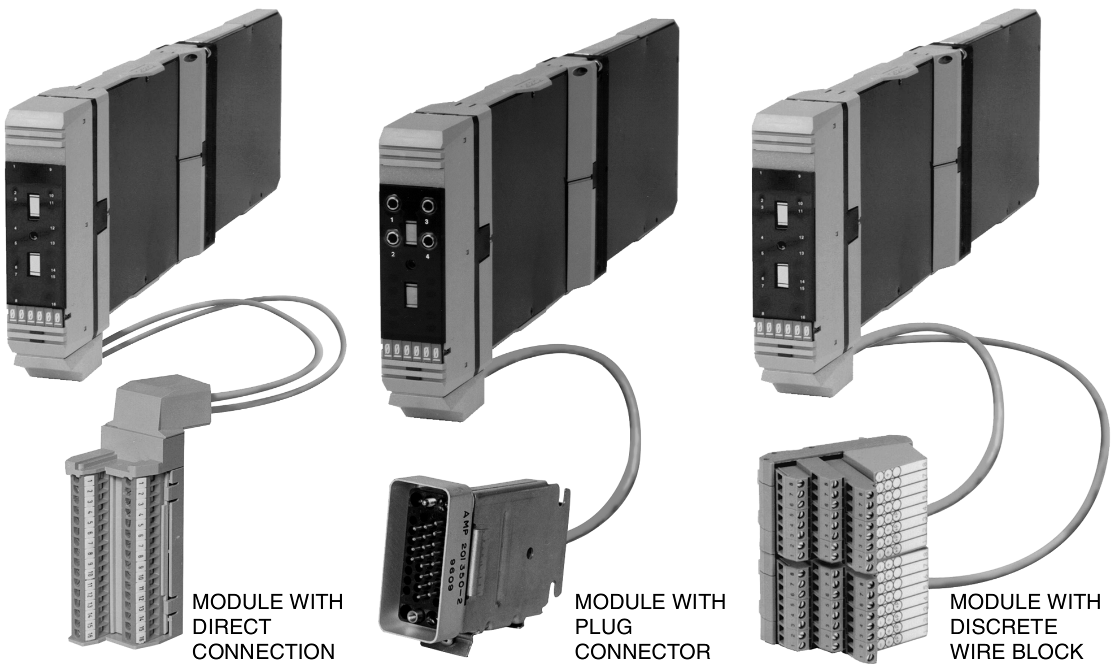
FOXBORO®

PSS 21H-2B1 B3

I/A Series® Hardware Fieldbus Modules



MODULE WITH DIRECT CONNECTION BLOCK

MODULE WITH PLUG CONNECTOR BLOCK

MODULE WITH DISCRETE WIRE BLOCK

Fieldbus Modules provide the interface between process sensors/actuators and the redundant Fieldbus. The modules appropriately convert the electrical input/output signals used by field devices to permit communication with these devices via the Fieldbus. The Fieldbus Modules available for use with I/A Series systems are partitioned into three categories; main modules, expandable main modules and expansion modules.

Main Modules

Each main module independently connects to the Fieldbus, has a fixed (that is, nonexpandable) capacity of field input/output channels, and performs the signal conversions and other related operational executions required for these resident input/output channels. All main modules contain the following:

- Digital processor
- Dual transceivers (for Fieldbus communications)
- Memory
- dc/dc power converter (accepts redundant power inputs)
- Security logic
- Power security and on-line self-check circuits.

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Expandable Main Modules

Each expandable main module independently connects to the Fieldbus, performs signal conversions and other related operational executions required for resident input/output channels and can functionally support a single expansion module. Optional use of an expansion module increases the capacity of field input/output channels to accommodate additional field signals of the same or different kind.

All expandable main modules contain the following:

- Digital processor
- Dual transceivers (for Fieldbus communications)
- Memory
- dc/dc power converter (accepts redundant power inputs)
- Security logic
- Power security and on-line self-check circuits.

Expansion Modules

Each expansion module connects to the Fieldbus via an expandable main module and is functionally dependent on the supporting main module for performance of signal conversions and other related operational executions.

Expansion modules are optionally used to either increase the input/ output capacity for field signals that are the same as those interfaced through the supporting main module or provide a supplemental input/output capacity to accommodate field signals that are different from those interfaced through the supporting main module.

Calibration

Analog input/output modules are calibrated at the factory prior to shipment and do not require field calibration. In addition, digital input/output modules do not require field adjustments. Accordingly, the Fieldbus Modules do not contain local (that is, module-mounted) manual controls or jumpers.

Configuration

The selected input/output functions for multifunction modules are reflected through use of a termination cable assembly appropriate to those specific functions. In addition, each Fieldbus Module is configurable for operation with the applicable field sensors and/or actuators through execution of appropriate application programs in conjunction with their respective configurable options. The executable programs and configurable options for main modules are identified in Table 1. The executable programs and configurable options for the combinations of expandable main and expansion modules are identified in Table 2.

Table 1. Main Fieldbus Module Configurations

Module Name	Type**	Application Program Description	Configurable Option(s) Description*
0 to 20 mA Input Interface	FBM01	Analog Inputs	Input Resolution
0 to 20 mA Input/Output Interface	FBM04	Analog I/O	Input Resolution, Fail-safe Configuration (Hold/Fallback), and Output Fail-safe Fallback Data
0 to 20 mA Redundant Input/Output Interface	FBM05	Redundant Analog I/O Output Diode O-Ring	Input Resolution, Fail-safe Configuration (Hold/Fallback), and Output Fail-safe Fallback Data
Pulse Input, 0 to 20 mA Output Interface	FBM06	Pulse Input/Analog Output	Pulse Rate Input Resolution, Meter Scaling Factor, Fail-safe Configuration and Output Fail-safe Fallback Data
Single 4 to 20 mA Input/Output Auto/Manual Interface	FBM22	Analog I/O	Input Resolution, Fail-safe Configuration (Hold/Fallback), and Output Fail-safe Fallback Data
Thermocouple/Millivolt Input Interface	FBM02	Analog Inputs	Input Resolution
RTD Input Interface (Platinum and Nickel)	FBM03	Analog Inputs	Input Resolution

Table 1. Main Fieldbus Module Configurations (Continued)

Module Name	Type**	Application Program Description	Configurable Option(s) Description*
0 to 10 V dc, Contact/dc Input/Output Interface	FBM17	Digital I/O, Analog I/O	Digital: Input Filter Period, Sustained or Momentary Outputs (if momentary, then Pulse Output Interval), Fail-safe Configuration and Fail-safe Fallback Analog: Input Resolution, Fail-safe Configuration (Hold/Fallback) and Output Fail-safe Fallback Data
Intelligent Transmitter Interface	FBM18	Intelligent Transmitter Interface	None
RTD Input Interface (Copper)	FBM33	Analog Inputs	Input Resolution
Thermocouple/Millivolt Input Interface (Type R)	FBM36	Analog Inputs	Input Resolution
0 to 20 mA Output Interface	FBM37	Analog Outputs	Fail-safe Configuration (Hold/Fallback) and Output Fail-safe Fallback Data
Intelligent Transmitter, 0 to 20 mA Output Interface	FBM39	Intelligent Transmitter Interface	Intelligent Transmitter: None 0 to 20 mA Output: Fail-safe Configuration (Hold/Fallback) and Output Fail-safe Fallback Data
Dual Baud Rate Intelligent Transmitter Interface	FBM43	Intelligent Transmitter Interface, Dual Baud Rate	Baud Rate is software selected by transmitter or Hand-Held Terminal to either 4800 or 600 Baud
Dual Baud Rate Intelligent Transmitter, 0 to 20 mA Output Interface	FBM44	Intelligent Transmitter Interface, Dual Baud Rate	Intelligent Transmitter: Baud Rate is Software Selected by Transmitter or Hand-Held Terminal to either 4800 or 600 Baud 0 to 20 mA Output: Fail-safe Configuration (Hold/Fallback) and Output Fail-safe Fallback Data
Redundant Dual Baud Rate Interface to Intelligent Transmitters and Redundant Analog Outputs	FBM46	Single IT to Redundant FBM Channels. Two Redundant FBM-Channel Pairs to Single I/P via Diode O-Ring	Intelligent Transmitter: Baud Rate is software selected by transmitter or hand-held terminal to either 4800 or 600 Baud. At 600 Baud, there can be a simultaneous 0 to 20 mA analog signal for emergency shutdown use. 0 to 20 mA Output: Fail-safe Configuration (Hold/Fallback), Analog Output Fail-safe Fallback Data (per channel basis), Fieldbus Switching Enable, and Fieldbus Switching Time.

*Configurable options for inputs are exercised on a per module basis; those for outputs are exercised on a per channel basis.
**The type code is used as a convenient identifier only; it is not a model number.

Table 2. Expandable Main and Expansion Fieldbus Module Configurations

Module Combinations (Field Signal Interface Capability)			
Expandable Main (See Table 3)	**Expansion (See Table 4)**	**Application Program Description***	**Configurable Option(s) Description****
Input Only	Input Only	Digital I/O, Sequence of Events Monitor, Pulse Count Inputs or Ladder Logic	Input Filter Period
Input Only	Input/Output	Digital I/O or Ladder Logic	Input Filter Period, Sustained or Momentary Outputs (if Momentary, then Pulse Output Interval), Fail-safe Configuration and Fail-safe Fallback
Input/Output	Input Only	Digital I/O or Ladder Logic	Input Filter Period, Sustained or Momentary Outputs (if Momentary, then Pulse Output Interval), Fail-safe Configuration and Fail-safe Fallback
Input/Output	Input/Output	Digital I/O or Ladder Logic	Input Filter Period, Sustained or Momentary Outputs (if Momentary, then Pulse Output Interval), Fail-safe Configuration and Fail-safe Fallback

*The application programs are executed by the supporting main module.
**Configurable options for inputs are exercised on a per module basis; those for outputs are exercised on a per channel basis

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Table 3. Expandable Main Modules*

Field Signal Interface Capability	**Module Name**	**Type****
Input Only	Contact/dc Input Interface	FBM07
Input/Output	Contact/dc Input/Output Interface	FBM09
Input/Output	High Power Contact/dc Input/Output Interface	FBM41
Input Only	Contact/125 V dc Input Interface	FBM24
Input/Output	Contact/125 V dc Input/Output Interface	FBM26
Input Only	120 V ac Input Interface	FBM08
Input/Output	120 V ac Input/Output Interface	FBM10
Input Only	240 V ac Input Interface	FBM20
Input/Output	240 V ac Input/Output Interface	FBM11

*Each expandable main module can support any one of the expansion modules.
**The type code is used as a convenient identifier only; it is not a model number.

Table 4. Expansion Modules*

Field Signal Interface Capability	**Module Name**	**Type****
Input Only	Contact/dc Expansion Input Interface	FBM12
Input/Output	Contact/dc Expansion Input/Output Interface	FBM14
Input/Output	High Power Contact/dc Expansion Input/Output Interface	FBM42
Input Only	Contact/125 V dc Expansion Input Interface	FBM25
Input/Output	Contact/125 V dc Expansion Input/Output Interface	FBM27
Input Only	120 V ac Expansion Input Interface	FBM13
Input/Output	120 V ac Expansion Input/Output Interface	FBM15
Input Only	240 V ac Expansion Input Interface	FBM21
Input/Output	240 V ac Expansion Input/Output Interface	FBM16

*Each expandable main module can support any one of the expansion modules.
**The type code is used as a convenient identifier only; it is not a model number.

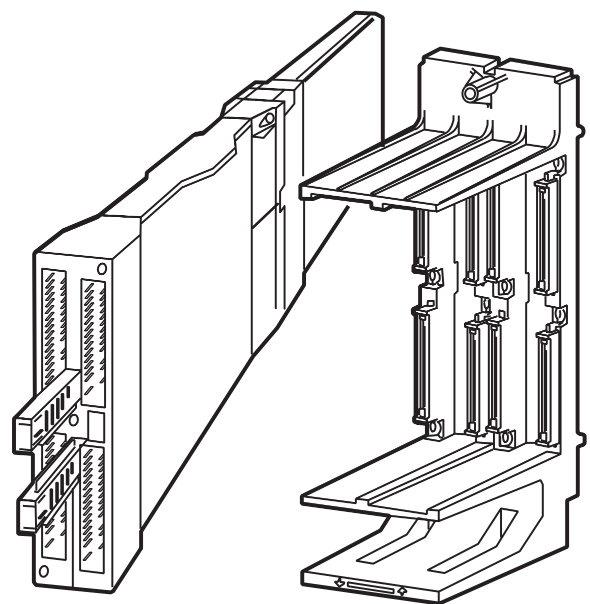
Packaging

All Fieldbus Modules are packaged as structurally identical plug-in modular assemblies that employ a void-filling material to prevent airborne contamination of the internally mounted electrical components. Each module contains integral exterior connectors for power inputs to the module, field input/output signals and Fieldbus communications.

Implementation

Each Fieldbus Module can be installed in any I/A Series system enclosure. When the modules are used in any enclosure other than Field Enclosure 4, Y-adapters are required. The adapter resides in the enclosure and accommodates two Fieldbus Modules; it provides a physical support for the modules and forms an associated wireway for the interconnecting cable portion of the termination cable assembly that is used for signal input/output wiring between field devices and Fieldbus Modules. In addition, the adapter connects the Fieldbus and power bus(es) to the modules and provides the interconnections between a main and an expansion module pair. Main and expanded FBM pairs must be both in the same Y-adapter. When the modules are used in a Field Enclosure 4, an integral bus connects the Fieldbus and power to the modules and provides, at adjacent slots, the interconnections between a main and expansion module pair.

A main and expanded FBM pair must be installed in any mounting structure with the main FBM in an odd slot section, and the expansion module in the adjacent even slot.



Communication

All communication with Fieldbus Modules is accomplished via a redundant Fieldbus.The Fieldbus is a single-master party-line serial data communications bus that employs asynchronous protocol and conforms to the general requirements of EIA standard RS-485. All Fieldbus transactions are initiated by a master station and the connected Fieldbus Modules are the slave devices (that is, they only acknowledge requests for data and respond to commands).The Fieldbus offers a high degree of security by providing complete protection against single-bit, double-bit, and odd-bit number errors. It also provides a high degree of protection against burst errors. In addition, the Fieldbus is immune to Fieldbus Module failures to the extent that no single failure in any one module can cause both segments of the redundant Fieldbus to become inoperable.

Field Connections

Field connections are accomplished using a termination cable assembly applicable to the enclosure containing the module and equipped with a connector appropriate to the module function with respect to the field wiring requirements. The termination cable assemblies are identified under two implementation categories defined as: those used when the Fieldbus Modules are installed in Field Enclosure 4, and those used when the modules are installed in any enclosure other than Field Enclosure 4.

Field Enclosure 4

Field wiring within this enclosure is accomplished using a separate termination cable assembly for each Fieldbus Module. Each assembly consists of a module-mounted termination connector and an integrally connected direct connection block that is dedicated exclusively to the module and is located immediately beneath the module. Field wires are individually connected directly to the block associated with a module.

Other Enclosures

Field wiring within any enclosure other than those identified above is similarly accomplished using a separate termination cable assembly for each Fieldbus Module. Each assembly consists of a module-mounted termination connector that is connected via a cable to either a discrete wire block or plug connector block located in a designated area on either side of the enclosure and dedicated exclusively to the module. (When the modules are contained in a 1x8 Mounting Structure, the blocks are located in designated areas within the customer-selected rack that houses the mounting structure.) Field wires can be individually connected directly to the discrete wire block associated with the module or can be terminated in a marshalling cabinet and subsequently connected via a multiconductor cable connector to the plug connector block associated with the module.

Termination Connector

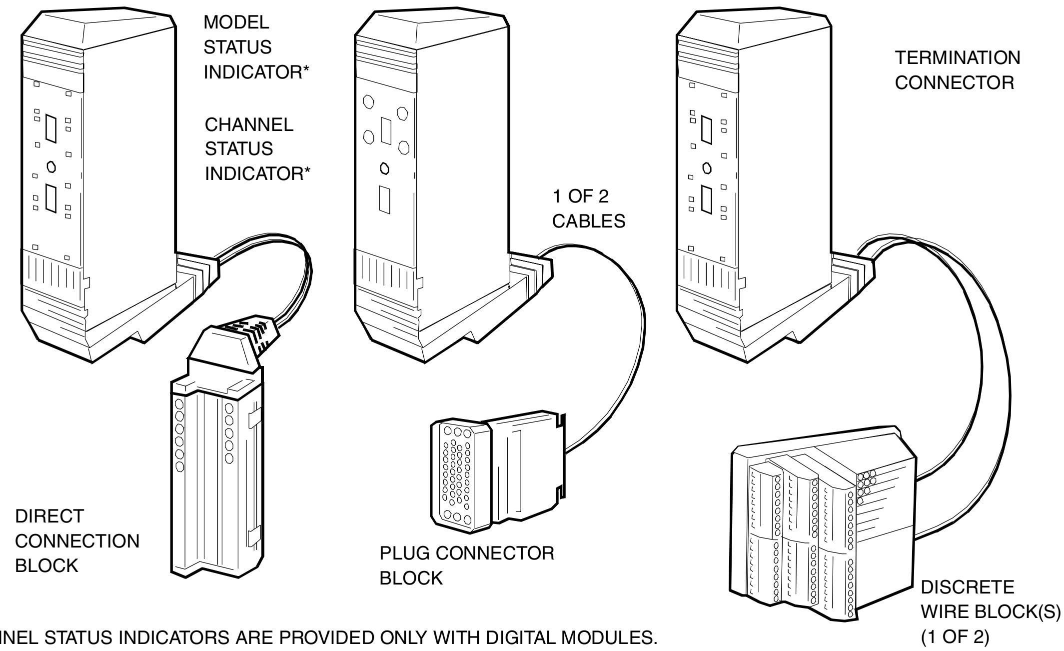
The termination connector on each termination cable assembly mounts on the front of the Fieldbus Module and incorporates integral status indicators, a receptacle for the module identifier and (when applicable to 0 to 20 mA analog output modules) a current source bypass jack.

- *Status Indicators* — Light-emitting diodes (LEDs) incorporated into the front of the termination connector provide visual status indications of Fieldbus Module functions.

  The termination connectors applicable to analog input/output modules employ two LEDs to logically represent the operational status of the module. The termination connectors applicable to digital input/output modules employ two LEDs to logically represent the operational status of the module and one LED for each I/O channel to indicate its status (that is, the state of the input/output signal).

- *Module Identifier* — The module identifier is a user-definable labeling device consisting of six interlocking and interchangeable elements (letterbugs) which produce a 6-character module identification code that is visually and electrically readable.The letterbugs are available in 52 standard characters and 12 special characters.

- *Bypass Jacks* — Bypass jacks are included on the front of most of the termination connectors applicable to analog output current Fieldbus Modules. The exception is the FBM37. The jack accepts a plug from the output bypass station and enables the output bypass station to drive the output channels of the modules during module replacement. The FBM37 discrete termination cable assembly has the jacks at the field wiring end of the cable.



* CHANNEL STATUS INDICATORS ARE PROVIDED ONLY WITH DIGITAL MODULES.
MODULE STATUS INDICATORS AND LETTERBUGS ARE USED WITH ALL MODULES.

** BYPASS JACKS (NOT SHOWN), APPLICABLE TO SOME ANALOG MODULES, ARE LOCATED IN THIS AREA.

Fieldbus Module Summary

The attributes of the Fieldbus Modules available for use with I/A Series systems are summarized in Table 5.

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Table 5. Fieldbus Modules

Name	Type+	Kind*	Application Program Execution	Field Signal Channels: Input Analog	Input Digital	Output Analog	Output Digital	Specification Reference
0 to 20 mA Input Interface	FBM01	M	Self	8	0	0	0	PSS 21H-2B1 B4
0 to 20 mA Input/Output Interface	FBM04	M	Self	4	0	4	0	PSS 21H-2B7 B4
0 to 20 mA Redundant Input/Output Interface	FBM05	M	Self	4	0	4	0	PSS 21H-2B8 B4
Pulse Input, 0 to 20 mA Output Interface	FBM06	M	Self	4	0	4	0	PSS 21H-2C1 B4
Single 4 to 20 mA I/O Auto/Manual Interface	FBM22	M	Self	1	0	1	0	PSS 21H-2E1 B4
Thermocouple/ Millivolt Input Interface	FBM02	M	Self	8 + 1**	0	0	0	PSS 21H-2B3 B4
RTD Input Interface	FBM03	M	Self	8	0	0	0	PSS 21H-2B5 B4
RTD Input Interface	FBM33	M	Self	8	0	0	0	PSS 21H-2E7 B4

Table 5. Fieldbus Modules (Continued)

Name	Type+	Kind*	Application Program Execution	Field Signal Channels				Specification Reference
				Input		Output		
				Analog	Digital	Analog	Digital	
0 to 10 V dc, Contact/dc Input/Output Interface	FBM17	M	Self	4	4	2	4	PSS 21H-2D3 B4
Intelligent Transmitter Interface	FBM18	M	Self	0	8	0	0	PSS 21H-2D5 B4
Thermocouple/ Millivolt Input Interface (Type R)	FBM36	M	Self	8 + 1**	0	0	0	PSS 21H-2E8 B4
0 to 20 mA Output Interface	FBM37	M	Self	0	0	8	0	PSS 21H-2D9 B4
Intelligent Transmitter, 0 to 20 mA Output Interface	FBM39	M	Self	0	4	4	0	PSS 21H-2C4 B4
Dual Baud Rate Intelligent Transmitter	FBM43	M	Self	0	8***	0	0	PSS 21H-2D8 B4
Dual Baud Rate Intelligent Transmitter, 0 to 20 mA Output Interface	FBM44	M	Self	0	4***	4	0	PSS 21H-2D4 B4
Redundant Dual Baud Rate Interface to Intelligent Transmitters and Redundant Analog Outputs	FBM46	M	Self	0	4****	4	0	PSS 21H-2D2 B4
Contact/dc Input Interface	FBM07	EM	Self	0	16	0	0	PSS 21H-2C3 B4
Contact/dc Expansion Input Interface	FBM12	E	Via a Main	0	16	0	0	PSS 21H-2C3 B4
Contact/dc Input/Output Interface	FBM09	EM	Self	0	8	0	8	PSS 21H-2C7 B4
Contact/dc Expansion Input/Output Interface	FBM14	E	Via a Main	0	8	0	8	PSS 21H-2C7 B4
High Power Contact/dc Input/Output Interface	FBM41	EM	Self	0	8	0	8	PSS 21H-2C6 B4

Table 5. Fieldbus Modules (Continued)

Name	Type+	Kind*	Application Program Execution	Field Signal Channels				Specification Reference
				Input		Output		
				Analog	Digital	Analog	Digital	
High Power Contact/dc Expansion Input/Output Interface	FBM42	E	Via a Main	0	8	0	8	PSS 21H-2C6 B4
Contact/125 V dc Input Interface	FBM24	EM	Self	0	16	0	0	PSS 21H-2E4 B4
Contact/125 V dc Expansion Input Interface	FBM25	E	Via a Main	0	16	0	0	PSS 21H-2E4 B4
Contact/125 V dc Input/Output Interface	FBM26	EM	Self	0	8	0	8	PSS 21H-2E6 B4
Contact/125 V dc Expansion Input/Output Interface	FBM27	E	Via a Main	0	8	0	8	PSS 21H-2E6 B4
120 V ac Input Interface	FBM08	EM	Self	0	16	0	0	PSS 21H-2C5 B4
120 V ac Expansion Input Interface	FBM13	E	Via a Main	0	16	0	0	PSS 21H-2C5 B4
120 V ac Input/Output Interface	FBM10	EM	Self	0	8	0	8	PSS 21H-2C9 B4
120 V ac Expansion Input/Output Interface	FBM15	E	Via a Main	0	8	0	8	PSS 21H-2C9 B4
240 V ac Input Interface	FBM20	EM	Self	0	16	0	0	PSS 21H-2D7 B4
240 V ac Expansion Input Interface	FBM21	E	Via a Main	0	16	0	0	PSS 21H-2D7 B4
240 V ac Input/Output Interface	FBM11	EM	Self	0	8	0	8	PSS 21H-2D1 B4
240 V ac Expansion Input/Output Interface	FBM16	E	Via a Main	0	8	0	8	PSS 21H-2D1 B4

*M = main module; EM = expandable main module; E = expansion module.
**Reference junction compensation channel.
***Digital communications for Intelligent Transmitters only; software selectable by transmitter or Hand-Held Terminal to either 4800 or 600 baud rate.
****Four redundant, individual channel pairs.
+ The type code is used as a convenient identifier only; it is not a model number.

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