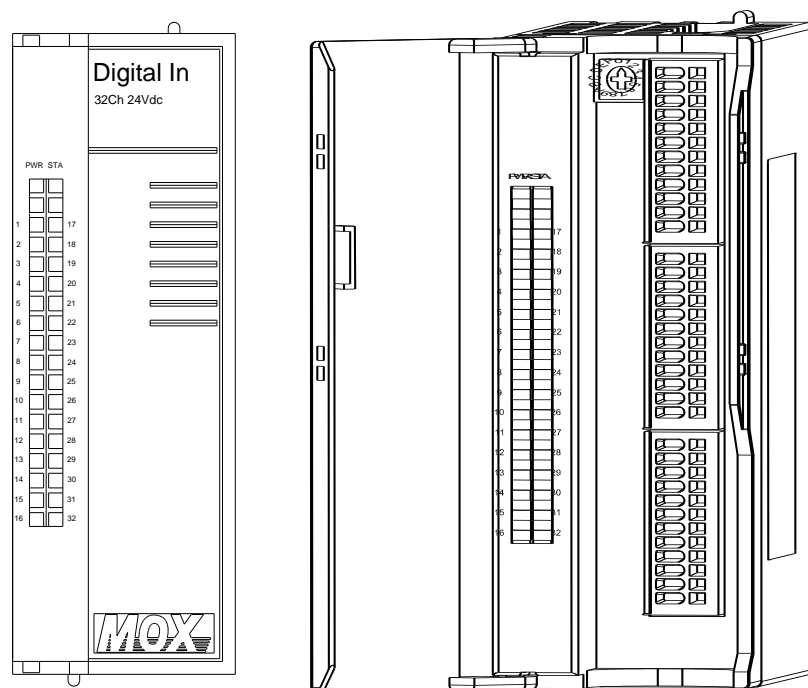


Figure 42 32 Channel Digital Input Module

4.10.2 Datasheet

Input	
Number of channels	32
Minimum pulse width detected	6ms
Maximum switching frequency (no-filtering)	80Hz
Isolation	
Channel to system	1000Vrms
Configurable Parameters	
Type of channel	Only Discrete Input, Only Enable Counter, Enable Counter and Frequency, Only Enable Latch High, Only Enable Latch Low
Filter time (ms)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC

Power dissipation within module	<1.0W
Voltage for channels	24VDC ($\pm 10\%$)
Power dissipation within channels	<10.0W

Table 39 32 Channel Digital Input Datasheet

4.10.3 Equivalent Circuit Diagram

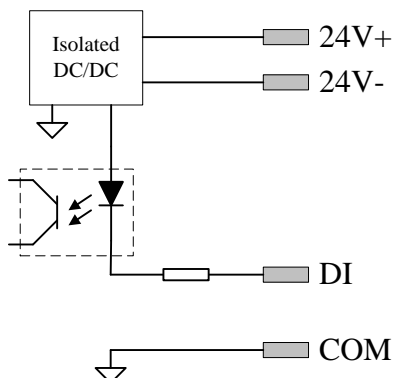


Figure 43 32 Channel Digital Input Equivalent Circuit Diagram

4.10.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
32	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 40 32 Channel Digital Input LED Definitions

4.10.5 Cabling Guide

The pins of 32 Channel Digital Input are located on the front of the module. Their definitions are shown below:

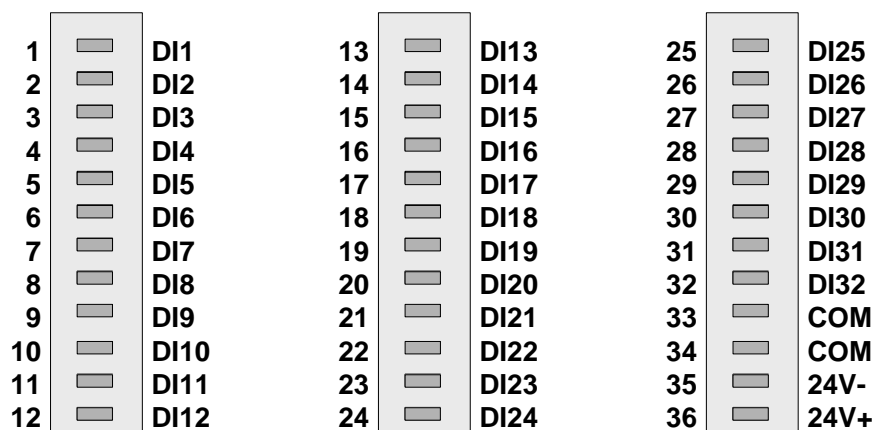


Figure 44 32 Channel Digital Input Pin Definitions

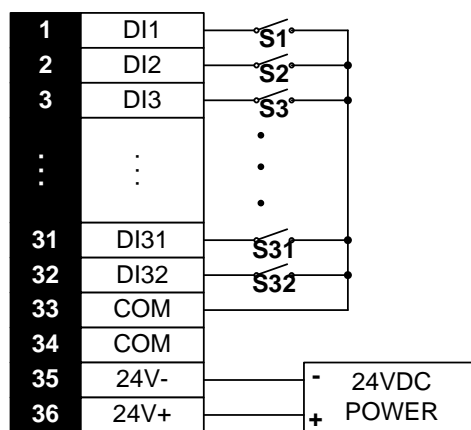


Figure 45 32 Channel Digital Input Cabling Diagram

The module adopts base MX603-2020-01.

4.10.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 41 32 Channel Digital Input Safety Keying

4.10.7 Configurable Channel Parameters

▪ Type of Channel

This parameter allows the user to change the input type of each channel. e.g. counter or latch.

Only Discrete Input: The channel only accepts discrete input with ON or OFF indication.

Only Enable Counter: The channel gives a counter value.

Enable Counter and Frequency: The channel gives counter and frequency values.

Only Enable Latch High: If the channel is OFF, and unlatch register is ON, when an ON signal comes, the ON status will be latched for this channel, until both unlatch register and signal recover to OFF.

Only Enable Latch Low: If the channel is ON, and unlatch register is OFF, when an OFF signal comes, the OFF status will be latched for this channel, until both unlatch register and signal recover to ON.

The factory default is "Only Discrete Input" for all channels.

- **Filter Time (ms)**

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the *filter time* is zero then there is no filter on this channel. The factory default value is "0ms".

4.11 32 Channel Digital Input Front-wiring

---MX603-0132-233

The MOX 603 32 Channel Digital Input module supports 32 non-isolated inputs. It is suitable for dry contact, voltage signal input, and 2/3/4 wire proximity switches.

The module adopts base MX603-2020-01.

4.11.1 Familiarization

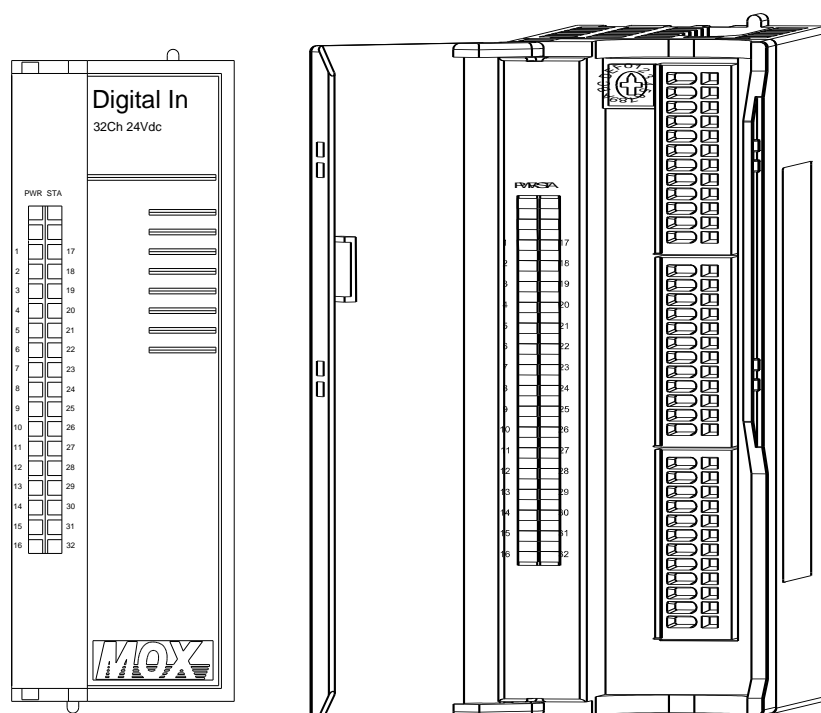


Figure 46 32 Channel Digital Input Module

4.11.2 Datasheet

Input	
Number of channels	32
Minimum pulse width detected	6ms
Maximum switching frequency (no-filtering)	80Hz
Isolation	
Channel to system	5000Vrms
Sensor Selection Data	
Input Voltage	Nominal value: 24VDC For 1 signal: 10V to 30V For 0 signal: -3V to 5V
Input Current	With 1 signal: 2mA
Input Delay	At 0 to 1 transition: 1ms to 5ms At 1 to 0 transition: 1ms to 5ms
Connection of 2-wiring Proximity Switch	Permissible Quiescent Current: Max. 0.5mA
Configurable Parameters	
Type of channel	Only Discrete Input, Only Enable Counter,

	Enable Counter and Frequency, Only Enable Latch High, Only Enable Latch Low
Filter time (ms)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.0W
Voltage for channels	24VDC ($\pm 10\%$)
Power dissipation within channels	<3.0W

Table 42 32 Channel Digital Input Datasheet

4.11.3 Equivalent Circuit Diagram

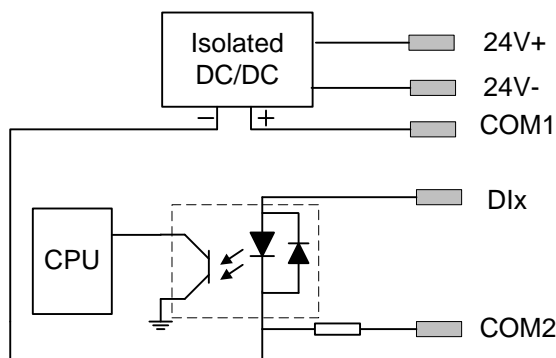


Figure 47 32 Channel Digital Input Equivalent Circuit Diagram

4.11.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.

32	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 43 32 Channel Digital Input LED Definitions

4.11.5 Cabling Guide

The pins of 32 Channel Digital Input are located on the front of the module. Their definitions are shown below:

1	24V+	13	DI10	25	DI22
2	24V-	14	DI11	26	DI23
3	COM1	15	DI12	27	DI24
4	DI1	16	DI13	28	DI25
5	DI2	17	DI14	29	DI26
6	DI3	18	DI15	30	DI27
7	DI4	19	DI16	31	DI28
8	DI5	20	DI17	32	DI29
9	DI6	21	DI18	33	DI30
10	DI7	22	DI19	34	DI31
11	DI8	23	DI20	35	DI32
12	DI9	24	DI21	36	COM2

Figure 48 32 Channel Digital Input Pin Definitions

The module supports the dry-contact, voltage signal input, 2/3/4-wire proximity switches. The following cabling diagrams show how to wire different types of input signals to the module.

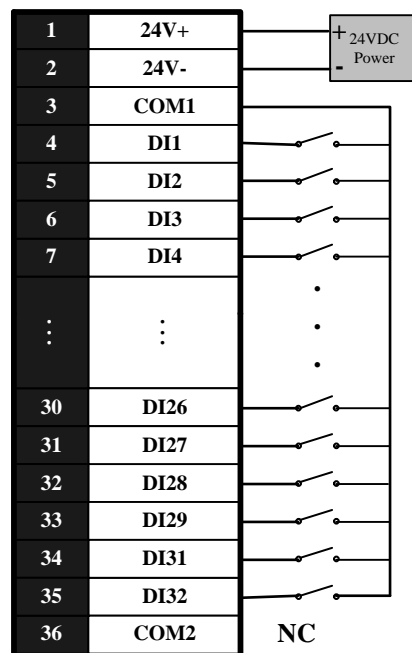


Figure 49 32 Channel Digital Input Cabling Diagram for Dry Contact Input

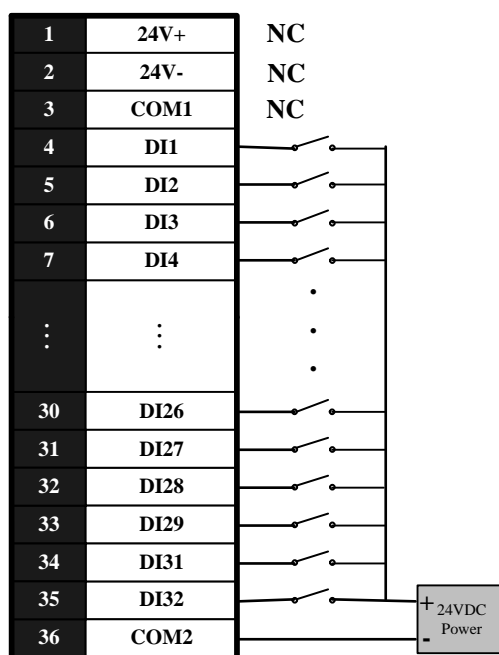


Figure 50 32 Channel Digital Input Cabling Diagram for Voltage Input (Common Negative)

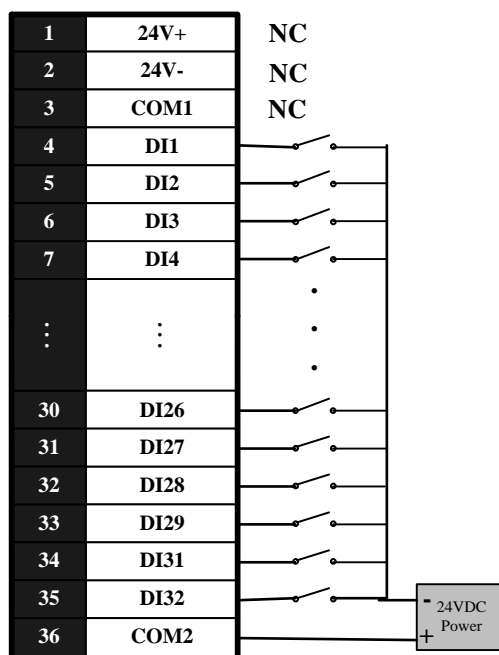


Figure 51 32 Channel Digital Input Cabling Diagram for Voltage Input (Common Positive)

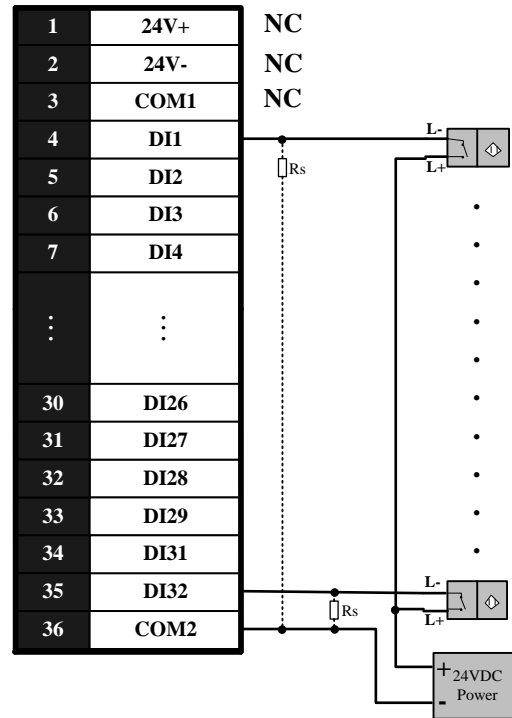


Figure 52 32 Channel Digital Input Cabling Diagram for 2-wiring Proximity Switches

When 2-wiring proximity switch is connected to the module, the shunt resistance should be used to provide more Quiescent Current to proximity switches. It is calculated by the following expression. If the max Quiescent Current of the proximity switches is less than 0.5mA, the shunt resistance could be removed.

$$R_s \leq \frac{V_s}{I_R - I_{OFFR}} (k\Omega)$$

$$P \leq \frac{V_s^2}{R_s} (mW)$$

V_s : Voltage between R_s when the proximity switch is off (V)

R_s : Value of shunt resistance ($k\Omega$)

P : Shunt resistance power (mW)

I_R : Leakage current of the proximity switch (mA)

I_{OFFR} : OFF current of DI (0.5mA TYP)

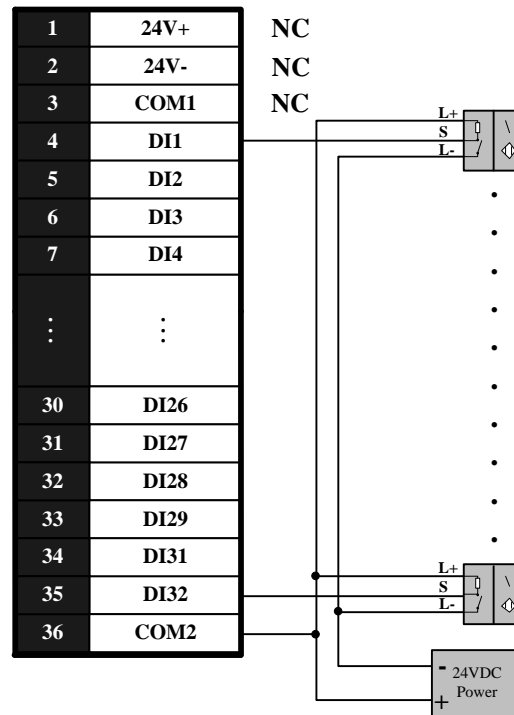


Figure 53 32 Channel Digital Input Cabling Diagram for 3-wiring NPN Proximity Switches (NO)

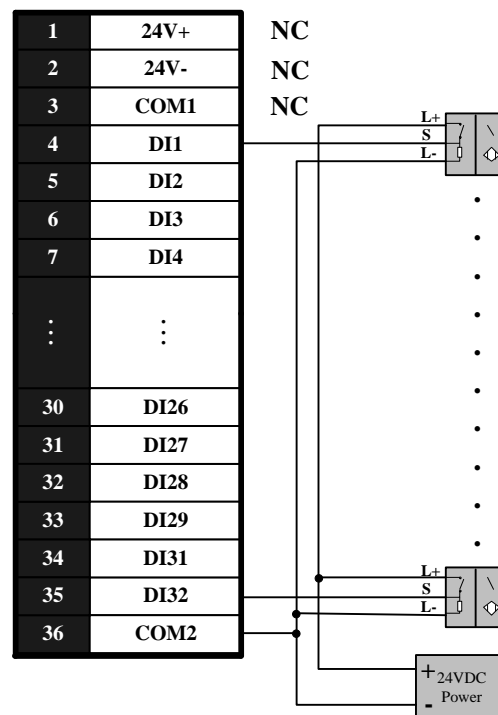



Figure 54 32 Channel Digital Input Cabling Diagram for 3-wiring PNP Proximity Switches (NO)

	<ol style="list-style-type: none"> 1. The terminals marked “NC” must be left unconnected in each diagram. 2. If dry contact signal is applied to the module, no other types of signals are allowed to be connected simultaneously. 3. The voltage input (common negative), 2-wiring proximity switch signals and the PNP proximity switch signals are allowed to be connected simultaneously to the module. However, these signals should use one common external power supply. 4. The voltage input (common positive) and NPN proximity switch signals are allowed to be connected simultaneously to the module. However, these signals should use one common external power supply. 5. The connection for 4-wiring proximity switches is similar to 3-wiring proximity. But only a NO or NC terminal can be connected.
---	---

4.11.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 44 32 Channel Digital Input Safety Keying

4.11.7 Configurable Channel Parameters

▪ Type of Channel

This parameter allows the user to change the input type of each channel. e.g. counter or latch.

Only Discrete Input: The channel only accepts discrete input with ON or OFF indication.

Only Enable Counter: The channel gives a counter value.

Enable Counter and Frequency: The channel gives counter and frequency values.

Only Enable Latch High: If the channel is OFF, and unlatch register is ON, when an ON signal comes, the ON status will be latched for this channel, until both unlatch register and signal recover to OFF.

Only Enable Latch Low: If the channel is ON, and unlatch register is OFF, when an OFF signal comes, the OFF status will be latched for this channel, until both unlatch register and signal recover to ON.

The factory default is “Only Discrete Input” for all channels.

▪ Filter Time (ms)

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the *filter time* is zero then there is no filter on this channel. The factory default value is "0ms".

4.12 8 Channel Digital Output Relay

---MX603-0208-313

The MOX 603 8 Channel Digital Output Relay module has 8 relay channel outputs. The output channels can be used as a switch, switching a user supplied voltage to field devices.

4.12.1 Familiarization

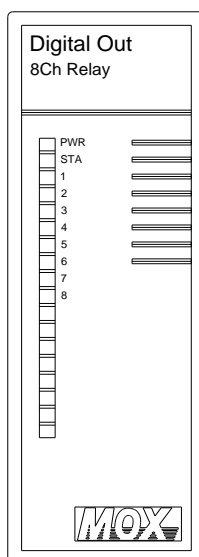


Figure 55 8 Channel Digital Output Relay Familiarization

4.12.2 Datasheet

Output	
Number of channels	8
Max output DC voltage range	30VDC
Output current rating	1A per point
Surge current per point	10A per 10ms every 2s
Isolation	
Channel to system	2000Vrms
Channel to channel	1500Vrms
Configurable Parameters	
Primary or standby	Primary, Standby
Predef value	OFF, ON
Fail-safe value of channel	Last Value, Predef Value
Type	Discrete Output, Single Pulse, Continuous Pulse
Pulse width (High, 20ms/unit)	User Definable
Pulse width (Low, 20ms/unit)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	

Voltage for module	5VDC
Power dissipation within module	<2.3W

Table 45 8 Channel Digital Output Relay Datasheet

4.12.3 Equivalent Circuit Diagram

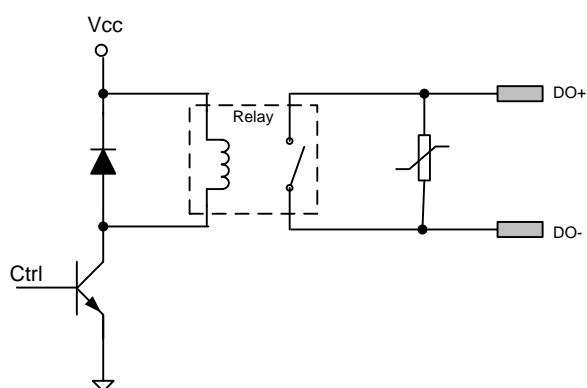


Figure 56 8 Channel Digital Output Relay Equivalent Circuit Diagram

4.12.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0
			2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 46 8 Channel Digital Output Relay LED Definitions

4.12.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
DO1+	DO2+	DO3+	DO+	DO5+	DO6+	DO7+	DO8+	N/A	N/A
11	12	13	14	15	16	17	18	19	20
DO1-	DO2-	DO3-	DO4-	DO5-	DO6-	DO7-	DO8-	N/A	N/A

Table 47 8 Channel Digital Output Relay Pin Definitions

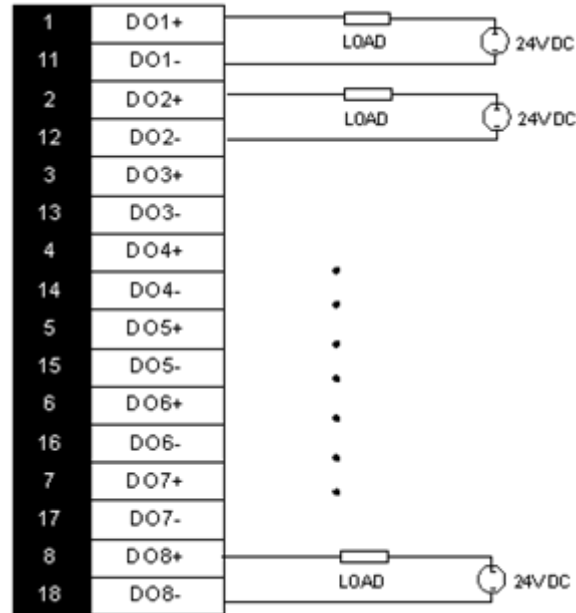


Figure 57 8 Channel Digital Output Relay Wiring Diagram

For applications with the base of MX603-2023-01, please refer to the following figure to wire two 8 Channel Digital Output Relay modules for redundancy application.

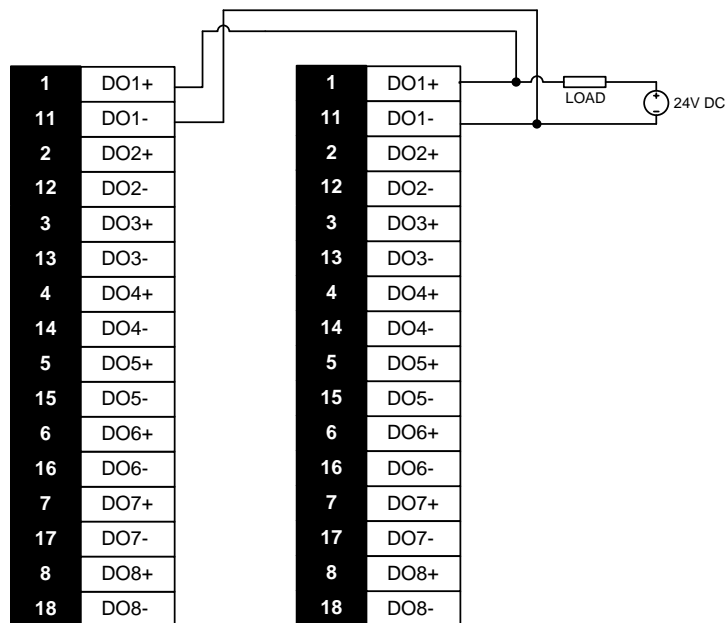


Figure 58 8 Channel Digital Output Relay Redundancy Wiring Diagram

4.12.6 Safety Keying

Module Top	0	0	1	1
Base Top	1	1	0	0
Module Bottom	1	1	0	1
Base Bottom	0	0	1	0

Table 48 8 Channel Digital Output Relay Safety Keying

4.12.7 Configurable Channel Parameters

▪ **Predefined Value**

This parameter is the value set for each channel on power-up of the module, e.g. “OFF” or “ON”.

This value is user defined and can be configured for each channel. This parameter can have the following values:

- OFF, ON

The factory default is “OFF” for this parameter.

▪ **Fail-safe value**

This parameter enables the user to configure a value to be used when communication with the module fails. The user configurable options are:

- Last Value – last known state of the channel
- Predef Value – the value is taken from the *Predefined Value* parameter

The factory default is “Last Value” for this parameter.

▪ **Type of channel**

This parameter enables the user to configure the channel output type. The user configurable options are:

Discrete Output: The channel output will remain constant as the controller requires.

Single Pulse: When working in single pulse mode, “1” means starting one high level period. The period length is defined in *Pulse Width* parameter. When the high level period time expires, the output will be kept low. “0” means canceling the last starting action; before starting the next single pulse, the canceling “0” is required.

Continuous Pulse: When working in continuous pulse mode, ‘1’ means starting a continuous pulse, the high and low period lengths of which are defined in *Pulse Width* parameter. ‘0’ means canceling the last starting action.

Note: *Single Pulse* and *Continuous Pulse* functions are not implemented under redundancy mode.

The factory default is “Discrete Output” for this parameter.

- ***Pulse width (High and Low) of channel***

This parameter is used to define the *pulse width* in conjunction with the “*Type of channel*” parameter when the *Single Pulse* or *Continuous Pulse* option is set. The high width and low width are configured separately; the unit is 20ms. If the low width is set to 0, it will be forced to be equal to the high width. The user configurable parameters are:

- ◆ **0-255**

The factory default is “0” for this parameter. For *Single Pulse* and *Continuous Pulse*, “0” means the minimum width which is 20ms.

4.13 12 Channel Digital Output Relay Front-wiring

---MX603-0212-113

The MOX 603 12 Channel Digital Output Relay module has 12 output channels. The output channels can be used as a switch, switching a user supplied voltage to field devices.

4.13.1 Familiarization

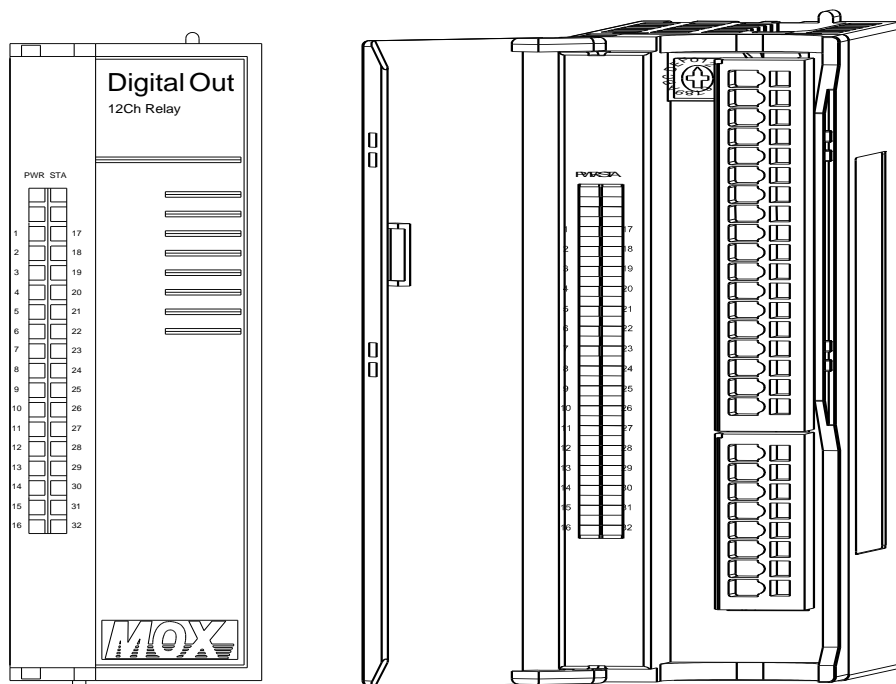


Figure 59 12 Channel Digital Output Relay Familiarization

4.13.2 Datasheet

Output	
Number of output channels	12
Max output AC voltage range	250VAC
Max output DC voltage range	30VDC
Output current rating	2A per point
Surge current per point	10A for 10ms every 2s
Isolation	
Channel to system	2000Vrms
Channel to channel	1000Vrms
Configurable Parameters	
Predef value	OFF, ON
Fail-safe value of channel	Last Value, Predef Value
Type	Discrete Output, Single Pulse, Continuous Pulse
Pulse width (High, 20ms/unit)	User Definable
Pulse width (Low, 20ms/unit)	User Definable
Environmental Conditions	

Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<3.0W

Table 49 12 Channel Digital Output Relay Datasheet

4.13.3 Equivalent Circuit Diagram

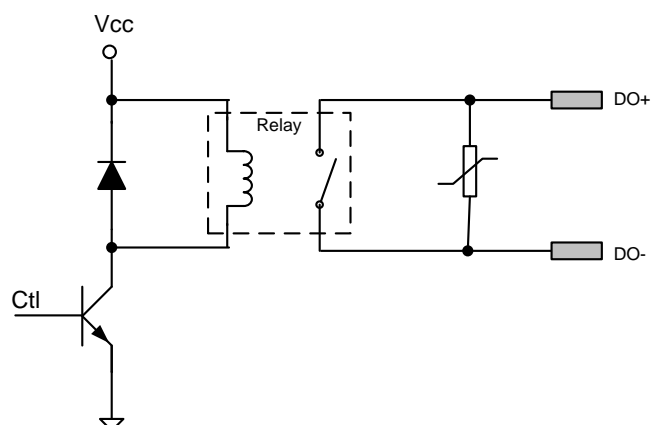


Figure 60 12 Channel Digital Output Relay Equivalent Circuit Diagram

4.13.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
12	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 50 12 Channel Digital Output Relay LED Definitions

4.13.5 Cabling Guide

The pins of 12 Channel Digital Output Relay are located on the front of the module. Their definitions are shown below:

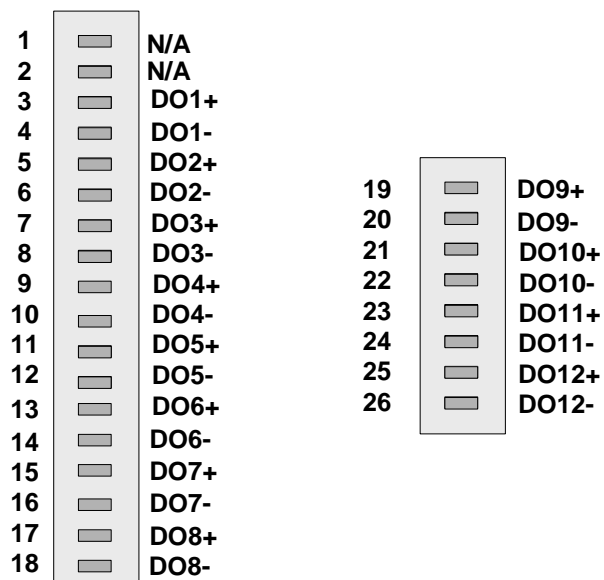


Figure 61 12 Channel Digital Output Relay Pin Definitions

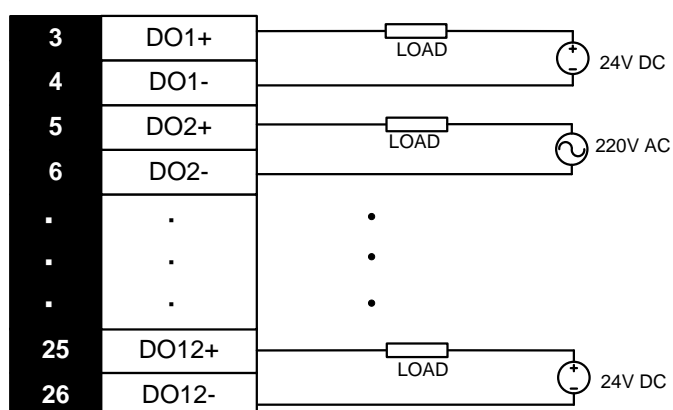


Figure 62 12 Channel Digital Output Relay Wiring Diagram

The module adopts base MX603-2020-01.

4.13.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 51 12 Channel Digital Output Relay Safety Keying

4.13.7 Configurable Channel Parameters

- **Predefined Value**

This parameter is the value set to each channel on power-up of the module, e.g. “OFF” or “ON”.

This value is user defined and can be configured for each channel. This parameter can have the following values:

- OFF, ON

The factory default is “OFF” for this parameter.

- **Fail-safe Value**

This parameter enables the user to configure a value to be used when communication with the module fails. The user configurable options are:

- Last value – last known state of the channel
- Predefined value – the value is taken from the predefined parameter

The factory default is “Last value” for this parameter.

- **Type of Channel**

This parameter enables the user to configure the channel output type. The user configurable options are:

Discrete Output: The channel output will remain constant as the controller requires.

Single Pulse: When working in single pulse mode, “1” means starting one high level period which is defined in *Pulse Width* parameter, when high level period time expires, the output will keep low. “0” means canceling the last starting action; before starting next single pulse, the canceling “0” is required.

Continuous Pulse: When working in continuous pulse mode, ‘1’ means starting one continuous pulse, the high and low level lengths of which are defined in Parameters; ‘0’ means canceling the last starting action.

The factory default is “Discrete Output” for this parameter.

- **Pulse width (High and Low) of channel**

This parameter is used to define the *pulse width* in conjunction with the “*Type of channel*” parameter when *Single Pulse* or *Continuous Pulse* option is set. The high width and low width are configured separately; the unit is 20ms. If the low width is set to 0, it will be forced to be equal to high width. The user configurable parameters are:

- ◆ 0-255

The factory default is “0” for this parameter. For *Single Pulse* and *Continuous Pulse*, “0” means the minimum width, 20ms.

4.14 16 Channel Digital Output 24VDC

---MX603-0216-123

---MX603-0216-133

The MOX 603 16 Channel Digital Output module has 16 non-isolated 24VDC channel outputs. The module powered output channels of the module are used to switch relays or other low-power devices.

The 16 Channel Digital Output Module comes in two different forms:

- 1) Standard 16 Channel Digital Output Module without read back capability – MX603-0216-123
- 2) Enhanced 16 Channel Digital Output Module with read back capability – MX603-0216-133

Note that both types have their own identifying part numbers.

4.14.1 Familiarization

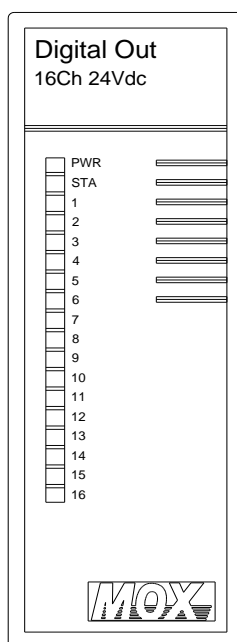


Figure 63 16 Channel Digital Output Familiarization

4.14.2 Datasheet

Output	
Number of channels	16
Output current rating	Channel 100mA Module 1A
Off leakage current (@25°C)	<25µA
Isolation	
Channel to system	1000Vrms
Configurable Parameters	
Primary or standby	Primary, Standby

Predef value	OFF, ON
Fail-safe value of channel	Last Value, Predef Value
Type	Discrete Output, Single Pulse, Continuous Pulse
Pulse width (High, 1ms/unit)	User Definable
Pulse width (Low, 1ms/unit)	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.5W
Voltage for channels	24VDC ($\pm 10\%$)
Power dissipation within channels	<24W

Table 52 16 Channel Digital Output and 16 Channel Digital Output Readback Datasheet

Note: The user should limit the output current of the module to less than 1A, so the power dissipation for the field is less than 24W.

4.14.3 Equivalent Circuit Diagram

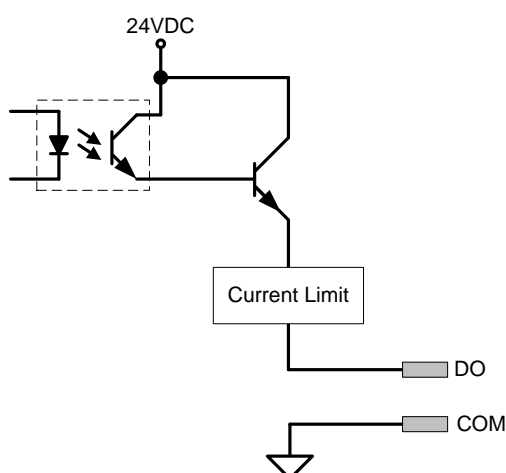


Figure 64 16 Channel Digital Output Equivalent Circuit Diagram

4.14.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON,	Inactive status in redundancy mode

		500ms OFF	
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
16	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 53 16 Channel Digital Output LED Definitions

4.14.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
DO1	DO3	DO5	DO7	DO9	DO11	DO13	DO15	24V+	24V-
11	12	13	14	15	16	17	18	19	20
DO2	DO4	DO6	DO8	DO10	DO12	DO14	DO16	COM	N/A

Table 54 16 Channel Digital Output Pin Definitions

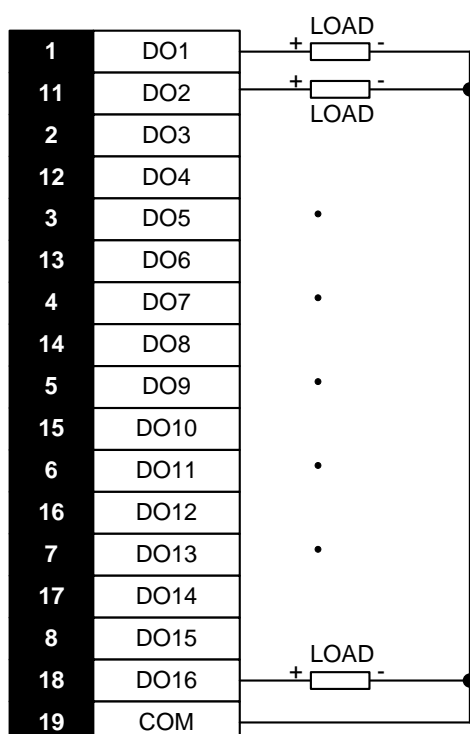


Figure 65 16 Channel Digital Output Cabling Diagram

For applications with the base MX603-2023-01, please refer to the following figure to wire two 16 Channel Digital Output modules for redundancy application.

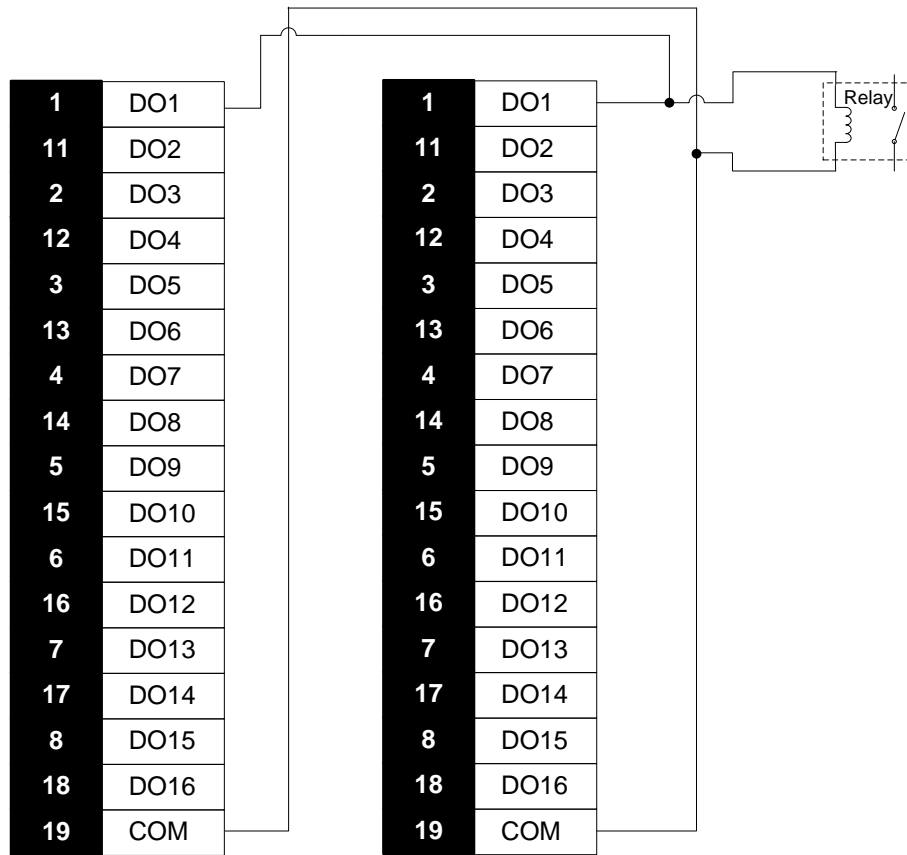


Figure 66 16 Channel Digital Output Redundancy Wiring Diagram

4.14.6 Safety Keying

Module Top	0	1	1	1
Base Top	1	0	0	0
Module Bottom	1	0	0	1
Base Bottom	0	1	1	0

Table 55 16 Channel Digital Output Safety Keying

4.14.7 Configurable Channel Parameters

▪ Predefined Value

This parameter is the value set to each channel on power-up of the module, e.g. “OFF” or “ON”.

This value is user defined and can be configured for each channel. This parameter can have the following values:

- OFF, ON

The factory default is “OFF” for this parameter.

- **Fail-safe Value**

This parameter enables the user to configure a value to be used when communication with the module fails. The user configurable options are:

- Last value – last known state of the channel
- Predefined value – the value is taken from the predefined parameter

The factory default is “Last value” for this parameter.

- **Type of Channel**

This parameter enables the user to configure the channel output type. The user configurable options are:

Discrete Output: The channel output will remain constant as the controller requires.

Single Pulse: When working in single pulse mode, “1” means starting one high level period. The period length is defined in the *Pulse Width* parameter; when the high level period time expires, the output will be kept low. “0” means canceling the last starting action; before starting the next single pulse, the canceling “0” is required.

Continuous Pulse: When working in continuous pulse mode, ‘1’ means starting a continuous pulse, the high and low period lengths of which are defined in *Pulse Width* parameter. ‘0’ means canceling the last starting action.

Note: *Single Pulse* and *Continuous Pulse* functions are not implemented under redundancy mode.

The factory default is “Discrete Output” for this parameter.

- **Pulse width (High and Low) of channel**

This parameter is used to define the *pulse width* in conjunction with the “*Type of channel*” parameter when the *Single Pulse* or *Continuous Pulse* option is set. The high width and low width are configured separately; the unit is 1ms. If the low width is set to 0, it will be forced to be equal to the high width. The user configurable parameters are:

- ◆ **0-255**

The factory default is “0” for this parameter. For *Single Pulse* and *Continuous Pulse*, “0” means the minimum width which is 1ms.

4.15 32 Channel Digital Output 24VDC Front-wiring

---MX603-0232-123

The MOX 603 32 Channel Digital Output module has 32 non-isolated 24VDC channel outputs. The module powered output channels of the module are used to switch relays and other low-power devices.

4.15.1 Familiarization

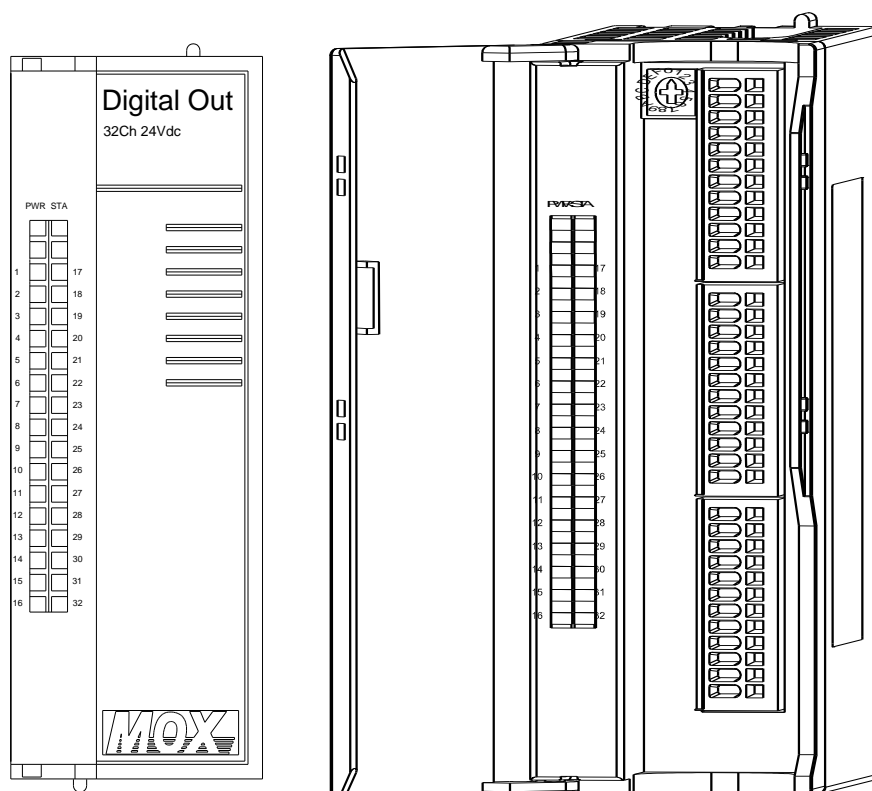


Figure 67 32 Channel Digital Output Familiarization

4.15.2 Datasheet

Output	
Number of channels	32
Maximum output current per channel	100mA
Maximum output voltage	24VDC
Off leakage current (@25°C)	<25uA
Configuration Parameters	
Predef value	OFF, ON
Fail-safe value of channel	Last Value, Predef Value
Type	Discrete Output, Single Pulse, Continuous Pulse
Pulse width (High, 1ms/unit)	User Definable
Pulse width (Low, 1ms/unit)	User Definable

Isolation	
Channel to system	2500Vrms
Environmental Conditions	
Operating temperature	-20 ~70 °C
Storage temperature	-40 ~85 °C
Relative humidity	5~95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.0W
Voltage for channels	24VDC (±10%)
Power dissipation within channels	<10.0W

Table 56 32 Channel Digital Output Datasheet

4.15.3 Equivalent Circuit Diagram

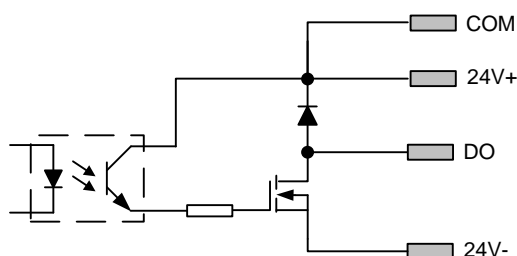


Figure 68 32 Channel Digital Output Equivalent Circuit Diagram

4.15.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
32	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 57 32 Channel Digital Output LED Definitions

4.15.5 Cabling Guide

The pins of 32 Channel Digital Output are located on the front of the module. Their definitions are shown below:

1	DO1	13	DO13	25	DO25
2	DO2	14	DO14	26	DO26
3	DO3	15	DO15	27	DO27
4	DO4	16	DO16	28	DO28
5	DO5	17	DO17	29	DO29
6	DO6	18	DO18	30	DO30
7	DO7	19	DO19	31	DO31
8	DO8	20	DO20	32	DO32
9	DO9	21	DO21	33	COM
10	DO10	22	DO22	34	COM
11	DO11	23	DO23	35	24V-
12	DO12	24	DO24	36	24V+

Figure 69 32 Channel Digital Output Pin Definitions

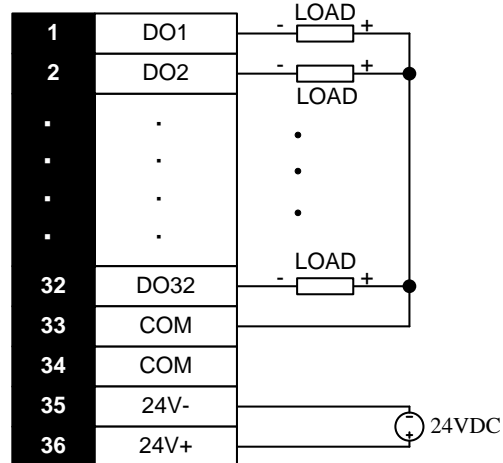


Figure 70 32 Channel Digital Output Cabling Diagram

The module adopts base MX603-2020-01.

4.15.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 58 32 Channel Digital Output Safety Keying

4.15.7 Configurable Channel Parameters

- **Predefined value**

This parameter is the value set to each channel on power-up of the module, e.g. “OFF” or “ON”.

This value is user defined and can be configured for each channel. This parameter can have the following values:

- OFF, ON

The factory default is “OFF” for this parameter.

- **Fail-safe value**

This parameter enables the user to configure a value to be used when communication with the module fails. The user configurable options are:

- Last value – last known state of the channel
- Predefined value – the value is taken from the predefined parameter

The factory default is “Last value” for this parameter.

- **Type of channel**

This parameter enables the user to configure the channel output type. The user configurable options are:

Discrete Output: The channel output will remain constant as the controller requires.

Single Pulse: When working in single pulse mode, “1” means starting one high level period. The period length is defined in the *Pulse Width* parameter. When the high level period time expires, the output will be kept low. “0” means canceling the last starting action; before starting the next single pulse, the canceling “0” is required.

Continuous Pulse: When working in continuous pulse mode, ‘1’ means starting a continuous pulse, the high and low period lengths of which are defined in *Pulse Width* parameter. ‘0’ means canceling the last starting action.

The factory default is “Discrete Output” for this parameter.

- **Pulse width (High and Low) of channel**

This parameter is used to define the *pulse width* in conjunction with the “*Type of channel*” parameter when the *Single Pulse* or *Continuous Pulse* option is set. The high width and low width are configured separately; the unit is 1ms. If the low width is set to 0, it will be forced to be equal to the high width. The user configurable parameters are:

- ◆ 0-255

The factory default is “0” for this parameter. For *Single Pulse* and *Continuous Pulse*, “0” means the minimum width which is 1ms.

4.16 8 Channel Analog Input 1-5VDC

---MX603-0308-423

The MOX 603 8 Channel Analog Input 1-5VDC module has 8 non-isolated 1-5VDC channel inputs.

4.16.1 Familiarization

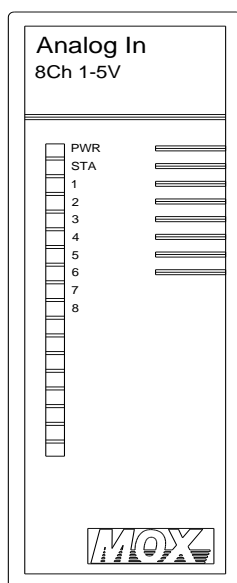


Figure 71 8 Channel Analog Input 1-5VDC Familiarization

4.16.2 Datasheet

Input	
Number of channels	8
Nominal signal range (span)	1-5VDC
Full signal range	0.2-5.5V
Line fault detection	<0.2V
Resolution of ADC chip	16bits
Input resistance	>1.8MΩ
Accuracy (@25°C)	± 5mV
Temperature stability (-20°C to +70°C)	± 0.006% of span per °C
Isolation	
Channel to system	1000Vrms
Configurable Parameters	
Primary or standby	Primary, Standby
Activate channel	Activate, Deactivate
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C

Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.1W
Voltage for channels	24VDC ($\pm 10\%$)
Power dissipation within channels	<0.5W

Table 59 8 Channel Analog Input 1-5VDC Datasheet

4.16.3 Equivalent Circuit Diagram

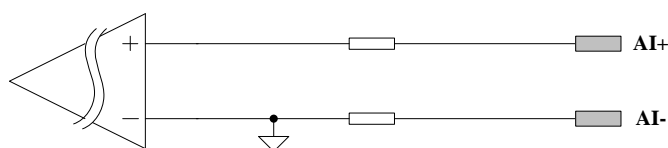


Figure 72 8 Channel Analog Input 1-5VDC Equivalent Circuit Diagram

4.16.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Green	ON	Channel is ON
		OFF	Channel is OFF
2	Green	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 60 8 Channel Analog Input 1-5V LED Definitions

4.16.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
AI1+	AI2+	AI3+	AI4+	AI5+	AI6+	AI7+	AI8+	24V+	24V-
11	12	13	14	15	16	17	18	19	20

AI1-	AI2-	AI3-	AI4-	AI5-	AI6-	AI7-	AI8-	COM	N/A
------	------	------	------	------	------	------	------	-----	-----

Table 61 8 Channel Analog Input 1-5V Pin Definitions

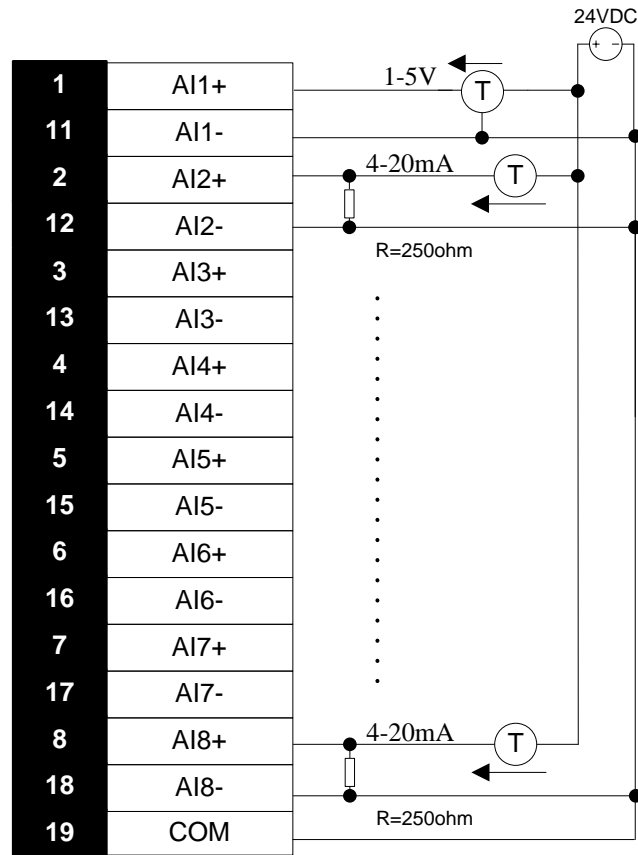


Figure 73 8 Channel Analog Input 1-5V Cabling Diagram

As an example, the following diagram shows a way to sample 4-20mA signals with two 8 Channel Analog Input 1-5V modules with the base of MX603-2023-01. With the help of the resistance, the sampled 4-20mA signals will be converted into 1-5V signals.

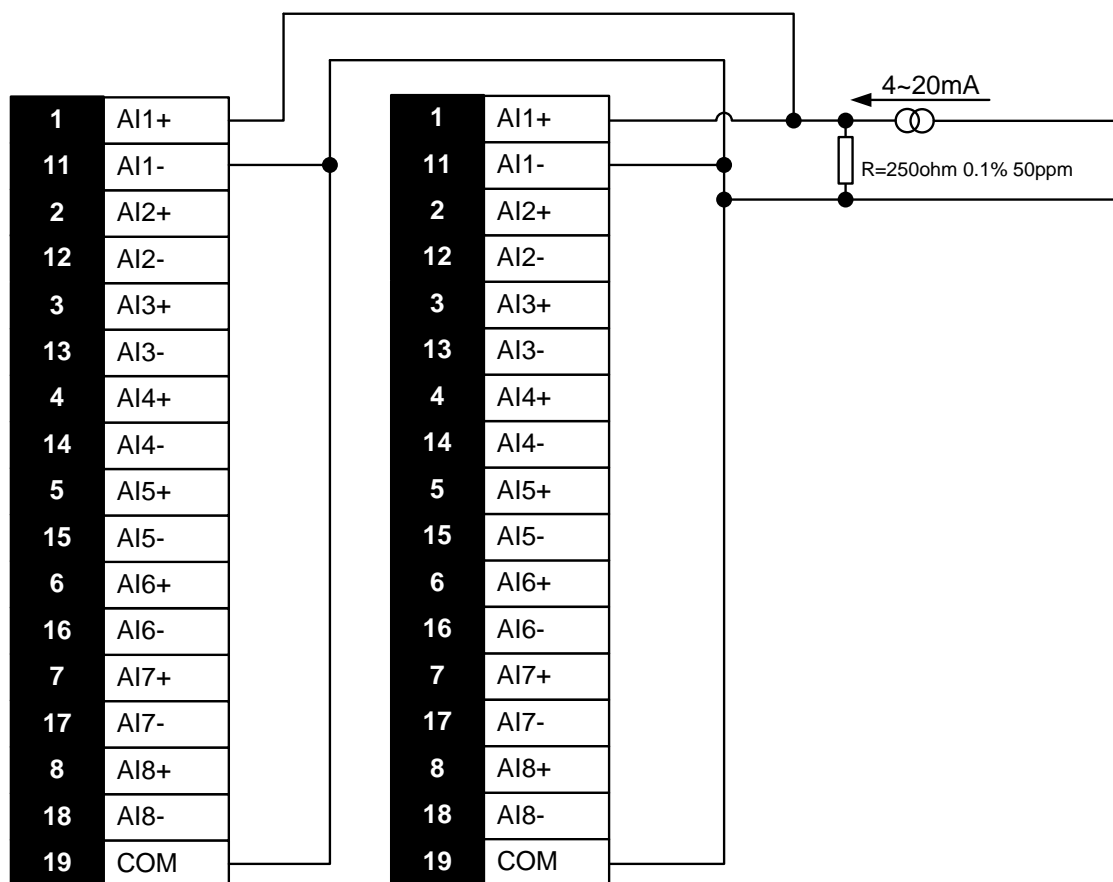


Figure 74 8 Channel Analog Input 1-5V Redundancy Wiring Diagram

4.16.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	0	1
Base Bottom	0	1	1	0

Table 62 8 Channel Analog Input 1-5V Safety Keying

4.16.7 Configurable Channel Parameters

▪ Activate Channel

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

▪ Filter Times

This value is the number of times the I/O module will sample the input before taking an average. This parameter is a way of smoothing the input from the field device.

The factory default is “0” for this parameter.

4.17 8 Channel Analog Input 4-20mA Isolated

---MX603-0308-613

The MOX 603 8 Channel Analog Input Isolated module supports 8 4-20mA individually isolated analog inputs.

4.17.1 Familiarization

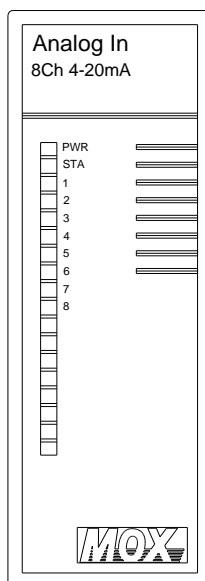


Figure 75 8 Channel Analog Input Isolated 4-20mA Familiarization

4.17.2 Datasheet

Input	
Number of channels	8
Nominal signal range (span)	4 to 20mA
Full signal range	0.5 to 22mA
Line fault detection	<0.5mA
Resolution of ADC chip	16bits
Input resistance (@20mA)	<300Ω
Accuracy (@25°C)	± 20μA
Temperature stability (-20°C to +70°C)	± 0.006% of span per °C
Isolation	
Channel to system	1000Vrms
Channel to channel	1000Vrms
Configurable Parameters	
Primary or standby	Primary, Standby
Activate channel	Activate, Deactivate
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C

Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.0W

Table 63 8 Channel Analog Input 4-20mA Isolated Datasheet

4.17.3 Equivalent Circuit Diagram

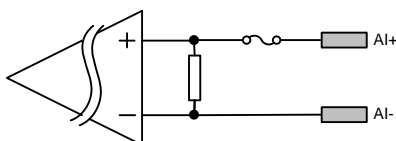


Figure 76 8 Channel Analog Input 4-20mA Isolated Equivalent Circuit Diagram

4.17.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 64 8 Channel Analog Input 4-20mA Isolated LED Definitions

4.17.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
AI1+	AI2+	AI3+	AI4+	AI5+	AI6+	AI7+	AI8+	N/A	N/A
11	12	13	14	15	16	17	18	19	20

AI1-	AI2-	AI3-	AI4-	AI5-	AI6-	AI7-	AI8-	N/A	N/A
------	------	------	------	------	------	------	------	-----	-----

Table 65 8 Channel Analog Input 4-20mA Isolated Pin Definitions

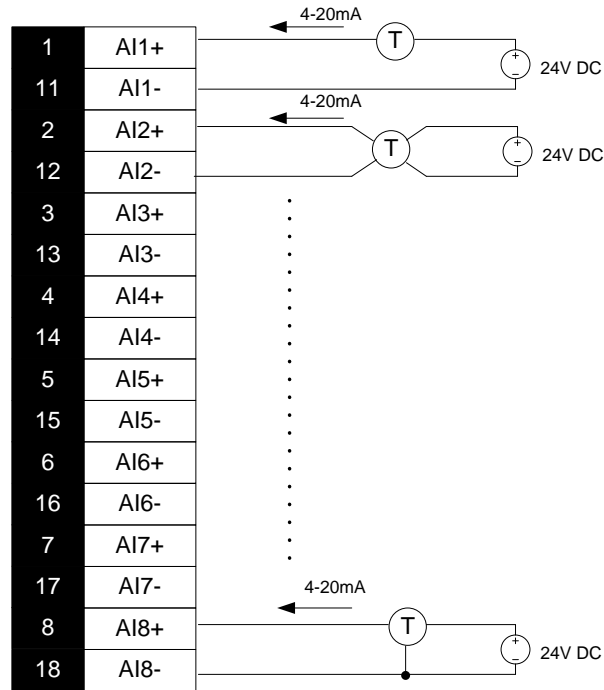


Figure 77 8 Channel Analog Input 4-20mA Isolated Wiring Diagram

This module samples current signals and supports limited redundancy function - the redundancy AI channels should NOT be wired in serial mode in one current loop. That is to say, two independent current loops for one site point are needed for the redundancy operation.

For applications with the base MX603-2023-01, please refer to the following figure to wire two 8 Channel Analog Input 4-20mA Isolated modules for redundancy application.

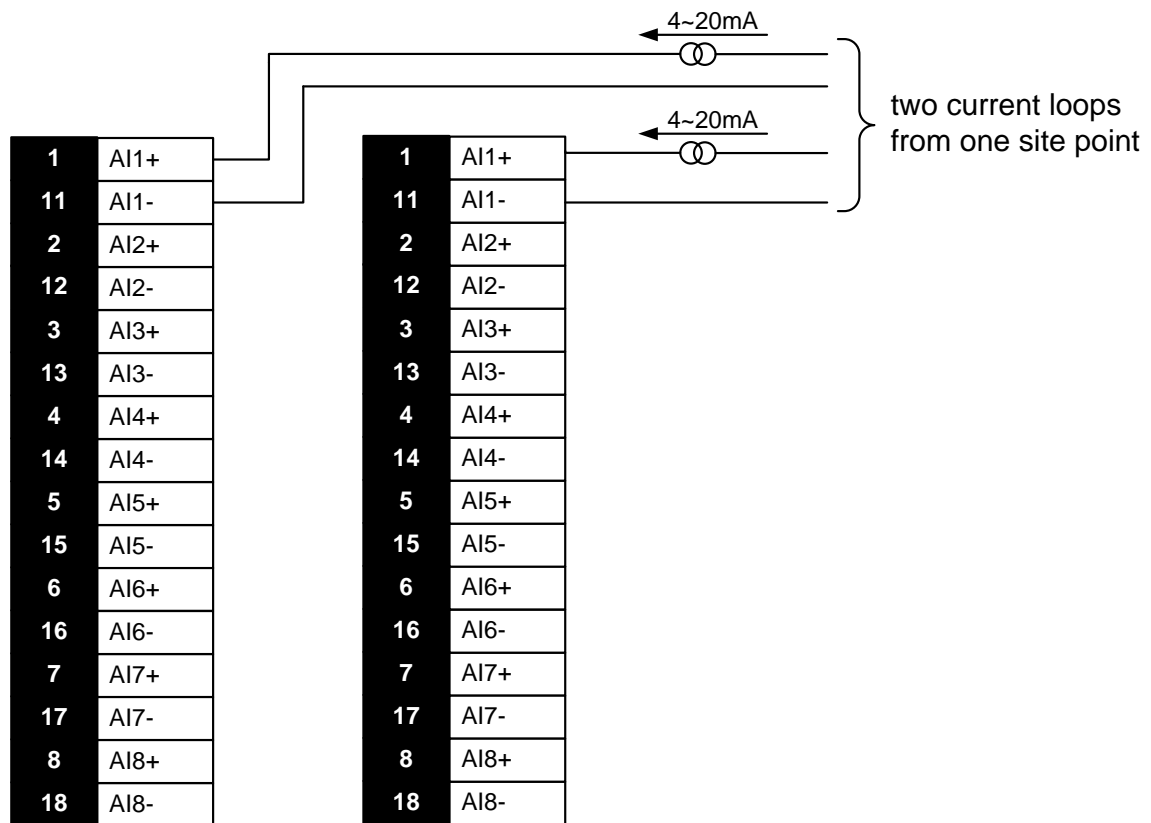


Figure 78 8 Channel Analog Input 4-20mA Isolated Redundancy Wiring Diagram

4.17.6 Safety Keying

Module Top	0	0	1	1
Base Top	1	1	0	0
Module Bottom	1	1	1	0
Base Bottom	0	0	0	1

Table 66 8 Channel Analog Input 4-20mA Isolated Safety Keying

4.17.7 Configurable Channel Parameters

▪ Activate Channel

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

▪ Filter Times

This value is the number of times the controller will sample the input before taking an average. This value is user definable. And this parameter is a way of smoothing the input from the field device.

The factory default is "0" for this parameter.

4.18 8 Channel Analog Input 4-20mA Module Power

---MX603-0308-633

The MOX 603 8 Channel Analog Input module has 8 non-isolated 4-20mA inputs. The channels are module powered.

4.18.1 Familiarization

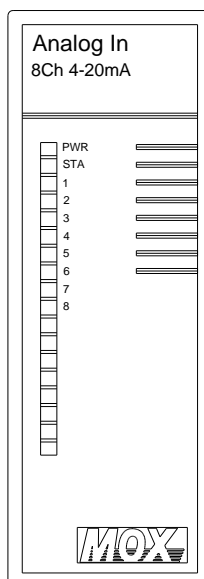


Figure 79 8 Channel Analog Input 4-20mA Module Power Familiarization

4.18.2 Datasheet

Input	
Number of channels	8
Nominal signal range (span)	4-20mA
Full signal range	0.5-22mA
Line fault detection	<0.5mA
Resolution of ADC chip	16bits
Input resistance (@20mA)	<300Ω
Accuracy (@25°C)	± 20μA
Temperature stability (-20°C to +70°C)	± 0.006% of span per °C
Isolation	
Channel to system	1000Vrms
Configurable Parameters	
Primary or standby	Primary, Standby
Activate channel	Activate, Deactivate
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing

Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.0W
Voltage for channels	24VDC ($\pm 10\%$)
Power dissipation within channels	<8.5W

Table 67 8 Channel Analog Input 4-20mA Module Power Datasheet

4.18.3 Equivalent Circuit Diagram

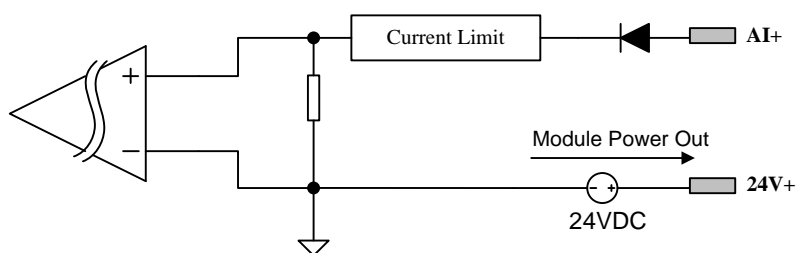


Figure 80 8 Channel Analog Input 4-20mA Module Power Equivalent Circuit Diagram

4.18.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 68 8 Channel Analog Input 4-20mA Module Power LED Definitions

4.18.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
AI1+	AI2+	AI3+	AI4+	AI5+	AI6+	AI7+	AI8+	24V+	24V-
11	12	13	14	15	16	17	18	19	20
24V+	24V+	24V+	24V+	24V+	24V+	24V+	24V+	N/A	N/A

Table 69 8 Channel Analog Input 4-20mA Module Power Pin Definitions

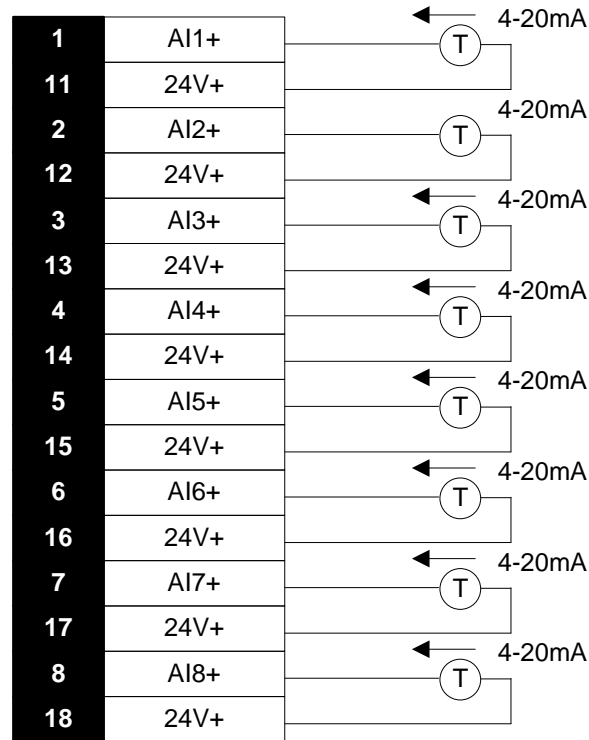


Figure 81 8 Channel Analog Input 4-20mA Module Power Cabling Diagram

This module samples current signals and supports limited redundancy function - the redundancy AI channels should NOT be wired in serial mode in one current loop. That is to say, two independent current loops for one site point are needed for the redundancy operation.

The following diagram shows a way to wire two 8 Channel Analog Input 4-20mA Module Power modules with the base of MX603-2023-01.

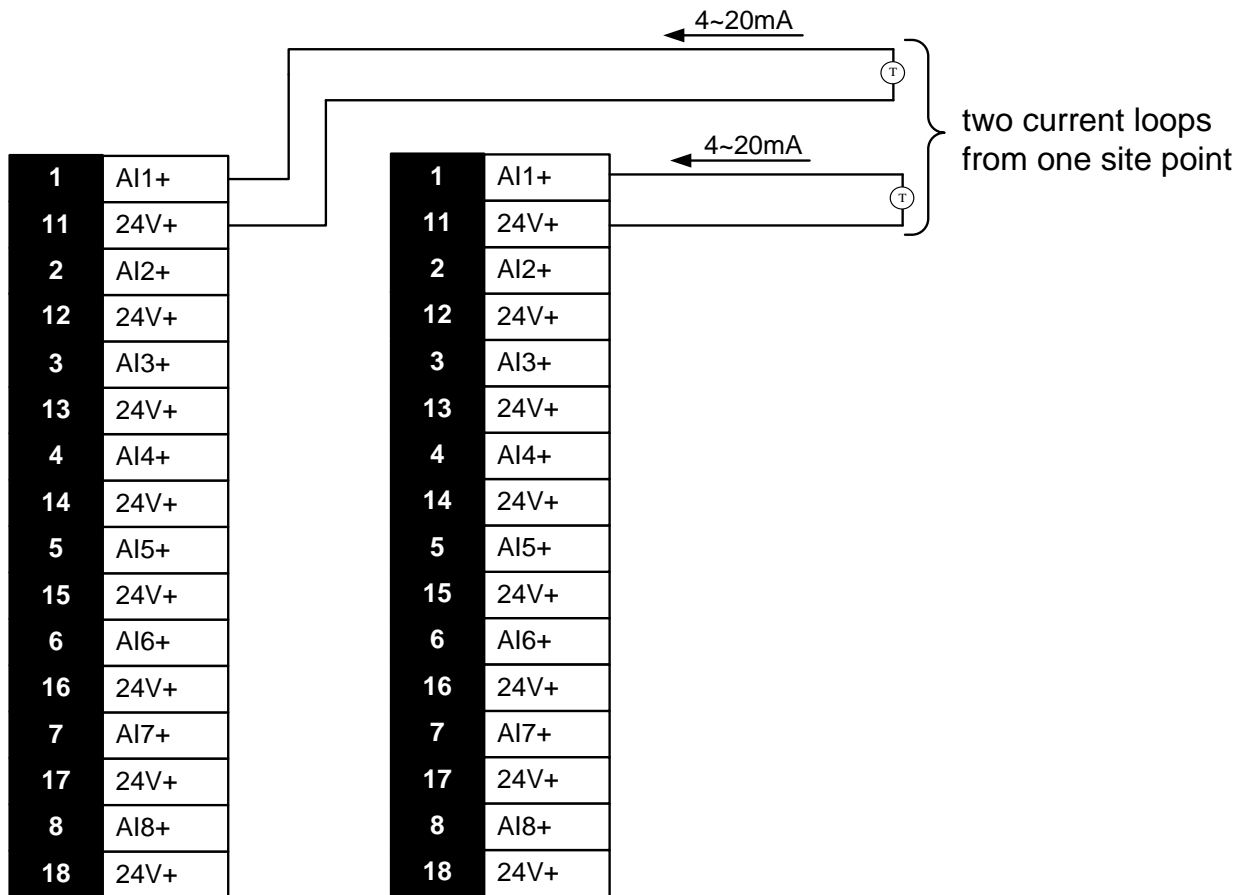


Figure 82 8 Channel Analog Input 4-20mA Module Power Redundancy Wiring Diagram

4.18.6 Safety Keying

Module Top	0	1	1	1
Base Top	1	0	0	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 70 8 Channel Analog Input 4-20mA Module Power Safety Keying

4.18.7 Configurable Channel Parameters

▪ Activate Channel

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

▪ Filter Times

This value is the number of times the controller will sample the input before taking an average. This value is user definable. This parameter is a way of smoothing the input from the field device.

The factory default is “0” for this parameter.

4.19 8 Channel Analog Input 4-20mA

---MX603-0308-643

The MOX 603 8 Channel Analog Input module has 8 non-isolated 4-20mA channel inputs.

4.19.1 Familiarization

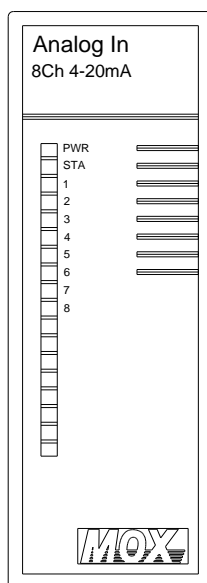


Figure 83 8 Channel Analog Input 4-20mA Familiarization

4.19.2 Datasheet

Input	
Number of channels	8
Nominal signal range (span)	4-20mA
Full signal range	0.5-22mA
Line fault detection	<0.5mA
Resolution of ADC chip	16bits
Input resistance (@20mA)	<300Ω
Accuracy (@25°C)	± 20μA
Temperature stability (-20°C to +70°C)	± 0.006% of span per °C
Isolation	
Channel to system	1000Vrms
Configurable Parameters	
Primary or standby	Primary, Standby
Activate channel	Activate, Deactivate
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C

Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<0.9W
Voltage for channels	24VDC ($\pm 10\%$)
Power dissipation within channels	<1.0W

Table 71 8 Channel Analog Input 4-20mA Datasheet

4.19.3 Equivalent Circuit Diagram

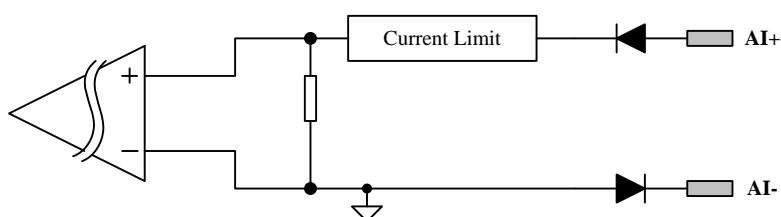


Figure 84 8 Channel Analog Input 4-20mA Equivalent Circuit Diagram

4.19.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
			Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 72 8 Channel Analog Input 4-20mA LED Definitions

4.19.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
AI1+	AI2+	AI3+	AI4+	AI5+	AI6+	AI7+	AI8+	24V+	24V-
11	12	13	14	15	16	17	18	19	20
AI1-	AI2-	AI3-	AI4-	AI5-	AI6-	AI7-	AI8-	COM	N/A

Table 73 8 Channel Analog Input 4-20mA Pin Definitions

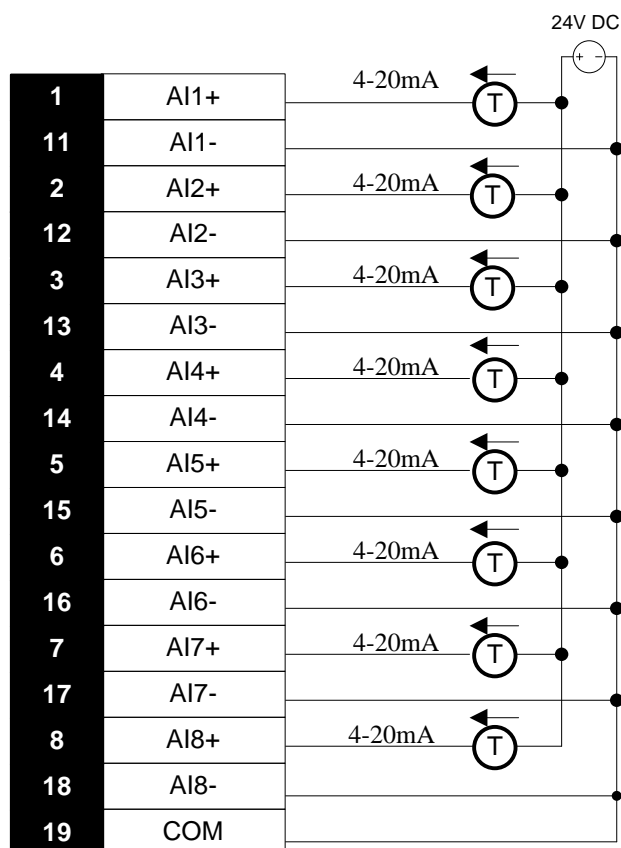


Figure 85 8 Channel Analog Input 4-20mA Wiring Diagram

This module samples current signals and supports limited redundancy function - the redundancy AI channels should NOT be wired in serial mode in one current loop. That is to say, two independent current loops for one site point are needed for redundancy operation.

The following diagram shows a way to wire two 8 Channel Analog Input 4-20mA modules in rack redundancy application with the base of MX603-2023-01.

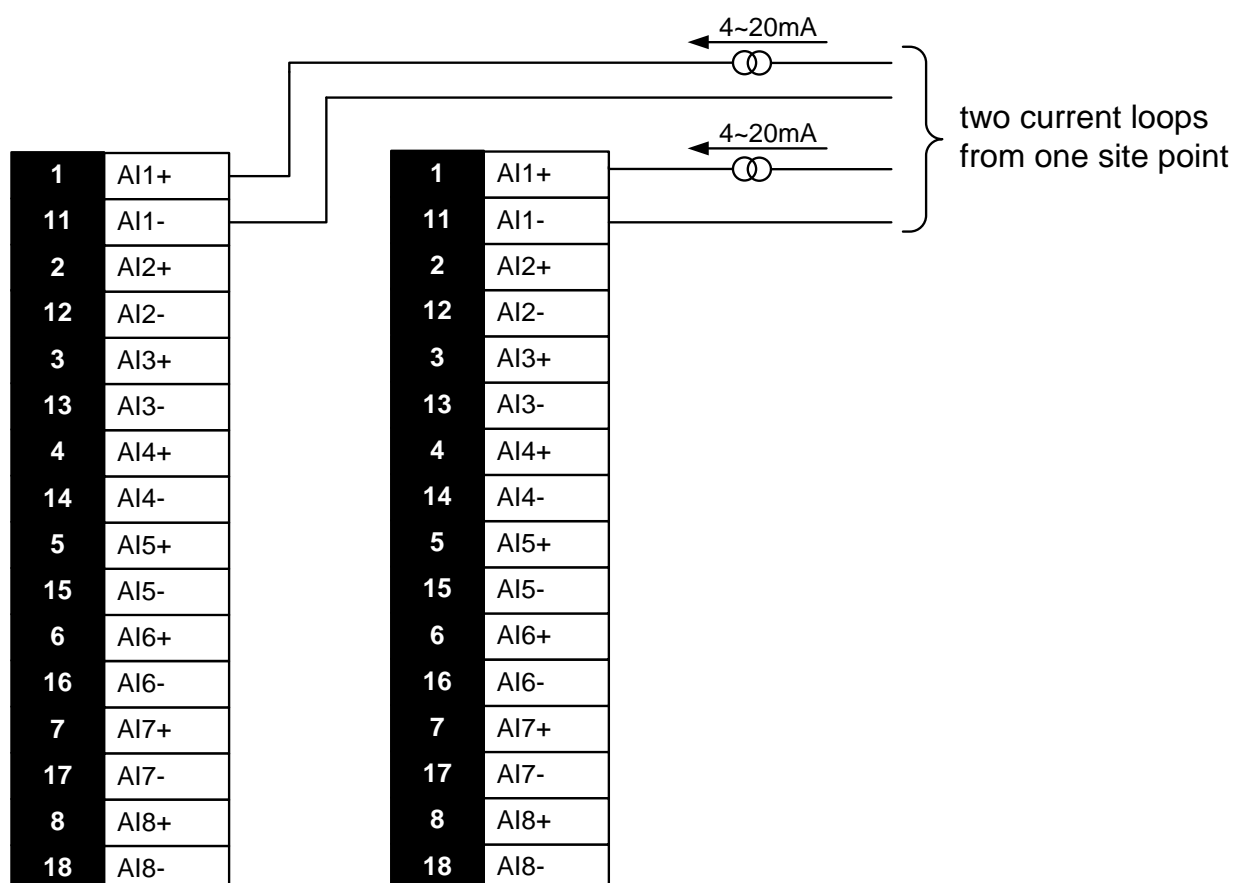


Figure 86 8 Channel Analog Input 4-20mA Redundancy Wiring Diagram

4.19.6 Safety Keying

Module Top	1	0	1	1
Base Top	0	1	0	0
Module Bottom	1	0	0	1
Base Bottom	0	1	1	0

Table 74 8 Channel Analog Input 4-20mA Safety Keying

4.19.7 Configurable Channel Parameters

▪ Activate Channel

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

▪ Filter Times

This value is the number of times the controller will sample the input before taking an average. This value is user definable. This parameter is a way of smoothing the input from the field device.

The factory default is "0" for this parameter.

4.20 12 Channel Analog Input 4-20mA Front-wiring

---MX603-0312-113

The MOX 603 12 Channel Analog Input 4-20mA module is a front wiring module. It has 12 analog 4-20mA current inputs.

4.20.1 Familiarization

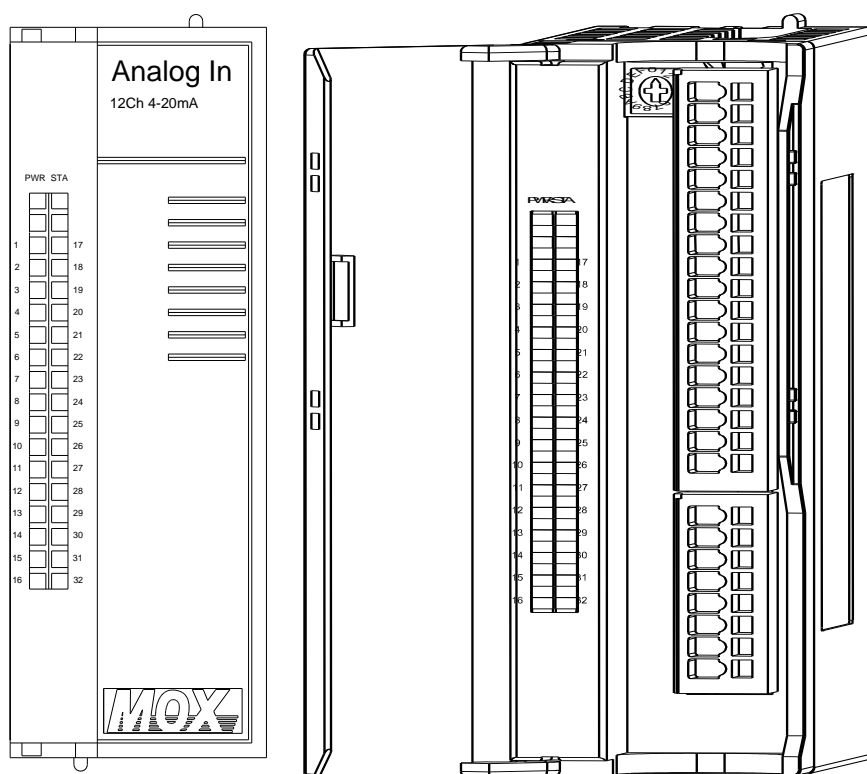


Figure 87 12 Channel Analog Input 4-20mA Familiarization

4.20.2 Datasheet

Input	
Number of channels	12
Nominal signal range (span)	4-20mA
Full signal range	0.5-22mA
Line fault detection	<0.5mA
Resolution of ADC chip	24bits
Input resistance (@20mA)	<200Ω
Accuracy (@25 °C)	± 20μA
Temperature stability (-20°C to +70°C)	± 0.006% of span per °C
Isolation	
Channel to system	1000Vrms

Permissible potential difference between channels	<400VDC
Configurable Parameters	
Activate channel	Activate, Deactivate
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.6W

Table 75 12 Channel Analog Input 4-20mA Datasheet

4.20.3 Equivalent Circuit Diagram

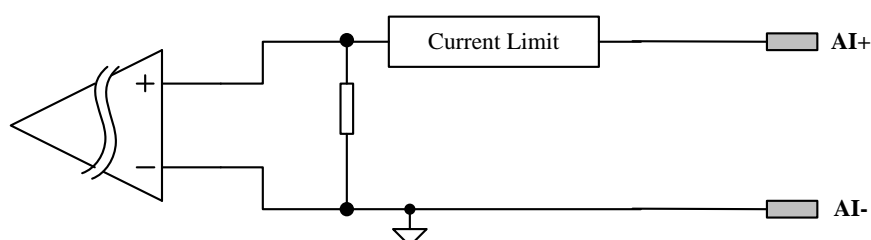


Figure 88 12 Channel Analog Input 4-20mA Equivalent Circuit Diagram

4.20.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
12	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 76 12 Channel Analog Input 4-20mA LED Definitions

4.20.5 Cabling Guide

The pins of 12 Channel Analog Input 4-20mA are located on the front of the module. Their definitions are shown below:

1		N/A		
2		N/A		
3		AI1+		
4		AI1-		
5		AI2+		
6		AI2-		
7		AI3+		
8		AI3-		
9		AI4+		
10		AI4-		
11		AI5+		
12		AI5-		
13		AI6+		
14		AI6-		
15		AI7+		
16		AI7-		
17		AI8+		
18		AI8-		
			19	
			20	
			21	
			22	
			23	
			24	
			25	
			26	
				AI9+
				AI9-
				AI10+
				AI10-
				AI11+
				AI11-
				AI12+
				AI12-

Figure 89 12 Channel Analog Input 4-20mA Pin Definitions

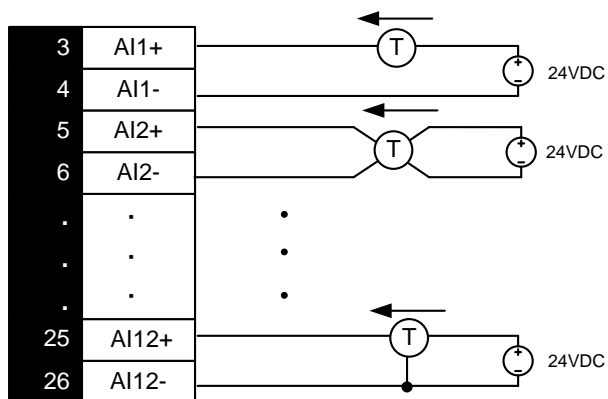


Figure 90 12 Channel Analog Input 4-20mA Wiring Diagram

The module adopts base MX603-2020-01.

4.20.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 77 12 Channel Analog Input 4-20mA Safety Keying

4.20.7 *Configurable Channel Parameters*

- ***Activate Channel***

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- ***Filter Times***

This value is the number of times the controller will sample the input before taking an average. This value is user definable. This parameter is a way of smoothing the input from the field device.

The factory set default is “0” for this parameter.

4.21 12 Channel Analog Input 1-5VDC Front-wiring

---MX603-0312-123

The MOX 603 12 Channel Analog Input 1-5VDC module is a front wiring module. It has 12 analog 1-5VDC inputs. This module provides over voltage protection. It also has the function of filtering and data processing of the input signal.

4.21.1 Familiarization

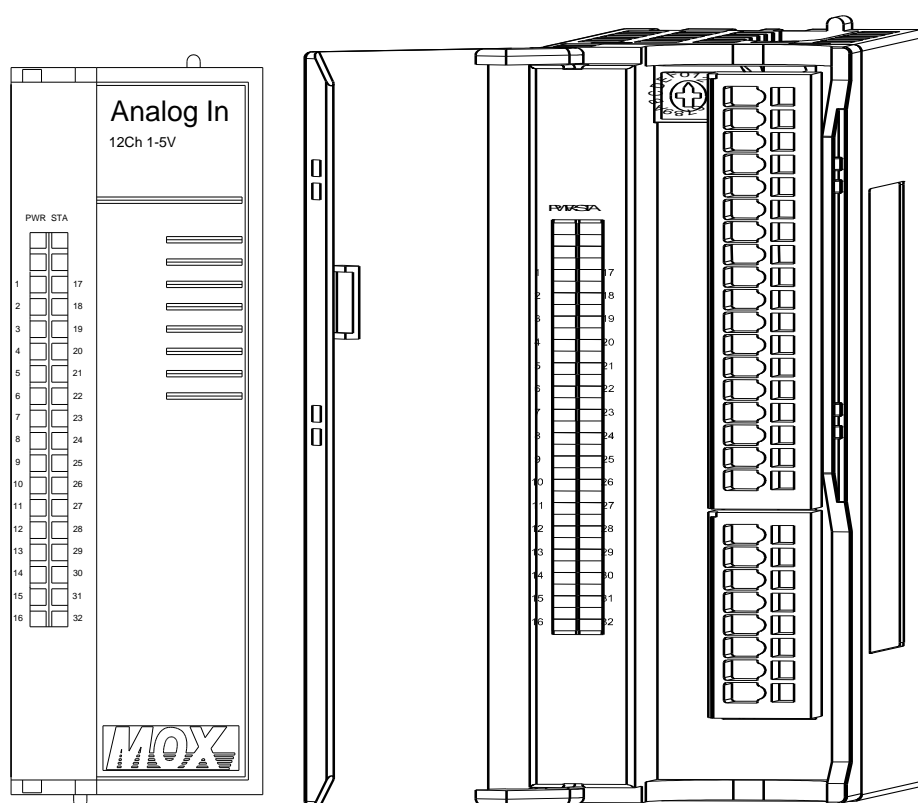


Figure 91 12 Channel Analog Input 1-5V Familiarization

4.21.2 Datasheet

Input	
Number of channels	12
Nominal signal range (span)	1-5VDC
Full signal range	0.2-5.5V
Line fault detection	<0.2V
Resolution of ADC chip	24bits
Input resistance	>1MΩ
Accuracy (@25°C)	± 5mV
Temperature stability (-20°C to +70°C)	± 0.006% of span per °C
Isolation	
Channel to system	1000Vrms
Permissible potential difference between channels	<400VDC

Configurable Parameters	
Activate channel	Activate, Deactivate
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.6W

Table 78 12 Channel Analog Input 1-5V Datasheet

4.21.3 Equivalent Circuit Diagram

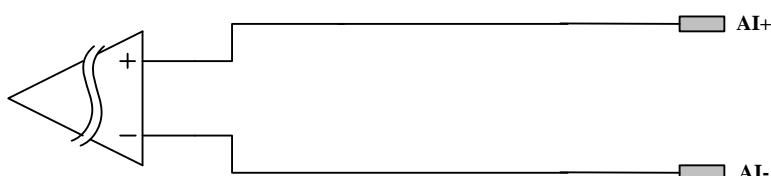


Figure 92 12 Channel Analog Input 1-5V Equivalent Circuit Diagram

4.21.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
12	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 79 12 Channel Analog Input 1-5V LED Definitions

4.21.5 Cabling Guide

The pins of 12 Channel Analog Input 1-5V are located on the front of the module. Their definitions are shown below:

1		N/A			
2		N/A			
3		AI1+			
4		AI1-			
5		AI2+			
6		AI2-			
7		AI3+			
8		AI3-			
9		AI4+			
10		AI4-			
11		AI5+			
12		AI5-			
13		AI6+			
14		AI6-			
15		AI7+			
16		AI7-			
17		AI8+			
18		AI8-			
			19		AI9+
			20		AI9-
			21		AI10+
			22		AI10-
			23		AI11+
			24		AI11-
			25		AI12+
			26		AI12-

Figure 93 12 Channel Analog Input 1-5V Pin Definitions

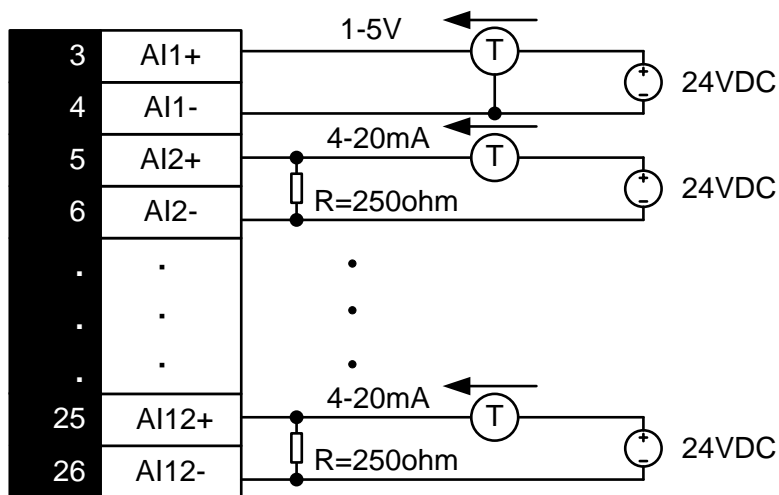


Figure 94 12 Channel Analog Input 1-5V Wiring Diagram

The module adopts base MX603-2020-01.

4.21.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 80 12 Channel Analog Input 1-5V Safety Keying

4.21.7 *Configurable Channel Parameters*

- ***Activate Channel***

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- ***Filter Times***

This value is the number of times the controller will sample the input before taking an average. This value is user definable. This parameter is a way of smoothing the input from the field device.

The factory set default is “0” for this parameter.

4.22 12 Channel Analog Input 4-20mA Front-wiring

---MX603-0312-133

This MOX 603 12 Channel Analog Input 4-20mA module is a front wiring module. It has 12 analog 4-20mA input channels and can connect to 2-wire, 3-wire or 4-wire transducers.

These channels are divided into 3 groups, with 4 channels of each group. Each group is isolated from each other.

The module adopts base MX603-2020-01.

4.22.1 Familiarization

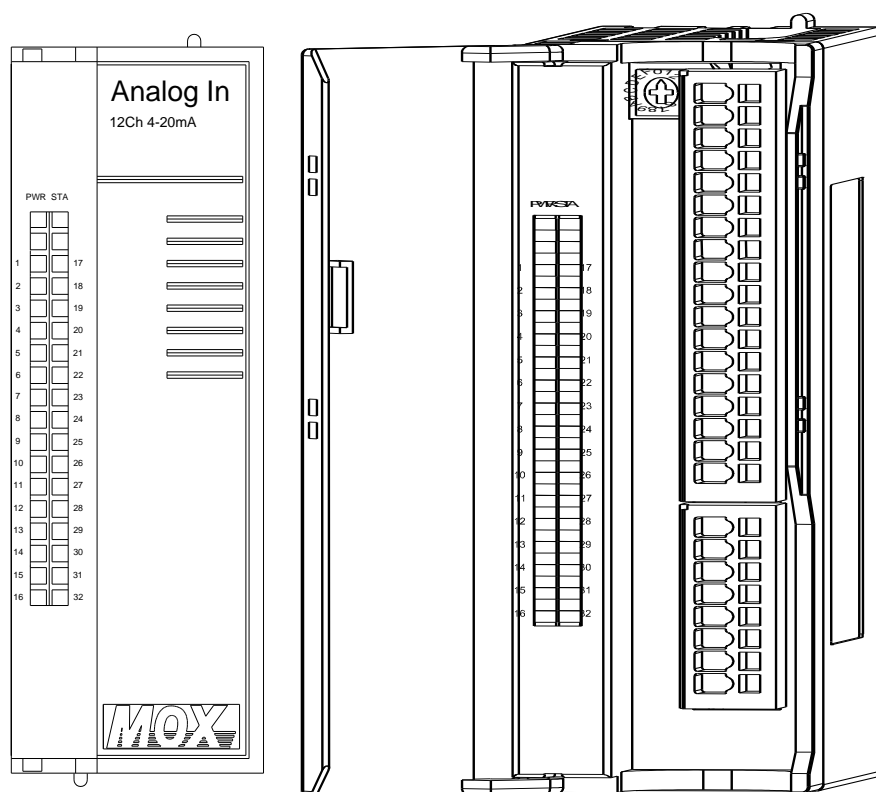


Figure 95 12 Channel Analog Input 4-20mA Familiarization

4.22.2 Datasheet

Input	
Number of channels	12
Number of channel groups	3
Channels of each group	4
Nominal signal range (span)	4 – 20mA
Full signal range	0.5 – 22mA
Line fault detection	<0.5mA
Resolution of ADC chip	24bits
Input resistance	<200Ω
Load of 2-wire instrument	<750Ω

Accuracy (@25°C)	± 20µA
Temperature stability (-20°C to +70°C)	± 0.006% of span per °C
Isolation	
Channel to system	1000Vrms
Channel group to channel group	1000Vrms
Over Input Protection	
Maximum input	30VDC
Configurable Parameters	
Activate channel	Activate, Deactivate
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.6W
Voltage for channels	24VDC (±10%)
Power dissipation within each channel group	<2W

Table 81 12 Channel Analog Input 4-20mA Datasheet

*Only for 2-wire transducer and powered by the module internally

4.22.3 Equivalent Circuit Diagram

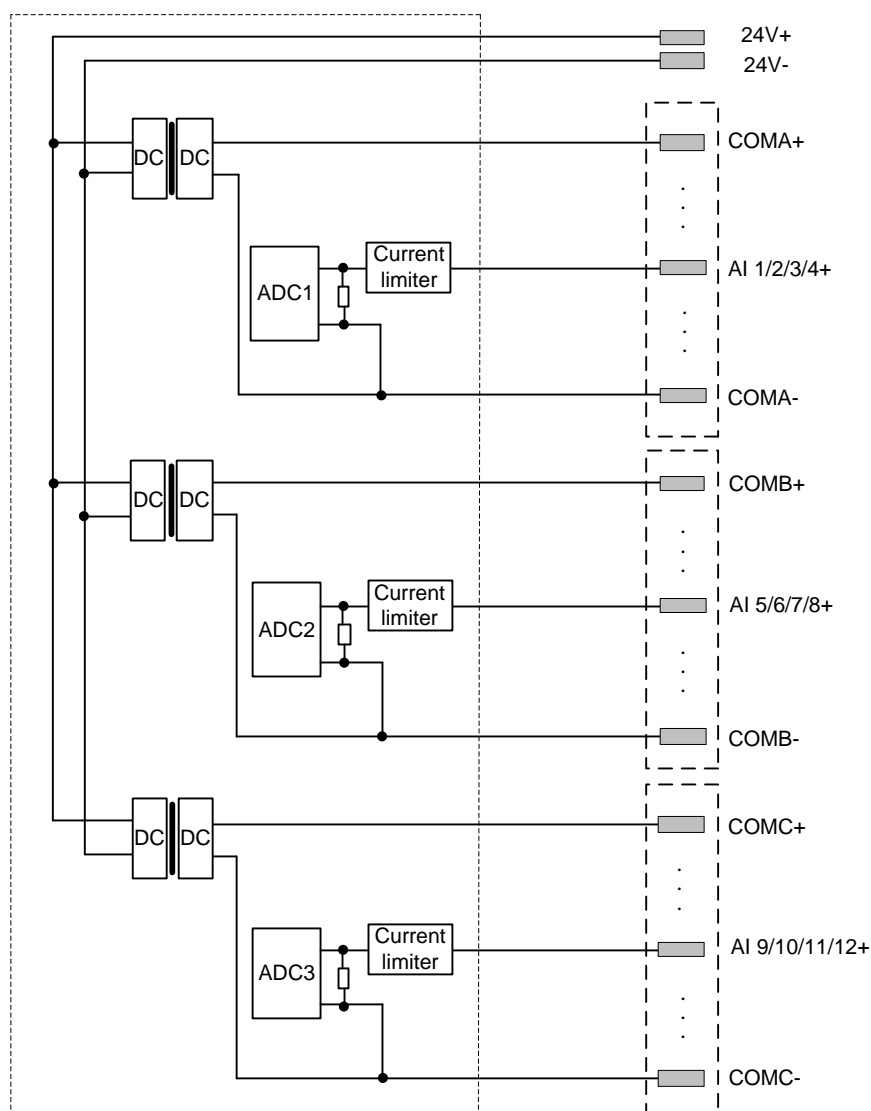


Figure 96 12 Channel Analog Input 4-20mA Equivalent Circuit Diagram

4.22.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Orange	ON	Channel is ON
		OFF	Channel is OFF

2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
12	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 82 12 Channel Analog Input 4-20mA LED Definitions

4.22.5 Cabling Guide

The pins of 12 Channel Analog Input 4-20mA are located on the front of the module. Their definitions are shown below:

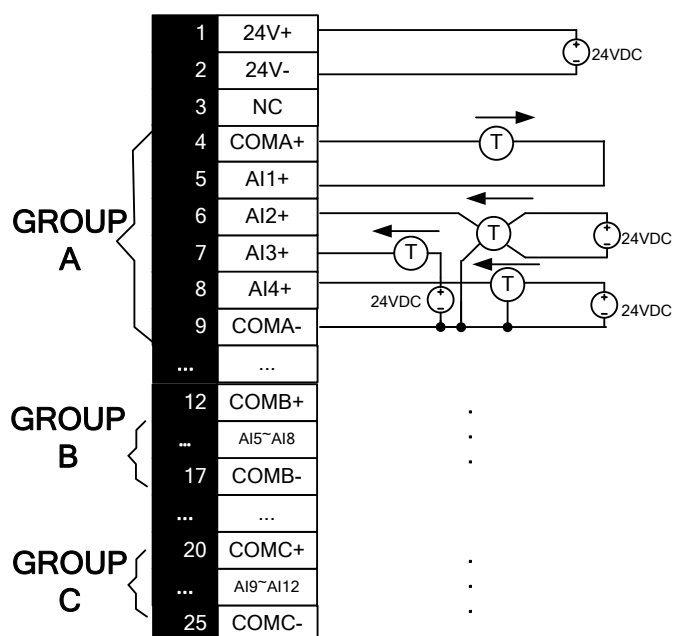


Figure 97 12 Channel Analog Input 4-20mA Pin Definitions

Each of the 12 channels is allowed to connect with a 2-wire, 3-wire or 4-wire transducer.

If any 2-wire transducer connected needs to be powered by the module internally, make sure to connect a 24VDC power to pin 1 and 2. Otherwise, leave these two pins unconnected.

As illustrated in the figure above, the AI1+ is connected with a 2-wire transducer powered from the module internally; AI2+ is connected with a 4-wire transducer; AI3+ is connected with a 2-wire transducer powered externally; AI4+ is connected with a 3-wire transducer.

4.22.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0

Base Bottom	0	1	0	1
-------------	---	---	---	---

Table 83 12 Channel Analog Input 4-20mA Safety Keying

4.22.7 Configurable Channel Parameters

- **Activate Channel**

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- **Filter Times**

This value is the number of times the controller will sample the input before taking an average. This value is user definable. This parameter is a way of smoothing the input from the field device.

The factory set default is “0” for this parameter.

4.23 12 Channel Analog Input 1-5VDC Front-wiring

---MX603-0312-143

The MOX 603 12 Channel Analog Input 1-5VDC module is a front wiring module. It has 12 analog 1-5VDC inputs. These channels are divided into 3 groups, with 4 channels of each group. Each group is isolated from each other.

The module adopts base MX603-2020-01.

4.23.1 Familiarization

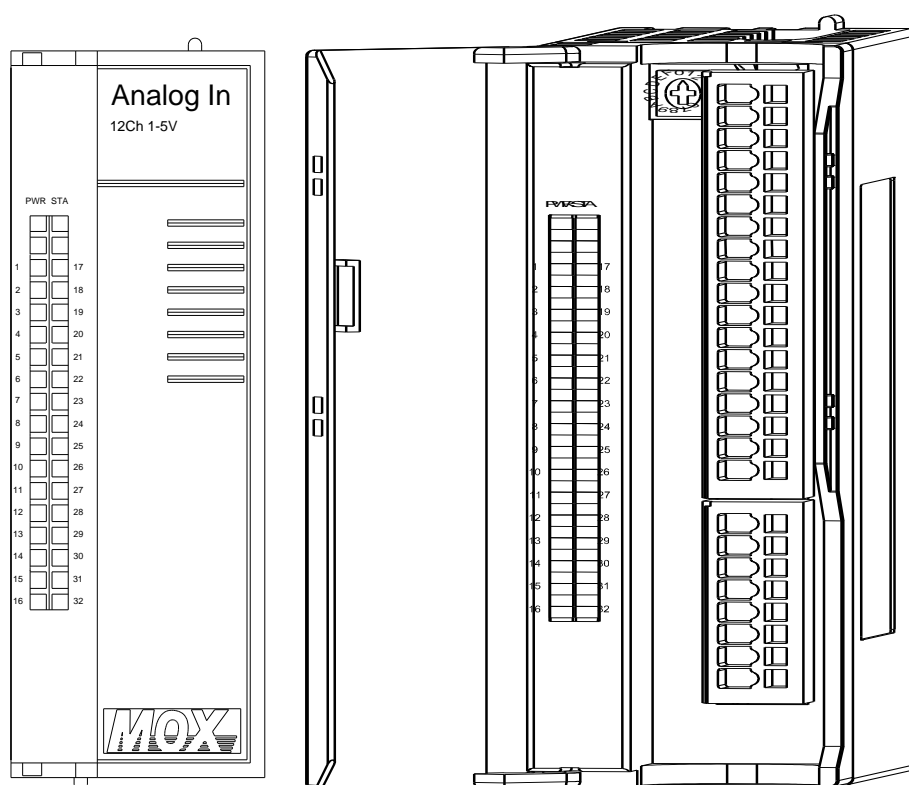


Figure 98 12 Channel Analog Input 1-5V Familiarization

4.23.2 Datasheet

Input	
Number of channels	12
Number of channel groups	3
Channels of each group	4
Nominal signal range (span)	1-5VDC
Full signal range	0.2-5.5VDC
Line fault detection	<0.2V
Resolution of ADC chip	24bits
Input resistance	>100KΩ

Load of 2-wire instrument	<750Ω
Accuracy (@25°C)	± 5mV
Temperature stability (-20°C to +70°C)	± 0.0007% of span per °C
Isolation	
Channel to system	1000Vrms
Channel group to channel group	1000Vrms
Configurable Parameters	
Activate channel	Activate, Deactivate
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.6W
Voltage for channels*	24VDC (±10%)
Power dissipation within each channel group	<2W

Table 84 12 Channel Analog Input 1-5V Datasheet

*Only for 2-wire transducer and powered by the module internally

4.23.3 Equivalent Circuit Diagram

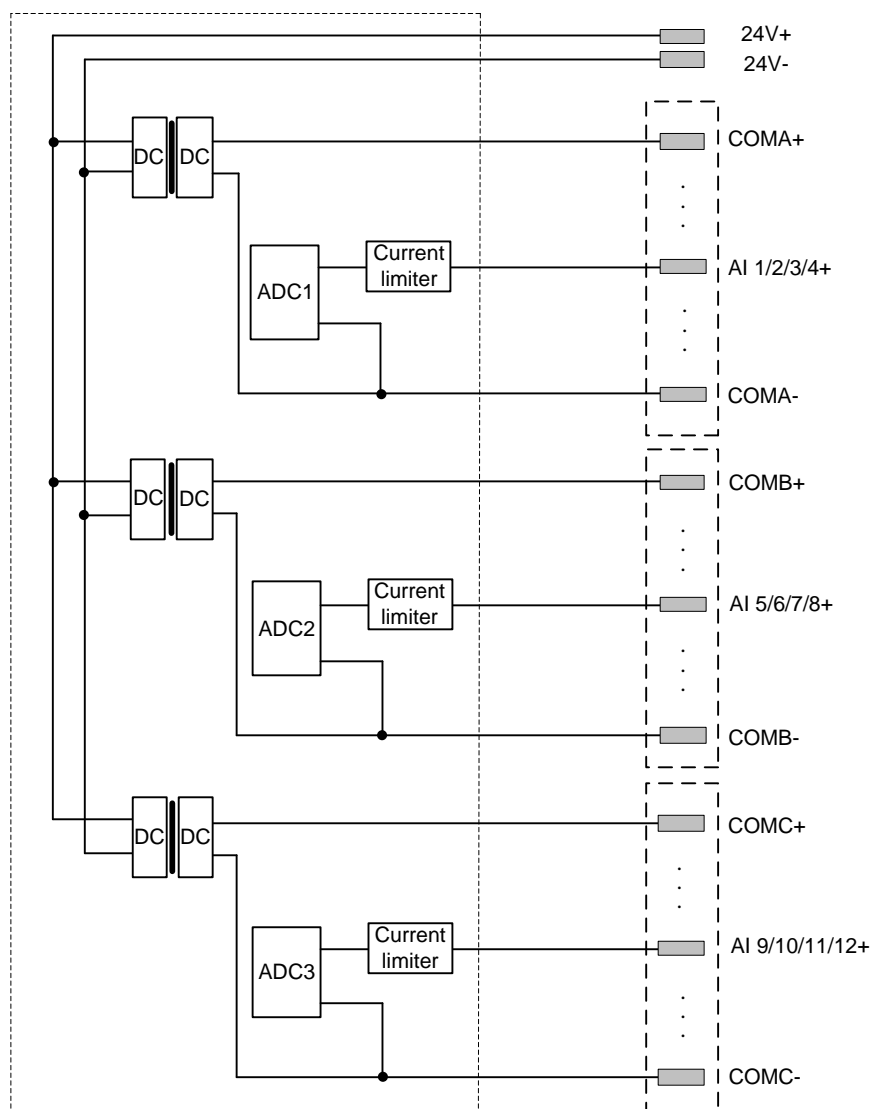


Figure 99 12 Channel Analog Input 1-5V Equivalent Circuit Diagram

4.23.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted

		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
12	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 85 12 Channel Analog Input 1-5V LED Definitions

4.23.5 Cabling Guide

The pins of 12 Channel Analog Input 1-5V are located on the front of the module. Their definitions are shown below:

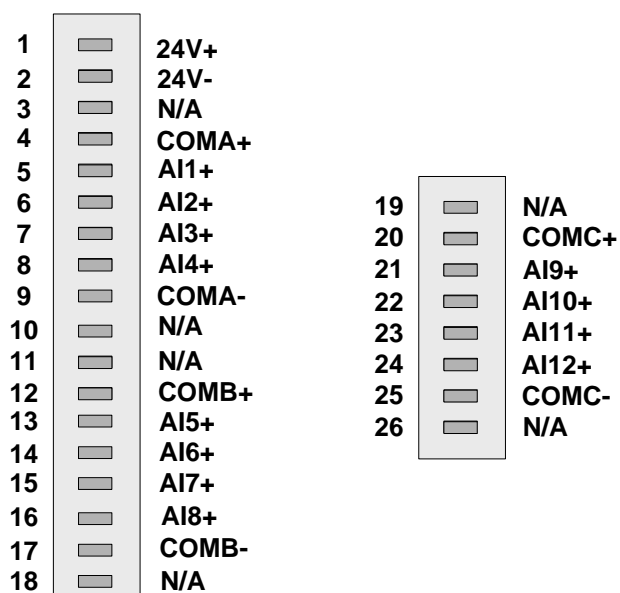


Figure 100 12 Channel Analog Input 1-5V Pin Definitions

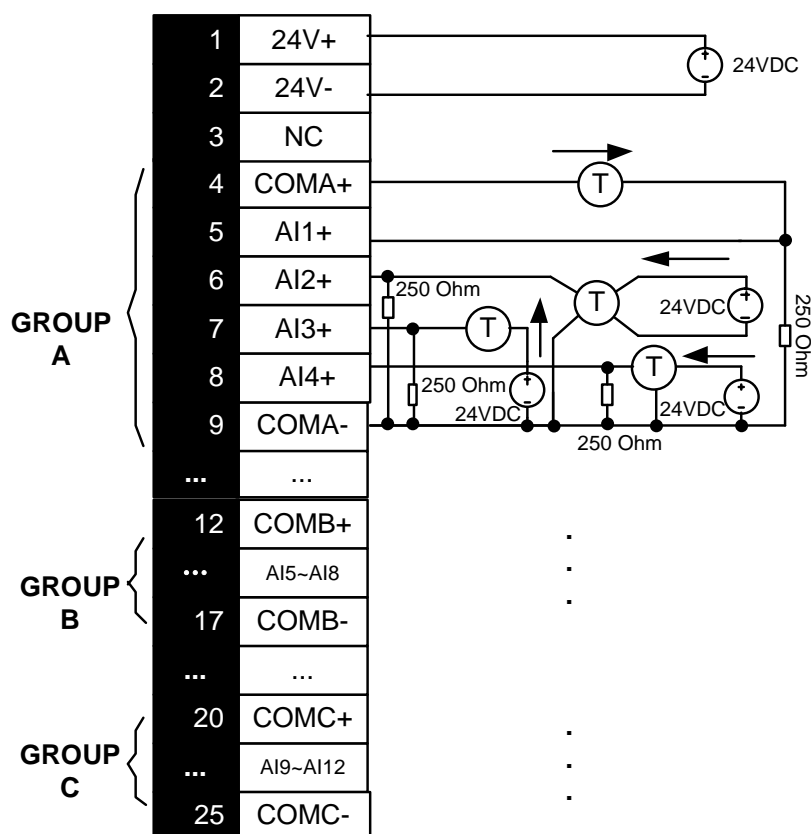


Figure 101 12 Channel Analog Input 1-5V Wiring Diagram

The 12 channels are divided into 3 groups. Each of the 12 channels is allowed to connect with a 2-wire, 3-wire or 4-wire transducer.

Each group has its own COM- and COM+ terminals. They are isolated by DC/DC isolators. It is forbidden to connect the COM+ or COMX- terminals from different groups.

If any 2-wire transducer connected needs to be powered by the module internally, make sure to connect a 24VDC power to pin 1 and 2. Otherwise, leave these two pins unconnected.

As illustrated in the figure above, the AI1+ is connected with a 2-wire transducer powered from the module internally; AI2+ is connected with a 4-wire transducer; AI3+ is connected with a 2-wire transducer powered externally; AI4+ is connected with a 3-wire transducer.

4.23.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 86 12 Channel Analog Input 1-5V Safety Keying

4.23.7 Configurable Channel Parameters

- ***Activate Channel***

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- ***Filter Times***

This value is the number of times the controller will sample the input before taking an average. This value is user definable. This parameter is a way of smoothing the input from the field device.

The factory set default is “0” for this parameter.

4.24 8 Channel TC

---MX603-0508-813

The MOX 603 8 Channel Thermal Couple (TC) input or mV input Module has the capability of sampling analog mV signal inputs and converting them into digital format, detecting a sensor break on individual input channel as well as filtering and data processing of the input signal.

4.24.1 Familiarization

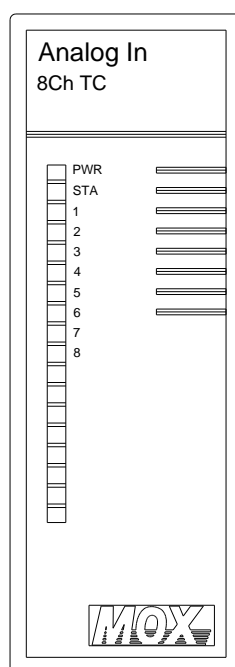


Figure 102 8 Channel TC Familiarization

4.24.2 Datasheet

Input	
Number of channels	8
Resolution of ADC chip	16bits
Input type	J, K, T, E, N, B, R, S, mV
Input voltage range	-12mv~78mv
Accuracy (@25°C)	±0.1%
Cold junction compensation accuracy	±1°C
Temperature stability (-20 °C to +70 °C)	±0.006% of span per °C
Isolation	
Channel to system	1000Vrms
Configurable Parameters	
Primary or standby	Primary, Standby
Check line status	User Definable
Activate channel	Activate, Deactivate
Sensor type	J, K, T, E, N, B, R, S, mV

Filter times	User Definable
Temperature compensation	No, Inter
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.8W

Table 87 8 Channel TC Datasheet

4.24.3 Equivalent Circuit Diagram

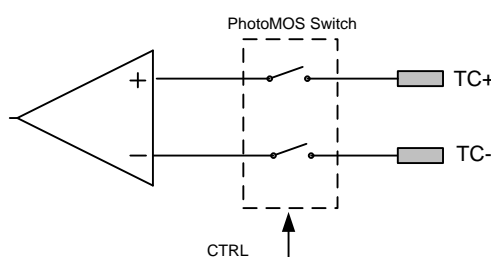


Figure 103 8 Channel TC Equivalent Circuit Diagram

4.24.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 88 8 Channel TC LED Definitions

4.24.5 Cabling Guide

For module base MX603-2008-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
TC1+	TC2+	TC3+	TC4+	TC5+	TC6+	TC7+	TC8+	RDI	RDO
11	12	13	14	15	16	17	18	19	20
TC1-	TC2-	TC3-	TC4-	TC5-	TC6-	TC7-	TC8-	N/A	RGND

Figure 104 8 Channel TC Pin Definitions

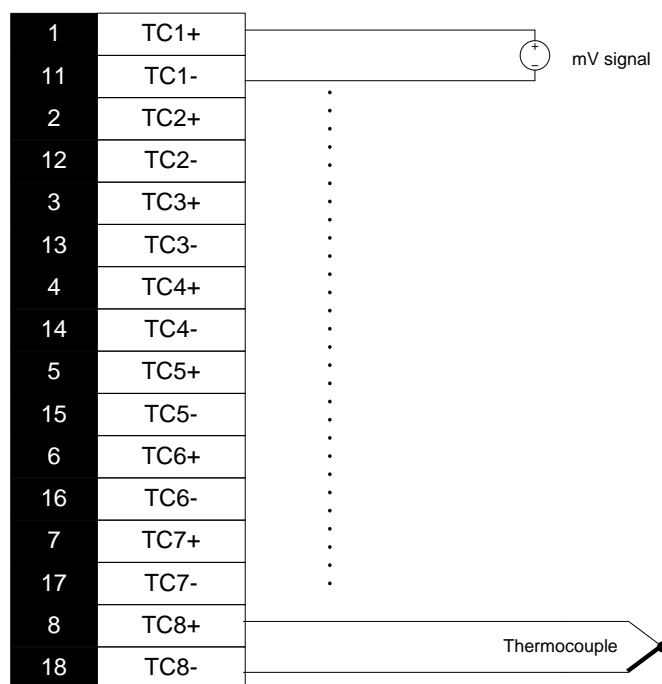


Figure 105 8 Channel TC Wiring Diagram

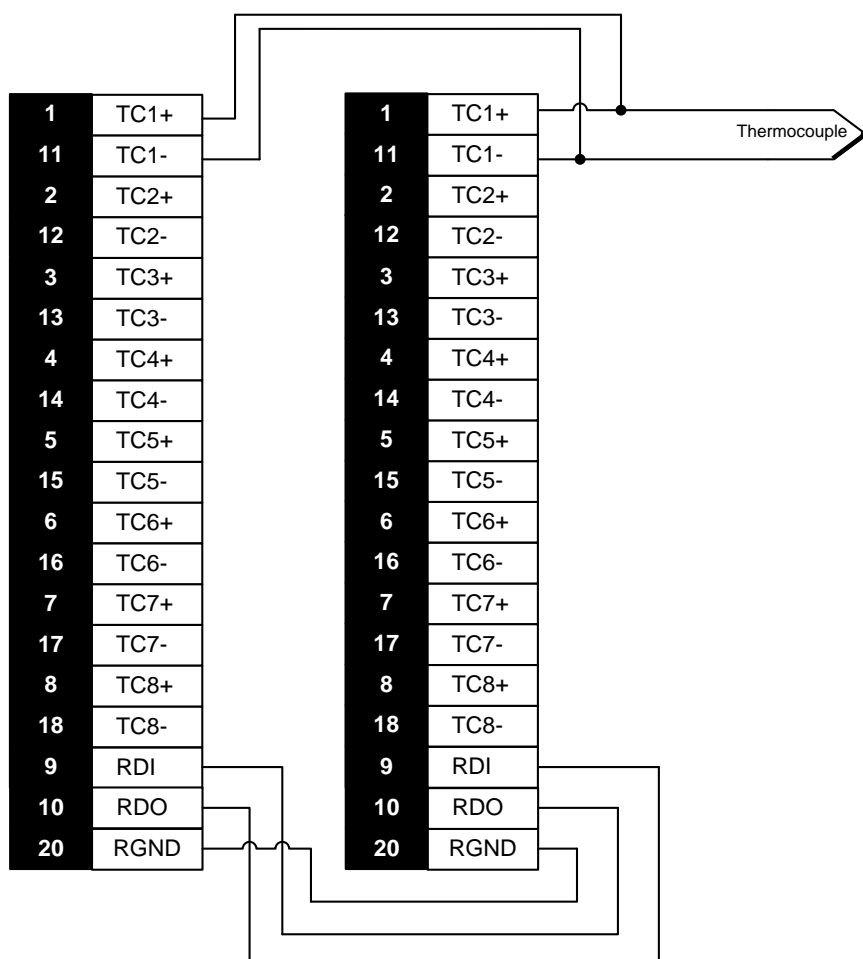


Figure 106 8 Channel TC Redundancy Wiring Diagram

4.24.6 Safety Keying

Module Top	0	1	1	1
Base Top	1	0	0	0
Module Bottom	1	1	0	0
Base Bottom	0	0	1	1

Table 89 8 Channel TC Safety Keying

4.24.7 Configurable Channel Parameters

▪ Activate Channel

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- **Check Line Status Interval(s)**

This parameter allows the user to set the time period of refresh for the line status of all channels. This parameter is user defined.

The factory default is “10” for this parameter.

- **Sensor Type**

This parameter allows the user to select which *sensor type* is connected to which input channel. With the TC module there is a connection combination of 9 different sensors. The TC type can be J, K, E, T, S, R, B, N or mV. Each input is equipped with open circuit detection and over voltage protection.

The factory default sensor is “J” for this parameter.

- **Filter Times**

This parameter controls the number of times the controller will sample the input before taking an average and is a way of smoothing the input from the field device. This parameter is user definable.

The factory default is “5” for this parameter.

- **Temperature Compensation**

This parameter allows the user to adjust the readings taken by the module with respect to surrounding environmental temperature. The user has the ability to use *Inter* temperature (operating temperature of the I/O module) as cold junction compensation.

- No
- Inter

The factory default is “No” for disabled.

4.25 12 Channel TC Front-wiring

---MX603-0512-823

The MOX 603 12 Channel Thermal Couple (TC) input or mV input Module has the capability of sampling analog mV signal inputs and converting them into digital format, detecting a sensor break on individual inputs as well as filtering and data processing of the input signal.

4.25.1 Familiarization

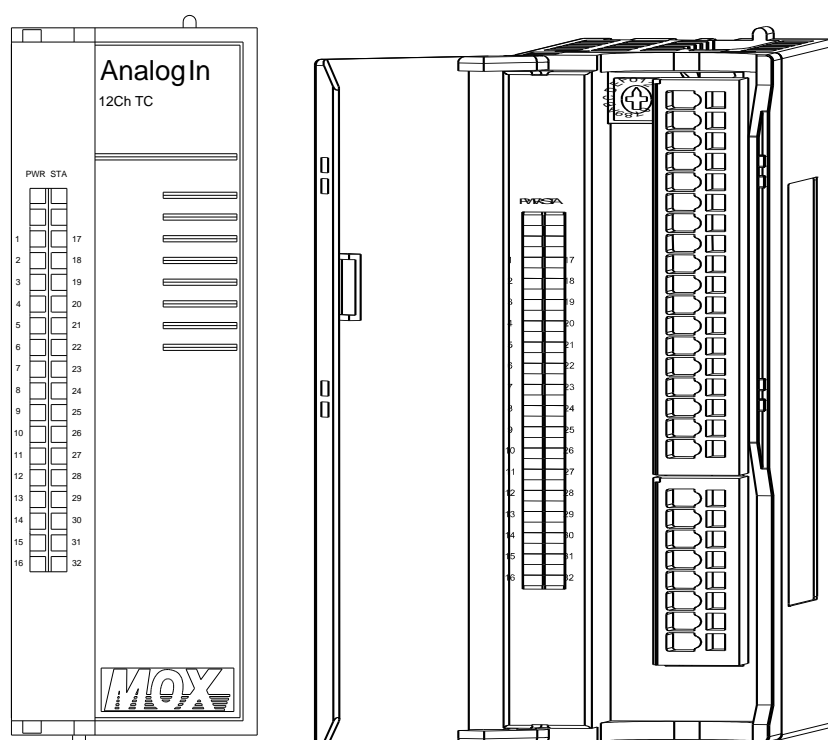


Figure 107 12 Channel TC Familiarization

4.25.2 Datasheet

Input	
Number of channels	12
Input type	J, K, T, E, N, B, R, S, mV
Input voltage range	-12mV~78mV
Resolution of ADC chip	24bits
Accuracy (@25°C)	±0.1%
Temperature stability (-20°C~+70°C)	± 0.006% of span per °C
Cold junction compensation accuracy*	±1°C
Isolation	
Channel to system	2500Vrms
Permissible potential difference between channels	<400VDC
Configurable Parameters	
Check line status	User Definable

Activate channel	Activate, Deactivate
Sensor type	J, K, T, E, N, B, R, S, mV
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	+5VDC
Power dissipation within module	<3.3W

*When Pt (1000) RTD (MX603-00-16006) is used for cold junction.

Table 90 12 Channel TC Datasheet

4.25.3 Equivalent Circuit Diagram

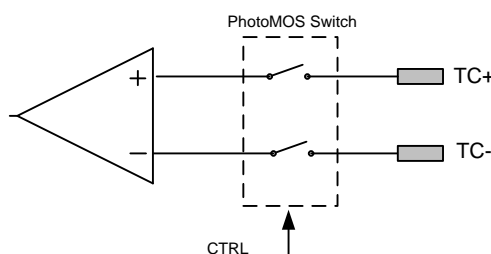


Figure 108 12 Channel TC Equivalent Circuit Diagram

4.25.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
12	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 91 12 Channel TC LED Definitions

4.25.5 Cabling Guide

The pins of 12 Channel TC are located on the front of the module. Their definitions are shown below:

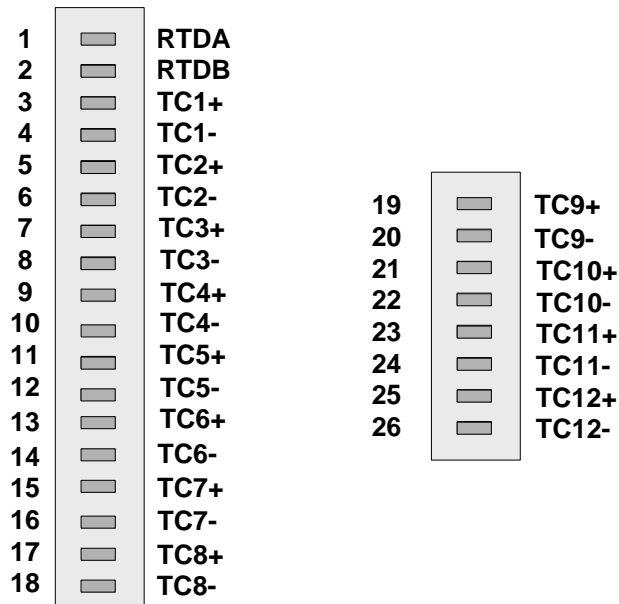


Figure 109 12 Channel TC Pin Definitions

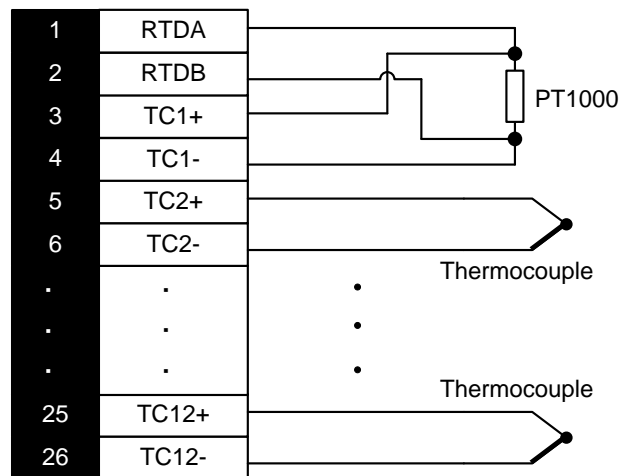


Figure 110 12 Channel TC Cabling Diagram

The module adopts base MX603-2020-01.

4.25.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 92 12 Channel TC Safety Keying

4.25.7 *Configurable Channel Parameters*

- **Activate Channel**

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- **Check Line Status Interval (s)**

This parameter allows the user to set the time period of refresh for the line status of all channels. This parameter is user defined.

The factory default is “10” for this parameter.

- **Sensor Type**

This parameter allows the user to select which *sensor type* is connected to which input channel. With the TC module there is a connection combination of 9 different sensors. The TC type can be J, K, E, T, S, R, B, N or mV. Each input is equipped with open circuit detection and over voltage protection. Furthermore, the first channel can be configured as Pt(375)1000 type to detect environment temperature and used as the cold junction compensation for the other TC channels.

The factory default sensor is “J” for this parameter.

- **Filter Times**

This parameter controls the number of times the controller will sample the input before taking an average and is a way of smoothing the input from the field device. This parameter is user definable.

The factory default is “5” for this parameter.

4.26 4 Channel RTD

---MX603-0604-913

The MOX 603 4 Channel Resistance Temperature Detector (RTD) module has the capability of exciting a current source and sampling analog voltage signal inputs on connected RTD. This module is capable of converting this input into digital format, as well as filtering and data processing of the input signal.

This module can excite current sources to develop a voltage on RTD. All four RTD inputs support 2-wire, 3-wire or 4-wire mode.

4.26.1 Familiarization

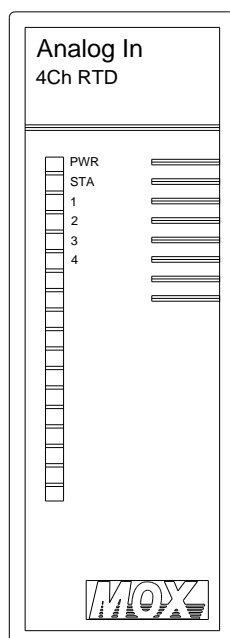


Figure 111 4 Channel Analog Input RTD Familiarization

4.26.2 Datasheet

Input	
Number of channels	4
RTD input type (2-wire, 3-wire, 4-wire)	0.00385 series inputs: PT100, PT200, PT500, PT1000 0.00428 series inputs: Cu100, Cu50 Ω inputs: 0~400 Ω
Excitation current	200 μ A
Accuracy (@25°C)	$\pm 0.1\%$
Resolution of ADC chip	16bits
Temperature stability (-20°C to +70°C)	$\pm 0.006\%$ of span per °C
Isolation	
Channel to system	1000Vrms
Configurable Parameters	

Primary or standby	Primary, Standby
Check line status	User Definable
Activate channel	Activate, Deactivate
Sensor type	PT(385)100, PT(385)200, PT(385)500, PT(385)1000, Cu50, Cu100, 0-400Ohm
Filter times	User Definable
RTD wiring type	2-wire, 3-wire, 4-wire,
Ohm value offset for 2-wire mode	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5% to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.5 W

Table 93 4 Channel RTD Specifications

4.26.3 Equivalent Circuit Diagram

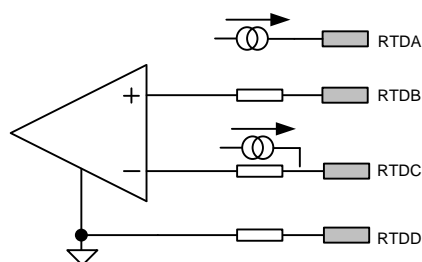


Figure 112 4 Channel RTD Equivalent Circuit Diagram

4.26.4 Indication LEDs

The indication LEDs for channels 1-4 are always kept OFF.

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module

Table 94 4 Channel RTD LED Definitions

4.26.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
RTD1A	RTD1C	RTD2A	RTD2C	RTD3A	RTD3C	RTD4A	RTD4C	N/A	N/A
11	12	13	14	15	16	17	18	19	20
RTD1B	RTD1D	RTD2B	RTD2D	RTD3B	RTD3D	RTD4B	RTD4D	N/A	N/A

Table 95 4 Channel RTD Pin Definitions

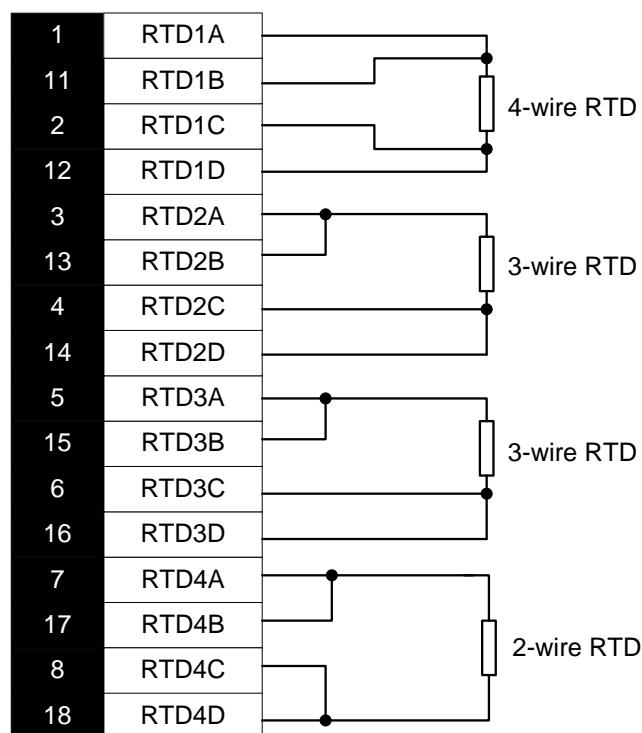


Figure 113 4 Channel RTD Wiring Diagram

For applications with the base MX603-2023-01, please refer to the following figure to wire two 4 Channel RTD modules for redundancy application.

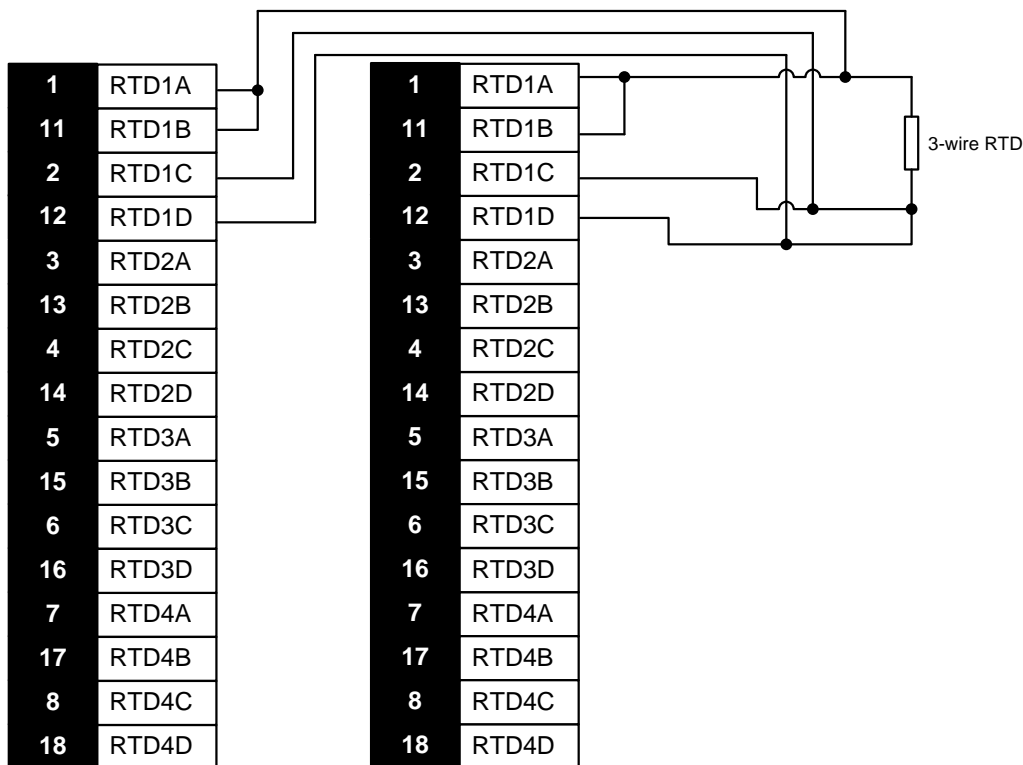


Figure 114 4 Channel RTD Redundancy Wiring Diagram

Note: 4-wire mode and 2-wire mode's wirings in redundancy mode are similar as 3-wire mode.

For 3-wire mode, in order to ensure the accuracy, the resistance of the cable lead wires must be equal to or less than 0.01Ω . It is recommended to adopt the cable with high quality which has small tolerance rating and the lead resistance is less than 20Ω . So the lead wires match as closely as possible.

4.26.6 Safety Keying

Module Top	1	0	0	1
Base Top	0	1	1	0
Module Bottom	1	0	1	1
Base Bottom	0	1	0	0

Table 96 4 Channel RTD Safety Keying

4.26.7 *Configurable Channel Parameters*

- **Activate Channel**

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- **Sensor Type**

This parameter allows the user to select which *sensor type* is connected to which input channel. The *sensor type* includes: PT(385)100, PT(385)200, PT(385)500, PT(385)1000, Cu50, Cu100, 0-400Ohm.

The factory default sensor is the “PT(385)100” for this parameter.

- **Filter Times**

This parameter controls the number of times the controller will sample the input before taking an average and is a way of smoothing the input from the field device. This parameter is user definable.

The factory default is “20” for this parameter.

- **RTD Wiring Type**

This parameter allows the user to select the type of wiring used e.g. 2, 3 or 4-wire connection. This parameter can have the following values:

- 2-wire
- 3-wire
- 4-wire

The factory default is “3-wire” connection for this parameter.

- **Ohm Value Offset for 2-wire Mode**

This parameter is used to establish an offset compensation value of the sensor input. This parameter is a user defined value and can be set only for two-wire mode. If 3-wire or 4-wire mode is in use this parameter should be set to 0.

The factory default is “0” for this parameter.

4.27 12 Channel RTD Front-wiring

---MX603-0612-923

The MOX 603 12 Channel Resistance Temperature Detector (RTD) module has the capability of exciting a current source and sampling analog voltage signal inputs on connected RTD. This module is capable of converting this input into digital format, detecting a sensor break on an individual input channel as well as filtering and data processing of the input signal.

The 12 input channels are divided into 3 groups. The groups are isolated each other.

4.27.1 Familiarization

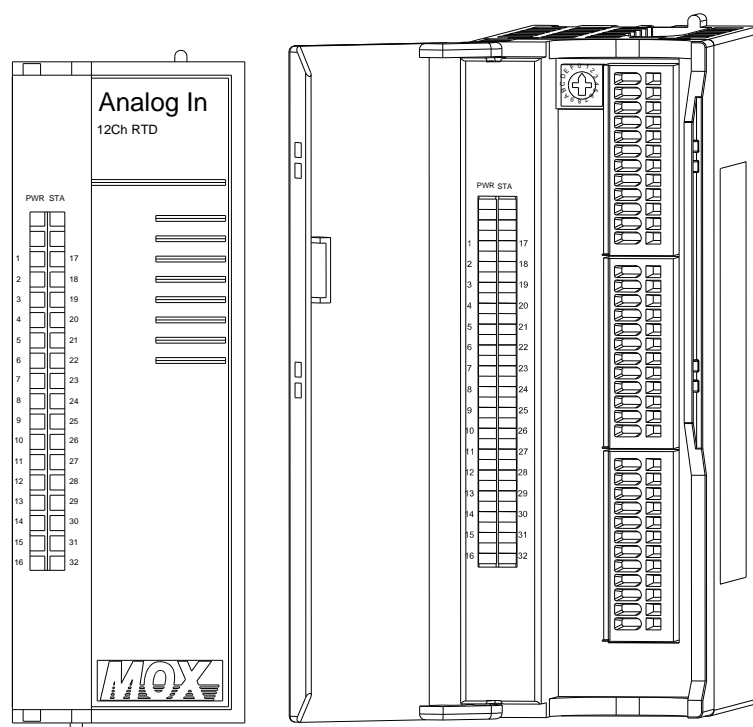


Figure 115 12 Channel RTD Familiarization

4.27.2 Datasheet

Input	
Number of channels	12
RTD input type	0.00385 series inputs: PT100, PT200, PT500, PT1000 0.00428 series inputs: Cu100, Cu50 Ω inputs: 0~400Ω
Excitation current	210μA
Accuracy (@25°C)	±0.1%
Temperature stability	± 0.0075% of span per °C (typ.)
Resolution of ADC chip	24bits
Isolation	
Channel to system	1500Vrms
Group to group	1000Vrms
Configurable Parameters	
Check line status	User Definable

Activate channel	Activate, Deactivate
Sensor type	PT(385)100, PT(385)200, PT(385)500, PT(385)1000, Cu50, Cu100, 0-400Ohm
Filter times	User Definable
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5% to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.5 W

Table 97 12 Channel RTD Datasheet

4.27.3 Equivalent Circuit Diagram

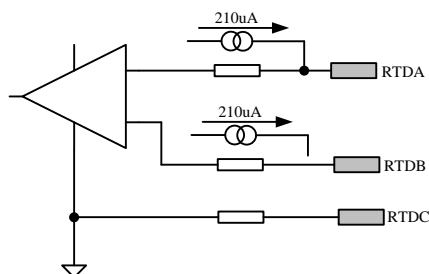


Figure 116 12 Channel RTD Equivalent Circuit Diagram

4.27.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
12	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 98 12 Channel RTD LED Definitions

4.27.5 Cabling Guide

The pins of 12 Channel RTD are located on the front of the module. Their definitions are shown below. They are divided to 3 isolated groups, RTD1~RTD4 belong to group1, RTD5~RTD8 belong to group2, RTD9 ~RTD12 belong to group3.

1	RTD1A	13	RTD5A	25	RTD9A
2	RTD1B	14	RTD5B	26	RTD9B
3	RTD1C	15	RTD5C	27	RTD9C
4	RTD2A	16	RTD6A	28	RTD10A
5	RTD2B	17	RTD6B	29	RTD10B
6	RTD2C	18	RTD6C	30	RTD10C
7	RTD3A	19	RTD7A	31	RTD11A
8	RTD3B	20	RTD7B	32	RTD11B
9	RTD3C	21	RTD7C	33	RTD11C
10	RTD4A	22	RTD8A	34	RTD12A
11	RTD4B	23	RTD8B	35	RTD12B
12	RTD4C	24	RTD8C	36	RTD12C

Figure 117 12 Channel RTD Pin Definitions

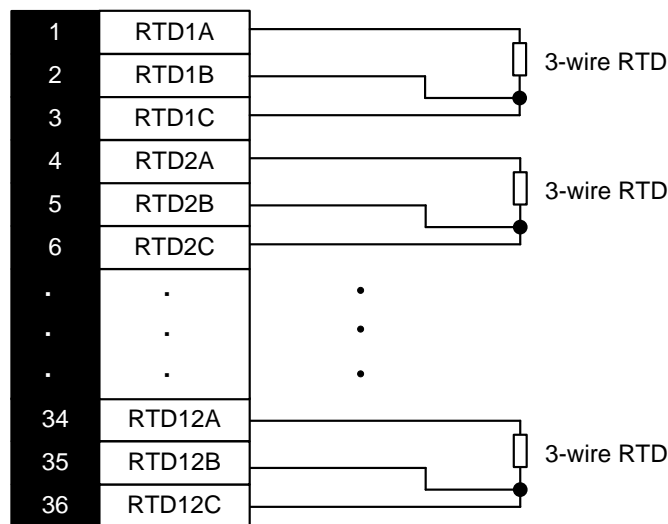


Figure 118 12 Channel RTD Wiring Diagram

The module adopts base MX603-2020-01.

In order to ensure the accuracy, the resistance of the cable lead wires must be equal to or less than 0.01Ω. It is recommended to adopt the cable with high quality which has small tolerance rating and the lead resistance is less than 20Ω. So the lead wires match as closely as possible.

4.27.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0

Base Bottom	0	1	0	1
-------------	---	---	---	---

Table 99 12 Channel RTD Safety Keying

4.27.7 Configurable Channel Parameters

- **Activate Channel**

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- **Check Line Status Interval (s)**

This parameter allows the user to set the time period of refresh for the line status of all channels. This parameter is user defined.

The factory default is “10” for this parameter.

- **Sensor Type**

This parameter allows the user to select which *sensor type* is connected to which input channel. The *sensor type* includes: PT(385)100, PT(385)200, PT(385)500, PT(385)1000, Cu50, Cu100, 0-400Ohm.

The factory default sensor is the “PT(385)100” for this parameter.

- **Filter Times**

This parameter controls the number of times the controller will sample the input before taking an average and is a way of smoothing the input from the field device. This parameter is user definable.

The factory default is “0” for this parameter.

4.28 8 Channel Analog Output 4-20mA Isolated Module Power Front-wiring

---MX603-0408-123

The MOX 603 8 Channel Analog Output Isolated 4-20mA Module Power module supports 8 individually isolated 4-20mA outputs. It has the capability of providing analog current signals, detecting an open circuit on individual output channels.

4.28.1 Familiarization

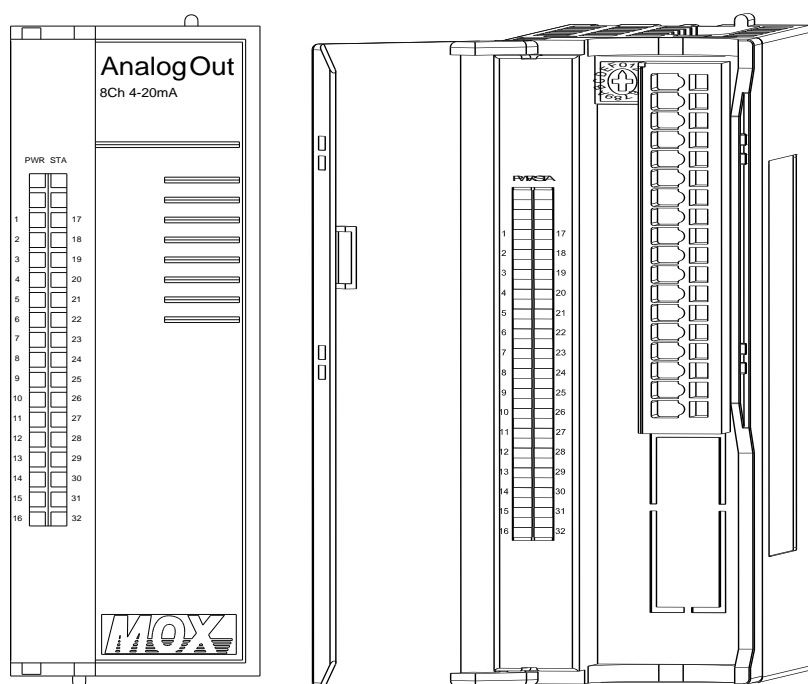


Figure 119 8 Channel Analog Output 4-20mA Isolated Familiarization

4.28.2 Datasheet

Output	
Number of channels	8
Nominal signal range (span)	4~20mA
Load resistance (@20mA)	0~750Ω
Resolution of DAC chip	12bits
Accuracy (@25°C)	± 20μA
Temperature stability (-20°C to +70°C)	± 0.006% of span per °C
Isolation	
Channel to system	1000Vrms
Channel to Channel	1000Vrms
Configurable Parameters	
Activate channel	Activate, Deactivate
Predef value	User Definable
Drive on failsafe value	User Definable
Environmental Conditions	

Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.0W
Voltage for channels	24VDC ($\pm 10\%$)
Power dissipation within channels	<10.0W

Table 100 8 Channel Analog Output 4-20mA Isolated Datasheet

4.28.3 Equivalent Circuit Diagram

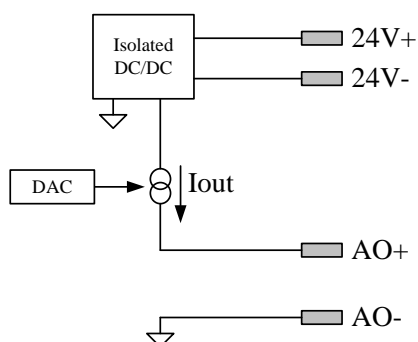


Figure 120 8 Channel Analog Output 4-20mA Isolated Equivalent Circuit Diagram

4.28.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 101 8 Channel Analog Output 4-20mA Isolated LED Definitions

4.28.5 Cabling Guide

The pins of 8 Channel Analog Output 4-20mA Isolated are located on the front of the module. Their definitions are shown below:

1	24V+
2	24V-
3	AO1+
4	AO1-
5	AO2+
6	AO2-
7	AO3+
8	AO3-
9	AO4+
10	AO4-
11	AO5+
12	AO5-
13	AO6+
14	AO6-
15	AO7+
16	AO7-
17	AO8+
18	AO8-

Figure 121 8 Channel Analog Output 4-20mA Isolated Pin Definitions

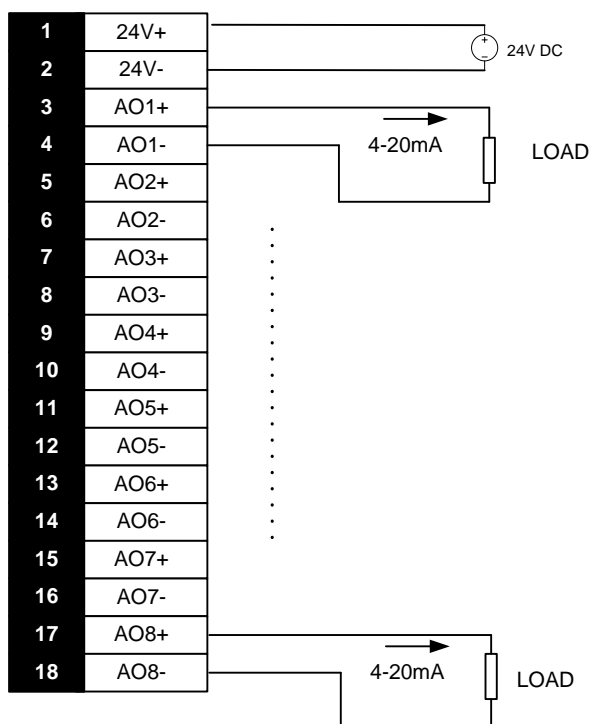


Figure 122 8 Channel Analog Output 4-20mA Isolated Cabling Diagram

The module adopts base MX603-2020-01.

4.28.6 *Safety Keying*

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 102 8 Channel Analog Output 4-20mA Isolated Safety Keying

4.28.7 *Configurable Channel Parameters*

- **Activate Channel**

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

- **Predefined value**

This parameter is the value set to each channel on power-up of the module. This value is user defined and can be configured for each channel.

- 0 - 22000

The factory default is “0” for this parameter.

- **Drive on Failsafe Value**

This parameter enables the user to configure a value to be used when communication with the module fails. This value is user defined and can be configured for each channel.

If the configured value is in the nominal range of the module, this value will be output; otherwise, the module will keep previous output unchanged.

- 0 – 22000

The factory default is “0” for all channels.

4.29 8 Channel Analog Output 4-20mA Isolated

---MX603-0408-613

The MOX 603 8 Channel Analog Output Isolated module supports 8 individually isolated 4-20mA outputs. It has the capability of providing analog current signals, detecting an open circuit on individual output channels.

4.29.1 Familiarization

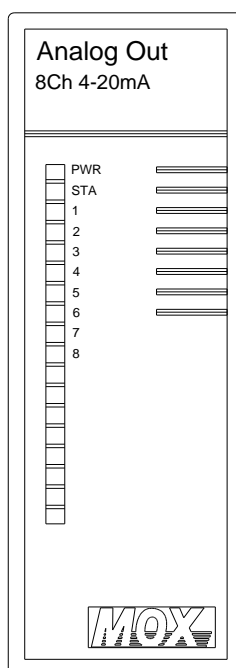


Figure 123 8 Channel Analog Output 4-20mA Isolated Familiarization

4.29.2 Datasheet

Output	
Number of channels	8
Nominal signal range (span)	4 to 20mA
Load capability (@20mA)	0 ~ 750Ω
Resolution of DAC chip	12bits
Accuracy (@25°C)	±20μA
Temperature stability (-20 to +70°C)	±0.006% of span per °C
Isolation	
Channel to system	2000Vrms
Channel to channel	1500Vrms
Configurable Parameters	
Primary or standby	Primary, Standby
Activate channel	Activate, Deactivate
Predef value	User Definable
Drive on failsafe value	User Definable
Environmental Conditions	

Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<1.1W

Table 103 8 Channel Analog Output 4-20mA Isolated Datasheet

4.29.3 Equivalent Circuit Diagram

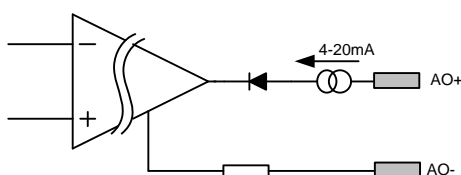


Figure 124 8 Channel Analog Output 4-20mA Isolated Equivalent Circuit Diagram

4.29.4 Indication LEDs

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	1) Station number is 0 2) Parameters are corrupted
		Flashing at 50ms ON, 950ms OFF	Parameters do not match the type of module
		Flashing at 500ms ON, 500ms OFF	Inactive status in redundancy mode
1	Orange	ON	Channel is ON
		OFF	Channel is OFF
2	Orange	ON	Channel is ON
		OFF	Channel is OFF
.	.	.	.
.	.	.	.
.	.	.	.
8	Orange	ON	Channel is ON
		OFF	Channel is OFF

Table 104 8 Channel Analog Output 4-20mA Isolated LED Definitions

4.29.5 Cabling Guide

For module base MX603-2022/2023-01, pin definitions are shown below:

1	2	3	4	5	6	7	8	9	10
AO1+	AO2+	AO3+	AO+	AO5+	AO6+	AO7+	AO8+	N/A	N/A

11	12	13	14	15	16	17	18	19	20
AO1-	AO2-	AO3-	AO4-	AO5-	AO6-	AO7-	AO8-	N/A	N/A

Table 105 8 Channel Analog Output 4-20mA Isolated Pin Definitions

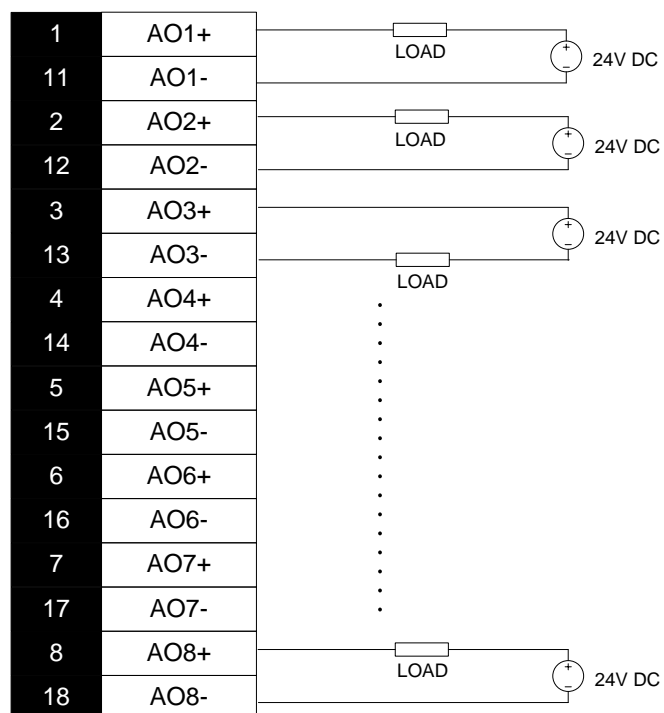


Figure 125 8 Channel Analog Output 4-20mA Isolated Wiring Diagram

For applications with the base MX603-2023-01, please refer to the following figure to wire two 8 Channel Analog Output 4-20mA Isolated modules for redundancy application.

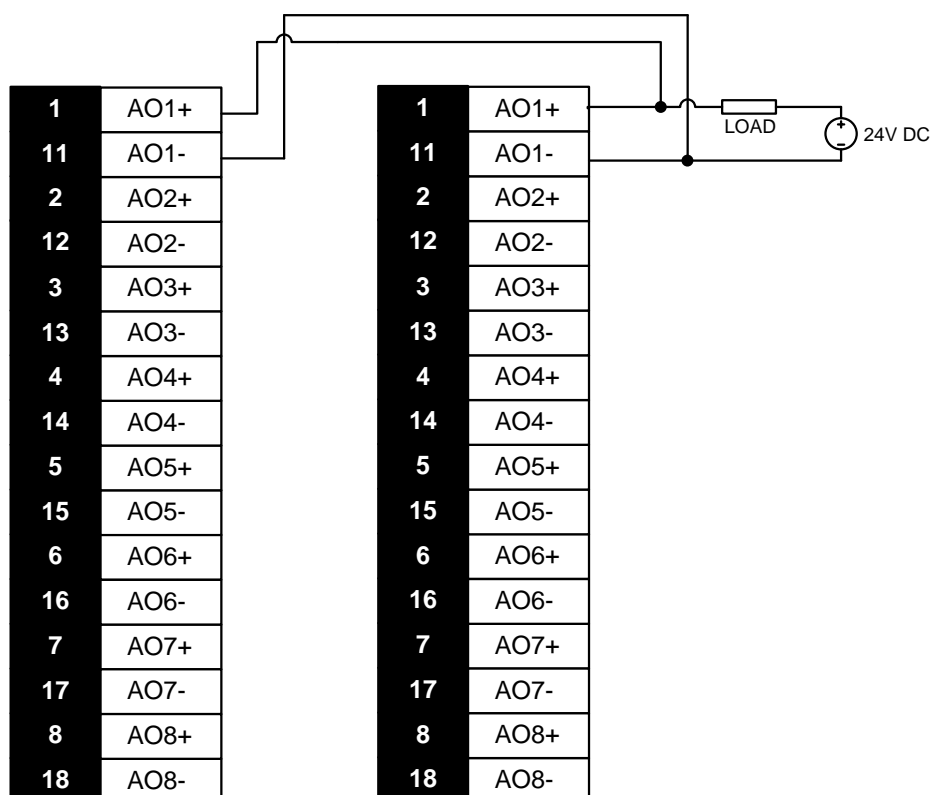


Figure 126 8 Channel Analog Output 4-20mA Isolated Redundancy Wiring Diagram

4.29.6 Safety Keying

Module Top	1	0	0	1
Base Top	0	1	1	0
Module Bottom	1	1	1	0
Base Bottom	0	0	0	1

Table 106 8 Channel Analog Output 4-20mA Isolated Safety Keying

4.29.7 Configurable Channel Parameters

▪ Activate Channel

The users are able to activate/deactivate any channel they desire through this parameter. Each channel has this attribute and as such its status can be manipulated by altering this parameter.

The factory default is “activated” for all channels.

▪ Predefined value

This parameter is the value set to each channel on power-up of the module. This value is user defined and can be configured for each channel.

- 0 - 22000

The factory default is “0” for this parameter.

- ***Drive on Failsafe Value***

This parameter enables the user to configure a value to be used when communication with the module fails. This value is user defined and can be configured for each channel.

If the configured value is in the nominal range of the module, this value will be output; otherwise, the module will keep previous output unchanged.

- 0 – 22000

The factory default is “0” for all channels.

4.30 Mixed I/O Modules

---MX603-0701-XXX

The MOX 603 mixed I/O module provides multiple I/O options on a single module. It is possible to select a maximum of three types from four I/O options for a module. The last three digits of the module's part number (PN) state the I/O options installed on the module as shown in the figure below.

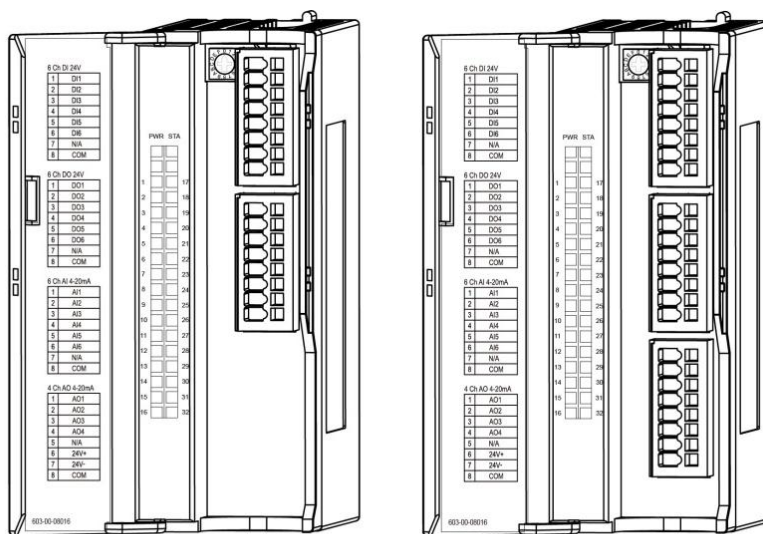
603-0701-XXX

I/O Type	
0	Null
1	6 Ch DI 24V
2	6 Ch DO 24V
3	6 Ch AI 4-20mA
4	4 Ch AO 4-20mA

The mixed I/O modules adopt base 603-2020-01.

4.30.1 Familiarization

The appearance of the mixed I/O module differs depending on the IO options included.



2 I/O Included

3 I/O Included

Figure 127 Mixed I/O Modules Familiarization

4.30.2 Datasheet

6-Channel Digital Input	
Input Voltage	Nominal value: 24VDC Allowable 24VDC tolerance: $\pm 10\%$ For 1 signal: 10V to 30V

	For 0 signal: -3V to 5V
Input Current	With 1 signal: 2mA@24VDC (per channel)
Input Delay	At 0 to 1 transition: 1ms to 5ms At 1 to 0 transition: 1ms to 5ms
Connection of 2-wire Proximity Switch	Permissible Quiescent Current: Max. 0.5mA
Minimum pulse width detected	6ms
Maximum switching frequency (no-filtering)	80Hz
Channel to system isolation	2500Vrms
Configurable Parameters	Filter Time (ms)
6-Channel Digital Output	
Max channel DC voltage range	30VDC
Output current rating	100mA per point (channel)
Surge current per point	10A per 10ms every 2s
Channel to system isolation	2500Vrms
Channel to channel isolation	None
Configurable Parameters	Failsafe Mode, Failsafe Value
6-Channel Analog Input	
Nominal signal range (span)	4 – 20mA
Full signal range	0.5 – 22mA
Line fault detection	<0.5mA
Resolution of ADC chip	16bits
Input resistance	<200Ω
Accuracy (@25°C)	± 16μA
Temperature stability (-20°C to +70°C)	± 0.006% of span per °C
Channel to system isolation	1500Vrms
Configurable Parameters	Activate Filter Times
4-Channel Analog Output	
Nominal signal range (span)	4 to 20mA
Full signal range	0.5 – 22mA
Load capability (@22mA)	0 ~ 1KΩ
Resolution of DAC chip	12bits
Accuracy (@25°C)	±16μA
Temperature stability (-20 to +70°C)	±0.006% of span per °C
Channel to system isolation	1500Vrms
Configurable Parameters	Activate, Predefined Value Failsafe Mode, Failsafe Value
Environmental Conditions	
Operating temperature	-20 to 70°C
Storage temperature	-40 to 85°C
Relative humidity	5 to 95%, non-condensing
Power Supplies	
Voltage for module	5VDC
Power dissipation within module	<2.5W

Table 107 Mixed I/O Modules Datasheet

4.30.3 Equivalent Circuit Diagram

6-channel Digital Input:

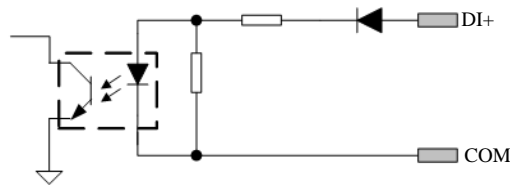


Figure 128 6-channel Digital Input Equivalent Circuit Diagram

6-channel Digital Output

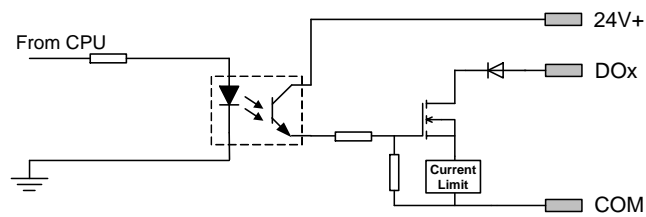


Figure 129 6-channel Digital Output Equivalent Circuit Diagram

6-channel Analog Input

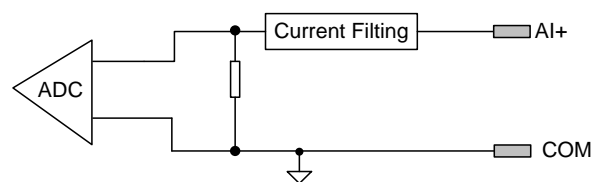


Figure 130 6-channel Analog Input Equivalent Circuit Diagram

4-channel Analog Output

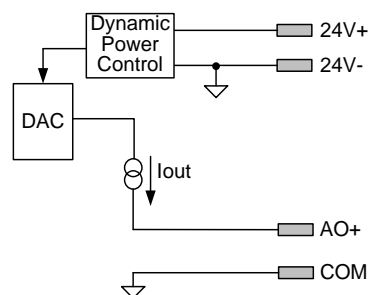


Figure 131 4-channel Analog Output Equivalent Circuit Diagram

4.30.4 Indication LEDs

The LEDs of the I/O options are located on the front panel starting with LED 1 in the PN sequence. Each I/O option has indication LEDs equal to its channel numbers. For example, 6-channel Digital Input has 6 indication LEDs and 4-channel Analog Output has 4 indication LEDs.

LED	Color	State	Description
PWR	Green	ON	The module is powered on
		OFF	The module is not functioning
STA	Green	ON	The onboard system is functioning
		OFF	Station number is 0, Parameters have bad CRC, parameters are in conflict with the firmware
		Flashing at 50ms ON, 950ms OFF	firmware and parameters settings not fit for the detected IO type IO card not detected
		Flashing rapidly	The module is communicating with other device
1~18	Green	ON	Channel is ON
		OFF	Channel is OFF

Table 108 Mixed I/O Module LED Definitions

4.30.5 Cabling Guide

The wiring terminals of I/O options are located on the front case from top to bottom in the PN sequence. Each option has its respective 8-pin wiring terminal.

6-Channel Digital Input

Following figure shows typical wiring of the digital input channels. The loads are powered by external 24V power supply.

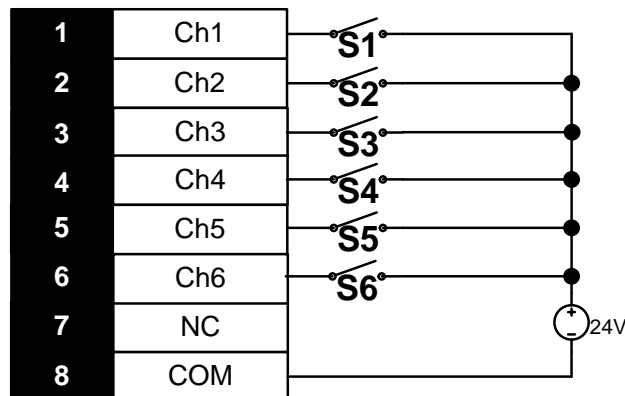


Figure 132 Digital Input Cabling Diagram

6-Channel Digital Output

Following figure shows typical wiring of the digital output channels. The loads are powered by external 24V power supply.

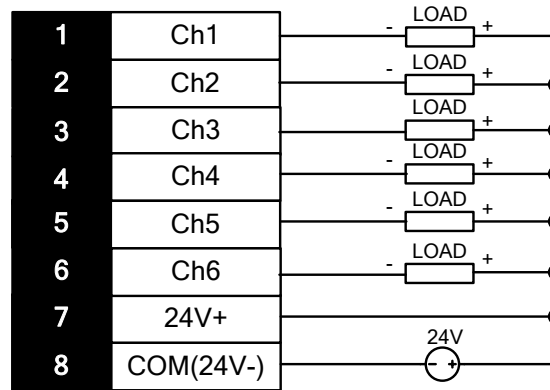


Figure 133 Digital Output Cabling Diagram

6-Channel Analog Input

Each channel of the analog input can connect to 2-wire, 3-wire or 4-wire instruments. The typical wiring diagram for the field signals to the terminal connector is shown as below.

As shown in the figure, there are 3 different connections for the channels. Channels 1~4 are connected to 2-wire transducers; Channel 5 is connected to a 4-wire transducer; and channel 6 is connected to a 3-wire transducer. All the transmitters are powered by 24V DC externally, as shown in the figure below.

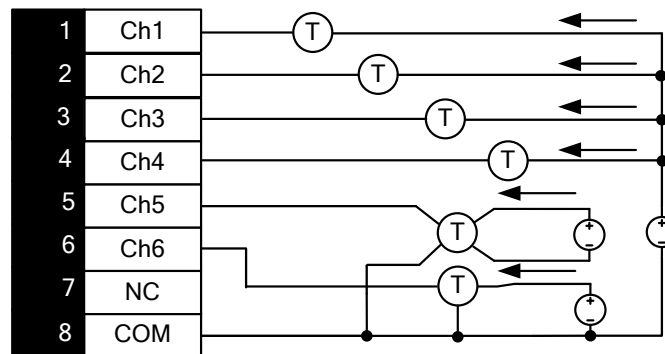


Figure 134 Analog Input Cabling Diagram

4-Channel Analog Output

The following figure shows the typical wiring of the analog output channels. The loads are powered by 24V externally, as shown in the figure below. The current flows out from each channel terminal. Please pay special attention to the current direction of the loads before making the connections.

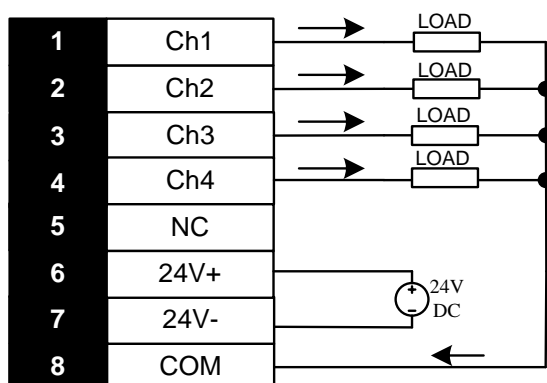


Figure 135 4 Ch Analog Output 4-20mA Cabling Diagram

4.30.6 Safety Keying

Module Top	1	1	0	1
Base Top	0	0	1	0
Module Bottom	1	0	1	0
Base Bottom	0	1	0	1

Table 109 Mixed I/O Modules Safety Keying

4.30.7 Configurable Channel Parameters

6-channel Digital Input:

▪ Filter Time (ms)

The *Filter Time* is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input. It is used to eliminate input noise. If it is set to zero, there will be no filter on the channel.

The following values are valid: 0~5000.

The factory default value is "0ms".

6-channel Digital Output

▪ Failsafe Mode

This parameter enables the user to configure the state of the outputs when communication with the module fails. The configurable options are:

- Keep Last Value –When the communication fault occurs, the output holds the last state.
- Use Failsafe Value –When the communication fault occurs, the output use failsafe value.

The factory default is "Keep Last Value" for all channels.

- **Failsafe Value**

This value is used in conjunction with “Failsafe Mode” to configure the state of the outputs when the communication fault occurs.

This value can be configured for each channel with the following options:

- OFF
- ON

The factory default is “OFF”.

6-channel Analog Input

- **Activate**

This parameter is used to activate or deactivate any channel of the module through the following options:

- Activated
- Deactivated

The factory default is “activated” for all channels.

- **Filter Times**

This value is the number of times the controller will sample the input before taking an average. This value is user definable. And this parameter is a way of smoothing the input from the field device.

Its’ full range is 0 to 40.

The factory default is “0”.

4-channel Analog Output

- **Activate**

This parameter is used to activate or deactivate any channel of the module through the following options:

- Activated
- Deactivated

The factory default is “activated” for all channels.

- **Predefined Value**

This parameter is the value set to each channel on power-up of the module. This value can be configured for each channel in the range of 500 to 22000 representing 0.5-22mA.

The factory default is “500”.

- **Failsafe Mode**

This parameter enables the user to configure the state of the outputs when communication with the module fails. The configurable options are:

- Keep Last Value –When the communication fault occurs, the output holds the last state.
- Use Failsafe Value –When the communication fault occurs, the output use failsafe value.

The factory default is “Keep Last Value” for all channels.

▪ **Failsafe Value**

This value is used in conjunction with “Failsafe Mode” to configure the state of the outputs when the communication fault occurs. This value can be configured for each channel in the range of 500 to 22000 representing 0.5-22mA:

The factory default is “500”.

5 Installation, Handling & Storage Considerations

In this chapter are detailed instructions on mounting, installation and cabling of each individual MOX 603 I/O module. The following items summarize the requirements and should be considered prior to progressing with their installation.

5.1 Electrostatic Discharge

Integrated circuits or semiconductors may be severely damaged by electrostatic discharge. This may be caused if the terminal connector pins come in contact with an electrostatically charged object such as hands or clothing. Follow these guidelines when you handle the module.

- Touch a grounded object to discharge static potential.
- Do not touch the terminal connector pins.
- Do not touch circuit components inside the unit.
- Always work with the unit on a grounded surface.

5.2 Environmental Precautions

To extend the life of the MOX 603 I/O modules, take the following precautions:

- Store within an ambient temperature range of -40°C to 85°C.
- Store within a relative humidity range of 5% to 90%, non-condensing.
- Avoid storing or operating the device where it could be exposed to a corrosive atmosphere.
- Protect from moisture and direct sunlight.
- Generally operate at an ambient temperature range of -20°C to 70°C. Refer to specific data sheet for details.
- MOX 603 I/O modules have been designed for use in an industrial environment when installed in accordance with these instructions. Within this environment, the equipment is still intended for installation in a clean, dry environment.

5.3 Preventing Excessive Heat

For most applications, normal convective cooling keeps the I/O modules within the specified operating range. The following should be considered to ensure that the specified operating range is maintained.

- Recommended spacing between the adjacent racks of I/O modules is 200mm minimum. This prevents much heat influence between the racks, and allows room for wire ducting to be installed without obstructing field wiring installation.
- If particularly high or low ambient temperatures occur, additional cooling or heating provisions should be provided.

- In some applications, a substantial amount of heat is produced by other equipment inside or outside the enclosure. In this case, place blower fans inside the enclosure to assist in air circulation and to reduce “hot spots” near the module.
- Do not bring unfiltered outside air into the enclosure. Place the I/O in an enclosure to protect it from a corrosive atmosphere. Harmful contaminants or dirt could cause improper operation or damage to components. In extreme cases, you may need to use air conditioning to protect against heat build-up within the enclosure.



It is strongly recommended that the I/O modules are installed upright under severe circumstance in order to ensure the normal convective cooling.

5.4 Installation Cleanliness

During installation and placement of items within the cabinet, do not install any components until all drilling is complete. Also, strip and trim cables well away from the MOX 603 I/O modules. Be sure that debris (metal chips, wire strands, etc.) does not fall into the MOX 603 I/O modules. Such debris could cause damage on power-up. Once wiring is complete, ensure that the unit is free of all metal fragments and other objects that may interfere with correct operation.

5.5 Terminal Connectors

Ensure all power sources including the MOX 603 I/O module supply and field I/O supply are isolated from the terminal connector before removing or inserting the terminal connector.



Always isolate the supply power before removal or insertion of the connector. When you remove or insert the connector with power applied, an electrical arc may occur.

An electrical arc can cause personal injury or damage to property by:

- Sending an erroneous or excessive signal to your system’s field devices
- Causing damage to the product through line spikes
- Cause excessive wear on module contacts due to the electrical arcing
- Create electrical resistance from worn contacts

5.6 DIN Rail Specifications

Ensure the DIN rail matches the dimensions of DIN EN 50022 provided as follows.

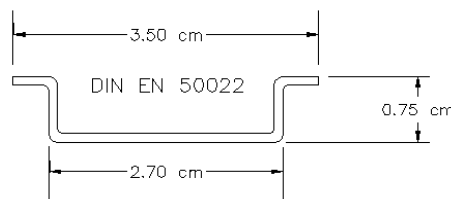


Figure 136 DIN Rail EN 50022

The spacing of the adjacently installed DIN rail in a cabinet must be great enough to secure minimum 200mm vertical spacing of I/O modules mounted.

5.7 Cable Path Considerations

When installing communications cables, the path of the cables should be planned to avoid electrical interference. Follow these guidelines to reduce electrical interference:

- Keep the communication cable at least 1.52m from any electric motors, transformers, rectifiers, generators, arc welders, induction furnaces, or sources of microwave radiation.
- If you must run the cable across power feed lines, run the cable at right angles to the lines.
- If you do not run the cable through a contiguous metallic wire way or conduit, keep the communication cable at least 150mm from AC power lines of less than 20A, 300mm from lines greater than 20A, but only up to 100kVA, and 600mm from lines of 100kVA or more.
- If you run the cable through a contiguous metallic wire way or conduit, keep the communication cable at least 80mm from AC power lines of less than 20A, 150mm from lines greater than 20A (but only up to 100kVA), and 300mm from lines of 100kVA or more.

Running the communication cable through conduit provides extra protection from physical damage and electrical interference. If you route the cable through conduit, follow these additional recommendations:

- Use ferromagnetic conduit near critical sources of electrical interference. You can use aluminum conduit in non-critical areas.
- Use plastic connectors to couple between aluminum and ferromagnetic conduit. Make an electrical connection around the plastic connector (use pipe clamps and the heavy gauge wire or wire braid) to hold both sections at the same potential.
- Ground the entire length of conduit by attaching it to the building earth ground.
- Do not let the conduit touch the plug on the cable.
- Arrange the cables loosely within the conduit. The conduit should contain only serial communication cables.
- Install the conduit so that it meets all applicable codes and environmental specifications.

5.7.1 *Minimizing Electrical Noise on Analog Signal Lines*

Analog input channels employ digital high frequency filters that significantly reduce the effects of electrical noise on input signals. However, because of the variety of applications and environments where analog controllers are installed and operating, it is impossible to ensure that the input filters will remove all environmental noise. Several specific steps can be taken to help reduce the effects of environmental noise on analog signals:

- Install the MOX 603 I/O system in a properly rated (i.e. NEMA) enclosure.

- Make sure that the MOX 603 I/O system is properly grounded.
- Use Belden cable #8761 for wiring the analog channels making sure that the drain wire and foil shield are properly earth grounded at one end of the cable.
- Route the Belden cable separate from any other wiring. Additional noise immunity can be obtained by routing the cables in grounded conduit.
- Periodically check the system operation, particularly when new machinery or other noise sources are installed near the system.

5.7.2 *Analog Signal Cable Grounding*

Use shielded communication cable (Belden #8761). The Belden cable has two signal wires (black and clear), one drain wire and a foil shield. The drain wire and foil shield must be grounded at one end of the cable. We recommend grounding the shield to the case of the signal source, so energy coupled to the shield will not be delivered to signal source's electronics.



Do not ground the drain wire and foil shield at both ends of the cable.

5.7.3 *High Speed Counter Cable Grounding*

We recommend shielded cable be used for high-speed counter input signals. We recommend Belden #9503 or equivalent for lengths up to 300m. Shields should be grounded only at the signal source end of the cable.

5.8 Typical Rack Base IO Dimensions

The IO modules with base MX603-2020-01 have the following dimensions although the addition of input or output options will differ from those displayed.

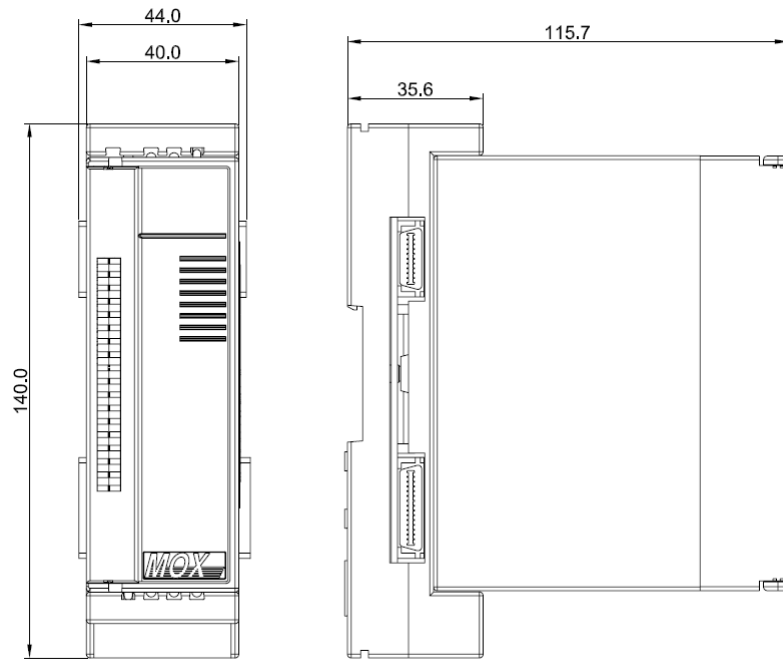


Figure 137 Rack Base I/O Dimensions (Base MX603-2020-01)

The IO modules with base MX603-2022-01 or MX603-2008-01 have the following dimensions although the addition of input or output options will differ from those displayed.

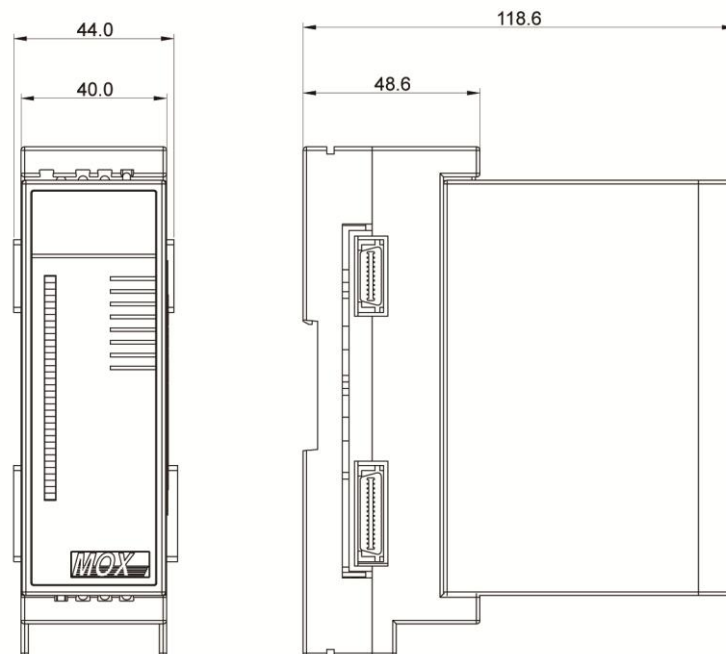


Figure 138 Rack Base I/O Dimensions (Base MX603-2022-01/MX603-2008-01)

The IO modules with base MX603-2023-01 have the following dimensions although the addition of input or output options will differ from those displayed.

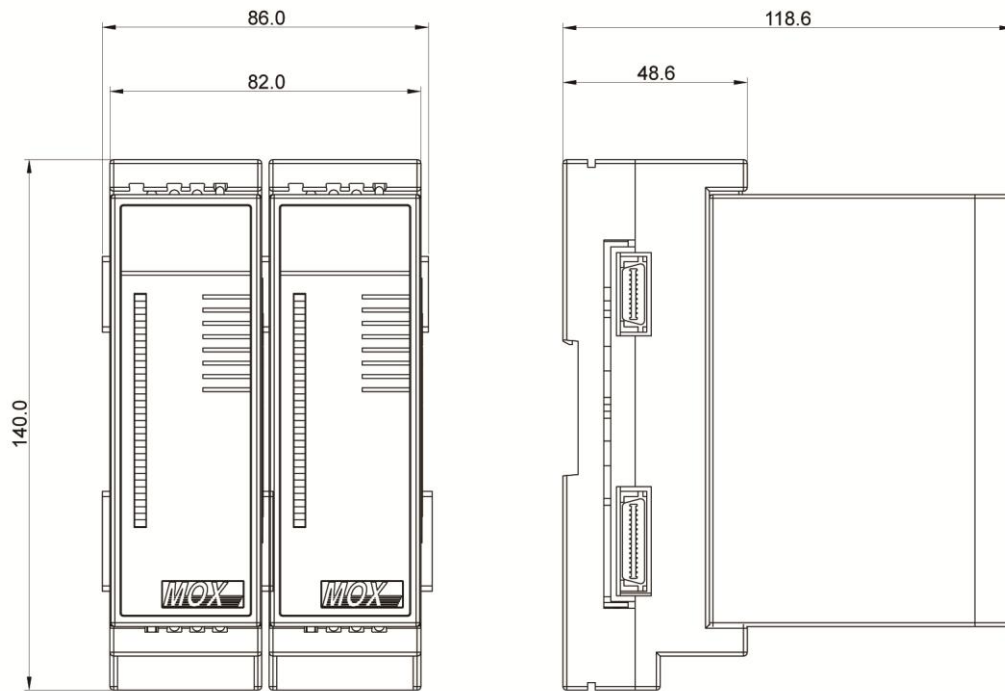


Figure 139 Rack Base I/O Dimensions (Base MX603-2023-01)

5.9 Power

5.9.1 Power Requirements

MOX 603 I/O modules in the rack-base configuration require a 5VDC voltage from the base and are supplied by the MOX 603 PSU. The MOX 603 PSU accepts external power and converts this to 5VDC to power the racked I/O modules via the module bases.

It may be more convenient to supply all of the devices in the same enclosure with a single power supply. However, this is not essential.

Applying an incorrect voltage to any of the MOX 603 I/O module may cause damage. Connect the mains power to the user supplied DC Power Supply Unit only. Ensure your power supply is sufficiently sized to suit the power requirements of your system.



To avoid electric shock or damage, power should only be applied after all wiring terminations are complete.

5.9.2 Power Isolation

When removing power from the device, interruption of the DC side of the power supply is preferred. This avoids the additional discharge delay of the power supply if the AC line is connected.

Always fuse the AC line of the power supply and place the main power isolation switch where operators and maintenance personnel have quick and easy access to it. If you mount an isolation switch inside the controller enclosure, place a handle on the outside of the enclosure to switch the isolator, so that you can disconnect power without opening the enclosure.

5.9.3 DC Power Wiring (User DC Source)

Ensure the power supply has adequate output capacity to supply all of the connected devices.

To calculate the current requirements, add the wattage required for the 603 I/O modules in use, divide the total wattage by the DC power source voltage.

5.9.4 Applying Power

After all field wiring is installed, power up all 603 I/O module and related peripherals. Observe the status LED on each of the 603 I/O modules. Normal 603 I/O modules start-up conditions will result in the following.

- 1) The power LED (PWR) will turn to the ON state, indicating that the unit is receiving a valid power input.
- 2) The MOX 603 I/O modules status LED (STA) will first switch on for a short period of time then turn off again. After another short period of time it will turn to and remain in the ON state, indicating that the Operating System within the unit is functional and awaiting either communication requests or an update of inputs/outputs.

5.10 Recommended Operating Tools

For front-wiring I/O modules, the terminal strips are provided for wiring the field signals to the module. They are of three different kinds: 18-pin, 8-pin and 12-pin. For the first two, the pin spacing is 3.5mm. For the last one, the pin spacing is 2.5mm. Please refer to the following table for details:

Part Number	Module Description	Pin Spacing (mm)
MX603-0116-253	16 DI 115VAC Front-wiring	2.5
MX603-0116-263	16 DI 230VAC Front-wiring	2.5
MX603-0132-133	32 DI Dry Contact Front-wiring	2.5
MX603-0132-233	32 DI Front-wiring	2.5
MX603-0232-123	32 DO 24VDC Module Power Front-wiring	2.5
MX603-0612-923	12 RTD Front-wiring	2.5
MX603-0116-273	16 DI Dry Contact Front-wiring	3.5
MX603-0212-113	12 DO Relay Front-wiring	3.5
MX603-0312-113	12 AI 4-20mA Front-wiring	3.5
MX603-0312-123	12 AI 1-5VDC Front-wiring	3.5
MX603-0312-133	12 AI 4-20mA Front-wiring	3.5

MX603-0312-143	12 AI 1-5VDC Front-wiring	3.5
MX603-0512-823	12 TC Front-wiring	3.5
MX603-0408-123	8 AO 4-20mA Isolated Module Power Front-wiring	3.5
MX603-0701-xxx	Mixed I/O Modules	3.5

Table 110 Pin Spacing for Front-wiring I/O Modules

2.5mm:

For terminal strips with 2.5mm pin spacing, a special screwdriver with insulated shaft is particularly appropriate for their easy operation. The part number of this operating tool is 603-00-16505. The following figure shows the appearance of the screwdriver:



Figure 140 Screwdriver for 2.5mm Pin Spacing Terminal Strips

It is recommended to adopt wires of following specifications:

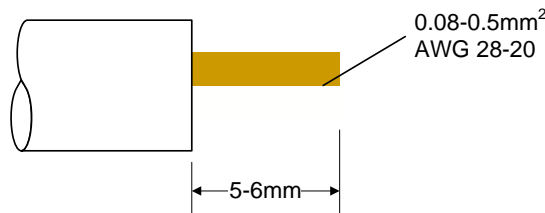


Figure 141 Wire Specifications for 2.5mm Pin Spacing Terminal Strips

3.5mm:

For terminal strips with 3.5mm pin spacing, the following screwdriver is recommended to operate the connector correctly. Its part number is 603-00-16511.



Figure 142 Screwdriver for 3.5mm Pin Spacing Terminal Strips

It is recommended to adopt wires of following specifications:

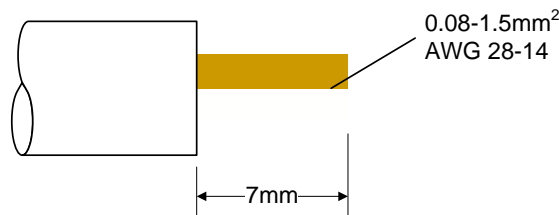


Figure 143 Wire Specifications for 3.5mm Pin Spacing Terminal Strips

To use these two recommended tools properly, you should insert the screwdriver into the bottom of the connector to flick the corresponding tole. Then insert the wires into the hole of the tole and pull up the screwdriver from the connector. In this way, the wires can be firmly locked.

6 Redundancy

6.1 How Redundant I/O Modules Work

On start up, the I/O module designated as the primary device will become "active" thereby taking control over field operations as it has been allocated to do so. However if the primary I/O module should fail, the standby I/O module then becomes active and takes control of the field operations.

It is noted that redundancy is only for bottom wiring I/O modules.

6.2 Configuring Redundant I/O Modules

Firstly, select which I/O module is to be configured the primary device and which I/O module is to be configured the standby device.

The primary and standby MOX 603 I/O modules must be installed on the same rack and configured with the same Station Number using the DIP-switches on the I/O bases.

The factory default mode for all I/O modules is "Primary".

As a requirement and before anything else, one of the redundant I/O modules should be set as Primary and the other should be set as Standby. This is because if the redundant I/O modules are both "Primary" or both "Standby" as set in their Parameters, they would not cooperate correctly in the system and also the redundant pair cannot be scanned in the MOXGRAF. To configure the "Standby or Primary" parameter and other parameters, the redundant pair of I/O modules with a station address matching both modules must be found by MOXGRAF. Because MOXGRAF will only download Parameters to the active module, it is a must to download Parameters to each module one by one. That is, before downloading the Parameters to a designated Primary module, the user must remove the designated Standby module from the rack and ensure that the "Primary or Standby" parameter in MOXGRAF is set to "Primary". And similarly, the user must remove the designated Primary module from the rack and ensure that the "Primary or Standby" parameter is set to "Standby" before downloading Parameters to the designated Standby module.

Once the configuration described above is completed, the redundant I/O modules can be powered up and initialized simultaneously in subsequent system restart or maintenance.

In normal working conditions, the inactive module will monitor the active module waiting for the opportunity to become active. To identify which module is currently active, look at the LEDs on the I/O module front panel.

- A solid STA LED indicates the module is active.
- A flashing STA LED, 500ms ON/500ms OFF, indicates an inactive module.

6.3 Wiring a Redundant I/O Pair

Refer to "Cabling Guide" of each MOX 603 I/O module that supports redundancy function for its detailed wiring diagrams.

7 A Typical System

For a typical system consists of a controller, MOX Communications Processor and rack-base I/O modules please refer to the figure below:



Figure 144 Example MOX Open Controller to CP & I/O Network

For further information on configuration of the MOX Open Controller or MOX Unity, please refer to the MOX Open Controller User Guide or the MOX Unity Field Controller User Guide.

Appendix A Station Address Information

Station Address	8 Position Dip Switch
1	10000000
2	01000000
3	11000000
4	00100000
5	10100000
6	01100000
7	11100000
8	00010000
9	10010000
10	01010000

Table 111 Station Number & Corresponding Dip Switch Position

Appendix B Product Support

Warranty Information

All MOX manufactured products are warranted to be free from defects in material and workmanship. Our obligation under this warranty will be limited to repairing or replacing, at our option, the defective parts within 1 year of the date of installation, or within 18 months of the date of shipment from the point of manufacture, whichever is sooner. Products may only be returned under authorization. The purchaser will prepay all freight charges to return any products with a valid return authorization number to the designated repair facility.

This limited warranty does not cover loss or damage that may occur in shipment of the goods or due to improper installation, maintenance, misuse, neglect or any cause other than ordinary commercial or industrial use. Warranty is also void if case is opened without manufacturer's consent. This limited warranty is in lieu of all other warranties whether oral or written, expressed or implied.

Liability associated with all MOX products shall not exceed the price of the individual unit that is the basis of the claim. In no event will there be liability for any loss of profits, loss of use of facilities or equipment or other indirect, incidental or consequential damages.

Contact Details

To obtain support for MOX products, call MOX Group on the following numbers or your designated support provider and ask for MOX Support.

E-mail Addresses:

support@mox.com.au

sales@mox.com.au

Visit our web page at:

<http://www.mox.com.au>



Service Information

If you require service, contact your local MOX Group representative. A trained specialist will help you to quickly determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit, an RMA (Return Material Authorization) number will be provided.

All returned materials are tracked with our RMA system to ensure speedy service. You must include this RMA number on the outside of the box so that your return can be processed immediately.

Your MOX Group authorized applications engineer will complete an RMA request for you. If the unit has a serial number, we will not need detailed financial information. Otherwise, be sure to have your original purchase order number and date purchased available.

We suggest that you provide a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RMA form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Most repairs are completed within two days. During busy periods, there may be a longer delay.

If you need a quicker turnaround, ship the unit to us by airfreight. We give priority service to equipment that arrives by overnight delivery. Many repairs received by midmorning (typical overnight delivery) can be finished the same day and returned immediately.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:

Please fill in the following information and keep this manual with your MOX system for future reference:

P.O. #: _____ Date Purchased: _____

Purchased From: _____



© 1999-2013 MOX Group, Australia. All rights reserved
Reproduction in whole or in part without permission prohibited
Features and specifications subject to change without notice
MOX and MOXGRAF are trademarks of the manufacturer
All other trademarks are the property of their respective owners

MOX Group

Web: www.mox.com.au

Email: info@mox.com.au