Input, High Level Analog Input, STI, Analog Output, Pulse Input, and 24 Vdc Digital Input.

Power Systems

The Advanced Process Manager has significantly lower power requirements than traditional designs because it uses low-power CMOS technology. Two power systems are available to meet different system requirements.

The standard APM power system provides an integrated system battery backup option. The power system can also be easily upgraded to redundancy in the field.

The AC-Only power system is intended for use with UPS systems and does not have provision for system battery backup. It can provide more cost-effective power for a small, remote I/O installation where a UPS is available.

Both power systems provide 24 Vdc power to the Advanced Process Manager Module and I/O Subsystem, and 24 Vdc transmitter power is provided through standard FTA connections. Both power systems support single or redundant power supplies in a highly compact space.

Both power systems provide 50-hour memory backup; the standard system includes rechargeable batteries with a charger, while the AC-Only power system uses alkaline batteries.

Each power supply on both systems provide a relay with a Form-A contact output that de-energizes (contact opens) in the event of power loss.

A single LED on each power module of the AC-Only system annunciates power loss, while the standard system has separate LED indicators for

- Loss of ac power
- Loss of dc power
- Improper charging of backup battery
- Failure or disconnection of battery
- High temperature

The standard APM power system delivers 20 amps. Two power supply sizes are available for the AC-Only power system—8 amp and 16 amp.

Table 7 — FTA Sizes

FTA Type	Compr'n Terminals	Screw Terminals	Circuits	Size(1)
High Level Analog Input/STI	√		16	A
High Level Analog Input/STI		√	16	B
HL Analog Input/STI (Redundant)	√	√	16	B
Low Level Analog Input	√		8	B
Low Level Analog Input Multiplexer (2)	√		16	B
Serial Device Interface (2)			1	A
Serial Interface (2)			1	A
Power Adapter				A
Analog Output	√		8	A
Analog Output		√	8	B
Analog Output (Redundant)	√	√	8	B
Digital Input—24 Vdc	√	√	32	C
Digital Input—120 Vac	√	√	32	C
Digital Input—240 Vac	√	√	32	C
Power Distribution FTA	√		12	A
Pulse Input	√	√	8	B
Digital Output—24 Vdc, Nonisolated Solid State	√	√	16	B
Digital Output—3-30 Vdc Solid State	√	√	16	B
Digital Output—31-200 Vdc Solid State	√	√	16	B
Digital Output—120/240 Vac Solid State	√	√	16	B
Digital Output—120 Vac/125 Vdc Relay	√	√	16	B
Digital Output—240 Vac/125 Vdc Relay	√	√	16	B
I.S. Galvanic Isolation—HLAI/STI FTA	√		16	B
I.S. Galvanic Isolation—AO FTA	√		16	B
I.S. Galvanic Isolation—DI FTA	√		16	B
I.S. Galvanic Isolation—DOFTA	√		16	B
I.S. Galvanic Isolation—Marshalling Panel		√	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 I.S. Galvanic Isolation) = 12.065 cm/4.75 in.
(all I.S. Galvanic Isolation FTAs) = 12.446 cm/4.90 in.

(2) Requires Power Adapter FTA (see Figures 9 and 10).

Card File Assemblies

A typical base APM configuration consists of up to three card files, as illustrated in Figure 11. When options such as I/O redundancy and/or remote I/O are used, configurations with up to eight card files can be provided. One or two card files contain the Advanced Process Manager Module(s). All remaining card file slots can be filled with any combination of I/O Processors. A single cabinet holds up to 35 I/O Processors along with redundant Advanced Process Manager Modules. Alternatively, it holds up to 40 I/O Processors with a single Advanced Process Manager Module. Figure 11

shows the cabinet layout with redundant APMMs.

Field Termination Assemblies

All connections to and from the process are made to Field Termination Assemblies (FTAs). Compression-type termination blocks (that can accept wire sizes as large as 14 AWG) are available for all FTAs. Screw-type terminations can also be provided for most FTAs as shown in Table 7.

The FTAs are connected to the I/O processors by cables that can be up to 50 meters in length. Three sizes of FTAs are used (Table 7). FTAs can be mounted in cabinets, or remotely, using Termination Mounting Channels. Digital input sense and 24 Vdc transmitter power are provided through standard FTA connections.

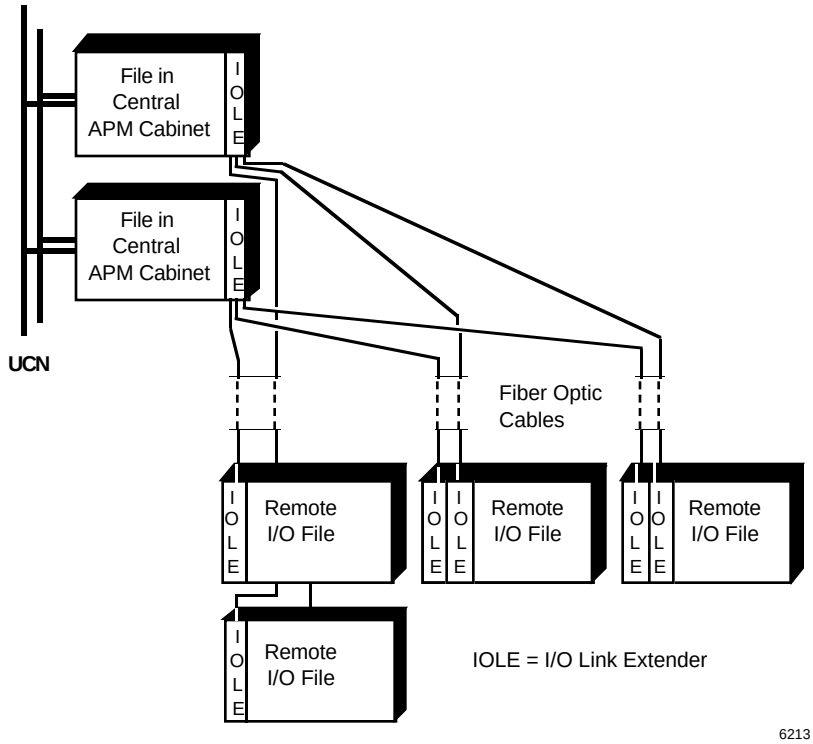

Figure 12 — Fiber Optic Remote I/O—1 Kilometer

Options

Advanced Process Manager Module Redundancy

In addition to the Universal Control Network, the I/O Link, and dc power cabling, which are always redundant, the Advanced Process Manager Module has a one-on-one redundancy option. In order to minimize the impact of a single failure, the database and functions within the backup APMM are kept up-to-date with the primary. If failure of the primary is detected by diagnostics that are continually being executed, the backup APMM automatically takes over from the primary and the operator is notified by a system alarm. The primary and secondary APMM can be located in separate card files to maximize control function availability.

I/O Redundancy

A one-on-one I/O redundancy option is also available for critical high level analog inputs, smart transmitter interface connections, and analog outputs. This option offers significantly increased availability of automatic control by providing continuous operation through failure and replacement of I/O Processors, FTA cables, backplanes, and AO switching hardware. Up to 40 I/O Processors can be supported in a redundant Advanced Process Manager, and the user can selectively apply redundancy to some or all IOPs, for a maximum of 40 IOP pairs. The one-on-one design approach offers maximum coverage and fast switchover times. Integrity of the backup database and of the switching functions is provided through the extensive diagnostic coverage made possible by the processing capability of the smart I/O Processors.

Power System Redundancy

Both standard and AC-Only power systems include the option for a redundant 24 Vdc power supply. In both cases, two different ac feeds can be used for the power system. No rearrangement of devices within a cabinet is necessary and, with the standard power system, the second power supply may be added at a future date.

Battery Backup

An option to the standard APM power system is a backup battery capable of providing regulated 24 Vdc power in the event of the loss of ac input power. The battery is a compact set of gel cells that is mounted within the cabinet's power system enclosure.

A fully charged battery provides a minimum of 20 minutes of backup for a fully loaded Advanced Process Manager.

Diagnostic and alarm capabilities inform the operator of the existing state of readiness of the battery and charger.

Because the backup batteries provide input to the power supplies, rather than powering

Digital Output Processor **MU-PDOX02**

Solid State			
Parameter	**Specification**		
	3-30 Vdc FTA	**120/240 Vac FTA**	**5-200 Vdc FTA**
FTA Model Numbers	MU-TDOD13, TDOD53	MU-TDOA13, TDOA53	MU-TDOD22, TDOD32
Output Channels	16 (Outputs are independent from each other and can use independent load power supplies.)	16 (Outputs are independent from each other and can use independent load power supplies.)	16 (Outputs are independent from each other and can use independent load power supplies.)
Output Type	Normally open power transistor switch per output (emitter and collector terminals are both available to the user.)	Normally open triac switch per output (both triac terminals are available to the user)	Normally open power transistor switch per output (emitter and collector terminals are both available to the user.)
Load Voltage Range	3-30 Vdc	120/240 Vac	5-200 Vdc
FTA Max Continuous Load Current	1.25 Adc per output (2)	1.25 Adc per output (2)	0.5 Adc per output (2)
Load Fusing	2.5 A 125 V SB (5x20 mm) fuse per output (readily replaceable in fuseholders)	2.5 A 250 V SB (5x20 mm) fuse per output (readily replaceable in fuseholders)	1 A 250 V SB (5x20 mm) fuse per output (readily replaceable in fuseholders)
Load Power Factor	N/A	Must be 0.5 or greater(1)	N/A
Min. Load Current(3)	10 mAdc	50 mA (rms)	10 mAdc
Isolation	1500 V (rms) (field terminals to APM system power supply common)	1500 V (rms) (field terminals to APM system power supply common)	1500 V (rms) (field terminals to APM system power supply common)
On-State Voltage Drop	1.6 V max. (@ max. load current)	1.6 V max. (@ max. load current)	1.6 V max. (@ max. load current)
Off-State Leak. Max.	10 µA DC	5 mA rms	2 mAdc max.
Turn-on/Turn-off Time	1 ms max.	Next zero voltage/next zero current(4)	1 ms max.
Contact Suppression (Shunt)	Diode clamp	Resistor/capacitor snubber plus varistor per output	Diode clamp
Fuse Type (BUSS)	GDC-2.5A	GDC- 2.5A	GDC-1A
Surge Protection	IEEE SWC 472-1974	IEEE SWC 472-1974	IEEE SWC 472-1974

(1) Load power factors less than 0.5 can damage the triac switches. Additional resistor/capacitor snubbing must be added across the triac as discussed in the *Advanced Process Manager Installation* manual for load power factors less than 0.5; otherwise, a load with power factor 0.5, or greater, must be used.

(2) Individual output rated at maximum 2 Adc, provided that total current for two adjacent channels does not exceed 2.5 amps.

(3) Surge current rating of solid-state switch at 20°C nonrepeating.

(4) As much as 0.5 line cycle (8.33 ms for 60 Hz line) for power factor <1.0.

(5) Actual fuse rating is slightly greater than the maximum FTA output allowed. Use the “FTA Max Continuous Load Current” section for maximum FTA output rating.

(Continued)

Digital Output Processor (continued)

Solid State (continued)	
Parameter	**Specification**
	24 Vdc Nonisolated FTA
FTA Model Numbers	MU-TDON12, TDON52
Output Channels	16 (outputs referenced to Advanced Process Manager power supply common)
Output Type	Open-collector (current-sinking) NPN transistors
Output Volt. States(1)	ON-state: 0-2 Vdc (maximum) OFF-state: "Ref +" terminal voltage (24 Vdc nominal)
Maximum Load Current	100 mA per output(2)
Minimum Load Current	1 mA per output
Output Isolation	None (any screw terminal to APM common)
On-State Voltage Drop	2 V max. @ max. load current
Off-State Leak. Current	100 μA max. @ max. output voltage
Turn-on/Turn-off Time	10 μs
Contact Suppression (Shunt)	Diode per output to "Ref +" terminal(3)
Output Transient Protection	(See Contact Suppression)

(1) Because of the open-collector transistor configuration of the outputs, the nominal off-state output voltage is the load power supply ("Ref +") voltage, nominally +24 Vdc, minus any voltage across the load caused by off-state leakage current.

(2) All outputs ON (100% duty cycle) at maximum operating temperature.

(3) User must diode-suppress any inductive loads (such as relay coils) as close as possible to the load.

(Continued)

Digital Output Processor (continued)

Electro-Mechanical Relay—120 Vac FTA, 125 Vdc FTA	
Parameter	**Specification**
FTA Model Numbers	MU-TDOR12, TDOR52
Outputs	16 isolated Form A (SPST/NO) or Form B (SPST/NC) contacts (jumper selectable per output)
Contact Type	Silver alloy
Maximum Load Voltage	140 Vac (rms)/140 Vdc
Maximum Steady-State Load Current	5 A rms @ 120 Vac (resistive) per output 2 A @ 30 Vdc (resistive) per output 0.5 A @ 125 Vdc (resistive) per output 1/8 horsepower per output
Minimum Load Current(1)	100 mA
Load Surge Current(2)	Overload and Endurance per UL 508
Isolation	1500 V (rms) (field terminals to APM system power supply common)
Turn-on Time	10 ms typical, 15 ms maximum
Turn-off Time	10 ms typical, 15 ms maximum
Maximum Repetition Rate	1,000 cycles per hour at rated load
Contact Life(3)	Operations — % of Max. Load 350,000 — 100 450,000 — 80 750,000 — 60 1,000,000 — 40 1,300,000 — 20 20,000,000 — 0 (Mechanical Life)
Contact Suppression (Shunt)	20 Ω/0.1 μF resistor/capacitor snubber and varistor across each contact
Load Fusing on Termination Assembly	6 A 125 V slow-blow (5x20 mm) fuse per output
Surge Protection	IEEE SWC 472-1974

(1) The “power contacts” in these relays are not suitable for load currents less than 100 mA.

(2) Rating of relay contact, not fuse. Load surge (inrush) currents greater than maximum steady-state load currents, shown above, further reduce contact life beyond deratings; for example, 2x surge = 150,000 operations, 3x surge = 50,000 operations.

(3) For resistive loads (power factor = 1.0); derate linearly by 5% at 0.9 load power factor to 50% at 0.1 load power factor.

(Continued)