Analog Output IOP Comparison

Function IOP Models	AO (8 points MC-PAOX03	AO (16 points) MU-PAOY22
IOP Configuration	AO	AO_16
Number of Channels	8	16
Smallest ORU(1)	IOP	IOP
Redundancy(2)	Yes	Yes
Redundancy Method	Outputs Electrically Isolated via Field Replaceable Relay Switch Module on FTA	Parallel Outputs -- Solid-State Switch in IOPs
Redundancy Bias(3)	Yes	No
Output Condition on IOP failure(4)	Configurable	Unpowered
Output Condition on PMM failure(5)	Configurable	Configurable
Single Channel Failure Robustness(6)	High	Medium
External Connection Check(7)	Yes	Yes
Standby Manual(8)	Yes	Yes

(1) The Optimal Replaceable Unit (ORU) is the object that can be replaced on a failure that minimally impacts the operation of the system. The ORU is generally an item that can be replaced in the field using a minimum number of tools. In many cases the item is plug replaceable such as the IOP.

(2) Failure detection coverage for the redundancy option is equivalent.

(3) In a redundant configuration, the primary is a "preferred" primary. System availability is slightly increased when the primary IOP is the “preferred” Primary. Servicing of the FTA switching module can be performed without disturbing the process when the IOP is the “preferred” primary.

(4) The output state upon failure of the AO8 IOP is configurable to either ***Hold*** or ***Unpower*** the output. AO16 outputs are always set to ***Unpowered*** upon failure of the IOP.

(5) The output state upon failure of the PMM for both AO8 and AO16 IOPs is configurable to either ***Hold*** or ***Unpower*** the output.

(6) Channel robustness is different in the two module types. The AO8 provides individual channel output circuitry including individual output power systems and individual DAC output circuits. The AO16 provides one power supply and one DAC per IOP. Individual AO16 outputs are controlled using sample and hold circuitry.

(7) Point level failures are detected by both AO8 and AO16 IOPs. Both IOPs can detect if the output is being correctly propagated to the field (i.e., wires are connected).

(8) The Standby Manual is an optional unit which handles 8 outputs. The AO16 provides a Standby manual function by using two AO8 standby manual units connected into the AO16 FTA.

Digital Input IOP Comparison

Function IOP Models	DI (32 points) MU-PDIX02	DI (32 points) MU-PDIY22	DI SOE (32 points) MU-PDIS12
Number of Channels	32	32	32
IOP Configuration(1)	DI	DI	DISOE
Maximum Input Voltage @ FTA	250 V ac/dc	30 Vdc	250 V ac/dc
Smallest ORU(2)	2 Channels	IOP	2 Channels
Redundancy	No	Yes	Yes

(1) The DI24V is configured into the TPS PM system as a standard DI IOP. This permits using the DI24 V IOP in systems on releases prior to R500. Any PM system requiring only 24 Volt Digital Inputs can use the DI24 V IOP.

(2) The Optimal Replaceable Unit (ORU) is the object that can be replaced on a failure that minimally impacts the operation of the system. The ORU is generally an item that can be replaced in the field using a minimum number of tools. In many cases the item is plug replaceable such as the IOP.

Digital Output IOP Comparison

Function IOP Models	DO (16 points) MU-PDOX02	DO (32 points) MU-PDOY22
IOP Configuration	DO	DO_32
Number of Channels	16	32
Smallest ORU(1)	1 Channel	IOP
Redundancy(2)	No	Yes
Redundancy Method	Solid-state switch in IOP	Solid-state switch in IOP
Relay Minimum Load current Relay FTA)	100 ma	10 ma
Standby Manual Supported	Yes	No
Output Overload Protection(3)	Fuses on FTA per channel	• Fuses on 24 Vdc FTA • No fuse on relay FTA
Contact Bounce Suppression-Relay FTA	Always Installed	Configurable via Jumper
Galvanic Output Isolation - Relay FTA(4)	per Channel	per Channel
Galvanic Output Isolation - SS FTA(4)	per Channel	no per channel isolation
Galvanic Output Isolation(4)	per Channel	per 16 Channels
Output Condition on IOP Failure(5)	Configurable	Unpowered
Output Condition on PMM Failure(6)	Configurable	Configurable
Output Readback Check(7)	Yes	Yes
Number of FTAs Supported(8)	5 (See Below)	2 (Direct & Relay)

(1) The Optimal Replaceable Unit (ORU) is the object that can be replaced on a failure that minimally impacts the operation of the system. The ORU is generally an item that can be replaced in the field using a minimum number of tools. In many cases the item is plug replaceable such as the IOP.

(2) Readback check coverage for the redundancy option is not equivalent. See Output Readback Check.

(3) Compression-type relay FTA for DO-32 has 1 fuse per 2 points. Screw-type relay FTA for DO-32 has 1 fuse per 8 points. Current overload protection for the DO16 is provided on a per channel basis based on the particular FTA used.

(4) All Outputs are galvanically isolated from system common.

(5) The output state upon failure of both the DO16 and DO32 IOP is configurable to either ***Hold*** or ***Unpower*** the output. The DO32 outputs are set to ***Unpowered*** when the on-board power regulator (5 V) has failed.

(6) The output state upon failure of the PMM (or APMM or HPMM) for both DO16 and DO32 IOPs is configurable to either ***Hold*** or ***Unpower*** the output.

(7) The DO32 performs register readback check on the IOP. The DO16 performs actual output readback check including the FTA and FTA cable.

(8) DO16 FTA types are: 120 Vac Electro-Mechanical Relay; 240 Vac Electro-Mechanical Relay; 24 Vdc @100 ma Non-Isolated; 20-200 Vdc Solid State; 3-30 Vdc Solid State; 120/240 Vac Solid State; 31-200 Vdc Solid State.

IOP/FTA Compatibility Matrix

IOP Model Number	FTA Model Number	Description	Red	CE Mark	Term Type(6)	Circuits	Size(1)
MC-PAIH03		**High Level Analog Input**	√	√		16	
	MU-TAIH02	HLAI/STI			C	16	A
	MU-TAIH12	HLAI /STI Redundant	√		C	16	B
	MU-TAIH52	HLAI/STI Redundant	√		S	16	B
	MU-TAIH03	HLAI		√	C	16	A
	MU-TAIH13	HLAI Redundant	√	√	C	16	B
	MU-TAIH53	HLAI Redundant	√	√	S	16	B
	MU-TAIH22	Enhanced Power HLAI /STI	√		C	16	B
	MU-TAIH23	Enhanced Power HLAI	√	√	C	16	B
	MU-TAIH62	Enhanced Power HLAI /STI	√		S	16	B
	MU-GAIH13	GI/IS - Aux. Out (4041B)	√	√	C(3)	16	B
	MU-GAIH83	GI/IS - Aux. Out (4041B)	√	√	CP(3)	16	B
	MU-GAIH14	GI/IS - Aux. & Hi V Out (4041P)	√	√	C(3)	16	B
	MU-GAIH84	GI/IS - Aux. & Hi V Out (4041P)	√	√	CP(3)	16	B
	MU-GAIH22	GI/IS - Aux. Current Out (4041B)	√	√	C(3)	16	B
	MU-GAIH92	GI/IS - Aux. Current Out (4041B)	√	√	CP(3)	16	B
MU-PSTX03		**Smart Xmtr Int. - Multi-Var.**	√	√		16	
	MU-TAIH02	HLAI /STI			C	16	A
	MU-TAIH12	HLAI/STI Redundant	√		C	16	B
	MU-TAIH52	HLAI/STI Redundant	√		S	16	B
	MU-TAIH22	Enhanced Power HLAI/STI	√		C	16	B
	MU-TAIH62	Enhanced Power HLAI/STI	√		S	16	B
	MU-TSTX03	STI		√	C	16	A
	MU-TSTX13	STI Redundant	√	√	C	16	B
	MU-TSTX53	STI Redundant	√	√	S	16	B
	MU-GAIH13	GI/IS - Aux. Out (4041B)	√	√	C(3)	16	B

NOTE: The footnotes are located at the end of the table. (Continued)

IOP / FTA Compatibility Matrix (continued)

IOP Model Number	FTA Model Number	Description	Red	CE Mark	Term Type(6)	Circuits	Size(1)
MU-PSTX03 (cont'd)	MU-GAIH83	GI/IS - Aux. Out (4041B)	√	√	CP(3)	16	B
	MU-GAIH14	GI/IS - Aux. & Hi V Out (4041P)	√	√	C(3)	16	B
	MU-GAIH84	GI/IS - Aux. & Hi V Out (4041P)	√	√	CP(3)	16	B
	MU-GAIH22	GI/IS - Aux. Current Out (4041B)	√	√	C(3)	16	B
	MU-GAIH92	GI/IS - Aux. Current Out (4041B)	√	√	CP(3)	16	B
MU-PAIL02		**Low Level Analog Input**		√		8	
	MU-TAIL02	Low Level Analog Input			C	8	B
	MU-TAIL03	Low Level Analog Input		√	C	8	B
MU-PLAM02		**Low Level Analog Input Mux.**		√		32	
	MU-TAMR03	LLMUX FTA RTD(2)		√	C	16	B
	MU-TAMT03	LLMUX FTA RTD(2)		√	C	16	B
	MU-TAMT13	LLMUX FTA TC w/ Remote CJR(2)		√	C	16	B
MU-PRHM01		**Remote Hardened Mux.**		√		32	
	MU-GRPA01	Intrinsically Safe Power Adapter(7)		√	C(3)	16	A
	MU-TRPA01	Non-Incendive Power Adapter(7)		√	C	16	B
	MC-GRMT01	Remote FTA (7)		√	C	16	12.5 x 12.5 in.
MU-PSDX02		**Serial Device Interface**		√		16 (5)	
	MU-TSDM02	SDI - Manual / Auto Station IF (2)		√	C	1	A
	MU-TSDT02	SDI - Toledo Weigh Cell IF (2)		√	DB25	1	A
	MU-TSDU02	SDI - UDC6000 IF (2)		√	C	1	A

(Continued)

IOP / FTA Compatibility Matrix (continued)

IOP Model Number	FTA Model Number	Description	Red	CE Mark	Term Type(6)	Circuits	Size(1)
MU-PSIM11		**Serial Interface**		√		32(5)	
	MU-TSIA12	SI - Allen Bradley PLC-2/3/5 IF(2)		√	DB25	1	A
	MU-TSIM12	SI - Modbus IF(2)		√	DB25 or C	1	A
MC-PAOX03		**Analog Output (8 Outputs)**	√	√		8	
	MU-TAOX02	AO		√	C	8	A
	MU-TAOX12	AO Redundant	√	√	C	8	B
	MU-TAOX52	AO Redundant	√	√	S	8	B
	MU-GAOX02	GI/IS - AO (4045C)		√	C(3)	8	B
	MU-GAOX72	GI/IS - AO (4045C)		√	CP(3)	8	B
	MU-GAOX12	GI/IS - AO Redundant (4045C)	√	√	C(3)	8	B
	MU-GAOX82	GI/IS - AO Redundant (4045C)	√	√	CP(3)	8	B
MU-PAOY22		**Analog Output (16 Outputs)**	√	√		16	
	MU-TAOY22	AO16 Redundant w/ Stby Man.	√	√	C	16	B
	MU-TAOY52	AO16 Redundant w/ Stby Man.	√	√	S	16	B
	MU-TAOY23	AO16 Redundant w/o Stby Man.	√		C	16	B
	MU-TAOY53	AO16 Redundant w/o Stby Man.	√		S	16	B
MU-PDIX02		**Digital Input**		√		32	
MU-PDIS12		**Digital Input SOE**	√	√		32	
	MU-TDID12	DI 24 Vdc	√	√	C	32	C
	MU-TDID52	DI 24 Vdc	√	√	S	32	C
	MU-TDID72	DI Packaged 24 Vdc			RS	32	C
	MU-TDIA12	DI Isolated 120 Vac	√	√	C	32	C
	MU-TDIA52	DI Isolated 120 Vac	√	√	S	32	C
	MU-TDIA72	DI Pckgd. Isolated 120 Vac			RS	32	C
	MU-TDIA22	DI 240 Vac	√	√	C	32	C
	MU-TDIA62	DI 240 Vac	√	√	S	32	C

(Continued)

IOP / FTA Compatibility Matrix (continued)

IOP Model Number	FTA Model Number	Description	Red	CE Mark	Term Type(6)	Circuits	Size(1)
MU-PDIS12 (cont'd)	MU-GDID12	GI/IS - DI (4016)	√	√	C(3)	32	B
	MU-GDID82	GI/IS - DI (4016)	√	√	CP(3)	32	B
	MU-GDID13	GI/IS - DI Solid-State Relays (4013)	√	√	C(3)	32	B
	MU-GDID83	GI/IS - DI Solid-State Relays (4013)	√	√	CP(3)	32	B
MU-PDIY22		**Digital Input 24 V Only**	√	√		32	
	MU-TDIY22	DI 24 Vdc Only	√	√	C	32	B
	MU-TDIY62	DI 24 Vdc Only	√	√	S	32	B
MU-PPIX02		**Pulse Input**		√		8	
	MU-TPIX12	Pulse Input		√	C	8	B
	MU-TPIX52	Pulse Input		√	S	8	B
MU-PDOX02		**Digital Output (16 Outputs)**		√		16	
	MU-TDON12	DO 24 Vdc, Nonisolated			C	16	B
	MU-TDON52	DO 24 Vdc, Nonisolated			S	16	B
	MU-TDOD13	DO 3-30 Vdc, Solid State			C	16	B
	MU-TDOD53	DO 3-30 Vdc, Solid State		√	S	16	B
	MU-TDOD14	DO 3-30 Vdc, Solid State		√	C	16	B
	MU-TDOD54	DO 3-30 Vdc, Solid State		√	S	16	B
	MU-TDOD23	DO 31-200 Vdc, Solid State		√	C	16	B
	MU-TDOD63	DO 31-200 Vdc, Solid State		√	S	16	B
	MU-TDOA13	DO 120/240 Vac, Solid State		√	C	16	B
	MU-TDOA53	DO 120/240 Vac, Solid State		√	S	16	B
	MU-TDOR12	DO120 Vac/125 Vdc Relay		√	C	16	B
	MU-TDOR52	DO120 Vac/125 Vdc Relay		√	S	16	B
	MU-TDOR22	DO 240 Vac/125 Vdc Relay		√	C	16	B
	MU-TDOR62	DO 240 Vac/125 Vdc Relay		√	S	16	B

(Continued)

IOP / FTA Compatibility Matrix (continued)

IOP Model Number	FTA Model Number	Description	Red	CE Mark	Term Type(6)	Circuits	Size(1)
MU-PDOX02 (cont'd)	MU-GDOL12	GI/IS - DO w/ line fault dect.(4023)		√	C(3)	16	B
	MU-GDOL82	GI/IS - DO w/ line fault dect.(4023)		√	CP(3)	16	B
	MU-GDOD12	GI/IS - DO (4021)		√	C(3)	16	B
	MU-GDOD82	GI/IS - DO (4021)		√	CP(3)	16	B
	MU-GLFD02	GI/IS DO Combiner Panel		√	N/A	32	A
MU-PDOY22		**Digital Output (32 Outputs)**	√	√		32	
	MU-TDOY22	Digital Output 32, 24 Vdc	√	√	C	32	B
	MU-TDOY62	Digital Output 32, 24 Vdc	√	√	S	32	B
	MU-TDOY23	Digital Output 32, Relay(4)	√	√	C	16	B
	MU-TDOY63	Digital Output 32, Relay(4)	√	√	S	16	B
		Misc. / Multiple Use FTAs					
	MU-TLPA02	LLMUX, SI, SDI Power Adapter		√	C	2	A
	MU-TDPR02	DI Power Distribution FTA		√	S	12	A
	MU-GPRD02	GI/IS Power Distribution FTA		√	N/A	12	A
	MU-GMAR52	GI/IS — Marshalling Panel		√	S	16	B

(1) Length: A = 15.24 cm/6.0 in.
B = 30.73 cm/12.1 in.
C = 46.228 cm/18.2 in.

(1) Width: All FTAs except GI/IS FTAs = 12.065 cm/4.75 in.
All GI/IS FTAs = 12.446 cm/4.90 in.
MU/MC-TAIL03 = 13.335 cm/5.25 in.

(2) Requires Power Adapter FTA.

(3) Terminals are on top of the GI/IS modules.

(4) One FTA supports up to 16 circuits. When 17-32 circuits are used, 2 FTAs are required. Bridge cable MU-KBFT01 or MU-KBFT02 is required to connect the two FTAs.

(5) Number of Circuits denotes number of logical connections.

(6) For nongalvanically isolated FTAs, the terminal connector types are compression (C), nonremovable screw (S), and removable screw (RS). For galvanic isolation type FTAs, the terminal connector types are compression (C), and crimp pin (CP). The Marshalling Panel has nonremovable screw (S) terminals.

(7) The MC-GRMT01 is a remotely mountable Field Termination for Thermocouple inputs. Two of these FTAs can be connected to a single Power Adapter (MU-GRPA01 or MU-TRPA01) depending on the hazardous environment. The Power Adapter is, in turn, connected to the IOP (MU-PRHM01).

Model Numbers

Description	Uncoated Model Number	Coated Model Number (see note)
I/O Processors		
High Level Analog Input Processor (16 Inputs)	n/a	MC-PAIH03
Smart Transmitter Interface (Multivariable) Processor (16 Inputs)	MU-PSTX03	MC-PSTX03
Serial Device Interface Processor (16 Points/Port)	MU-PSDX02	MC-PSDX02
Serial Interface Processor (16 Points/Port)	MU-PSIM11	MC-PSIM11
Low Level Analog Input Processor (8 Inputs)	MU-PAIL02	MC-PAIL02
Low Level Analog Input Multiplexer Processor (32 Inputs)	MU-PLAM02	MC-PLAM02
Remote Hardened Multiplexer IOP (32-Points)	MU-PRHM01	MC-PRHM01
Pulse Input Processor (8 Inputs)	MU-PPIX02	MC-PPIX02
Analog Output Processor (8 Outputs)	n/a	MC-PAOX03
Analog Output 16 Processor (16 Outputs)	n/a	MC-PAOY22
Digital Input Processor (32 Inputs)	MU-PDIX02	MC-PDIX02
Digital Input Processor for Sequence of Events (32 Inputs)	MU-PDIS12	MC-PDIS12
Digital Input 24 Vdc Processor (32 Inputs)	MU-PDIY22	MC-PDIY22
Digital Output Processor (16 Outputs)	MU-PDOX02	MC-PDOX02
Digital Output 32 Processor (32 Outputs)	MU-PDOY22	MC-PDOY22
Blank Filler Plate for I/O Slot	MU-PFPX01	n/a
I/O Link Extender Pair–Main Location	MU-IOLM02	MC-IOLM02
I/O Link Extender Pair–Remote Location	MU-IOLX02	MC-IOLX02
Long Distance I/O Link Extender Pair	MU-ILDX03	MC-ILDX03
I/O Link Extender Shroud (EC)	MU-ILES01	n/a
NOTE: MC model numbers indicate conformally coated boards. All IOPs are available conformally coated (MC models).		

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