

760 Series SINGLE STATION MICRO Controller



This powerful, new single-station controller is a self-contained, stand-alone, microprocessor-based instrument that permits control of a wide range of processes. It has a host of advanced features including the revolutionary and exclusive EXACT control.

FEATURE HIGHLIGHTS

- EXACT Control
- Brilliant Fully-Interactive Display
- Familiar Operating Procedures
- Computer Compatible
- Housing or Shelf Mounting
- Ideal Physical Retrofit into Existing Shelves
- Passcode Security
- Nonvolatile Memory
- Transportable Configuration
- Power Failure Recovery Logic
- Common Keypad for Configuration and Operator Interface

EXACT CONTROL

The EXACT tuning method does not use an arbitrary process model. Instead it uses micro-processor technology to make controller adjustments based on the actual, current process dynamics. Thus, while continuously scanning the process variables, if it senses a process upset, it immediately takes corrective action. The user can choose the degree of response by specifying the desired damping and overshoot-to-load change, such as quarter-amplitude damping.

This new, exciting tool is on the job 24 hours a day, and it can be turned on or off from the keypad.

Process upsets do occur, but with EXACT control, the product need not suffer.

CHOICE OF HOUSING OR SHELF MOUNTING

The 760CNA has an integral housing that can be mounted directly to a panel. The 760CSA can be installed in most Foxboro shelves with only little additional hardware.

The controller is a physical substitute for H-Line, E27 Series, and even pneumatic 100-Line controllers.

SIMPLIFIED CONFIGURATION AND OPERATION

Because of the controller's flexibility, it can be easily configured to meet the most exacting process requirements. All operating functions can be examined and/or changed by pushbutton. Interactive prompting simplifies setting of adjustable functions.

From the operator's standpoint there is very little new to learn. The same familiar control concepts and terminology are used. What is new is the ease with which the various controller operations can be implemented or changed, and the ease with which complete information about the process and the controller is made available, literally at the push of a button.

COPY FEATURE

The copy feature permits the controller configuration to be duplicated for use in another controller. This is accomplished by using two NOVRAMS (nonvolatile, random access memory modules) and a configuration copy accessory. Briefly, after turning off power, the procedure is as follows. First remove the first NOVRAM (in controller and already configured); then install (plug in) the copy accessory; next plug the first NOVRAM and second NOVRAM (memory to be configured) into the copy accessory; and then turn on the power and the second NOVRAM is now copied for use in another controller. With minimum effort, any number of controllers can thus be configured to the same parameters as the original controller. Each controller, as configured, can then have any of its individual parameters changed to any desired value.

READY FOR COMPUTER TIE-IN

The controller is equipped with an RS485 serial port to connect to certain personal computers through an RS232C-RS485 converter. This simple converter provides the proper electrical and mechanical interface between these serial communication standards.

COMPLETE SECURITY FOR PROCESS SETTINGS

The operator has keypad access to read the value of inputs, alarm and limit settings, as well as the operating configuration. However, the operator can adjust only those settings which were specified as operator-changeable when the controller was configured. The remaining parameters can only be accessed for change by first entering a passcode from the keypad.

This passcode is chosen by an authorized person at the time the controller is configured. Thus, only those who have been given this passcode can change any of the configuration parameters, including the passcode.

FULL-FUNCTION DISPLAY

The front of the controller has a clear, bright, easy-to-read, anti-glare display consisting of graphics and alphanumeric characters. This enables the operator to keep track of every parameter that is received or generated by the controller. Measurement and set-point displays have applicable engineering units electronically displayed. See Figure 1.

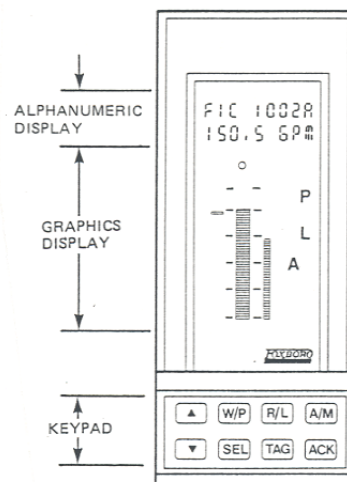


Figure 1. Front-of-Panel Functions

FUNCTIONAL SPECIFICATIONS

Proportional Input Signals

Any combination of the following proportional inputs with total of all types not to exceed four. All signals

can be characterized or combined in a variety of calculations. See table below.

Proportional Type Input Signal	Maximum Number	Details											
4 to 20 mA dc Current Input	4	4 to 20 mA dc input is standard for all shelf-mounted controllers, and for housing-mounted controllers that have 32-position terminal blocks on the rear of the housing. Inputs are across 250 Ω resistors. Housing-mounted controllers that have a 30-pin socket on the rear of the housing will accept 4 to 20 mA inputs by the addition of 250 Ω resistors across the input terminations. Includes 25 V dc source for powering one or two field transmitters.											
10 to 50 mA dc Current Input	4	10 to 50 mA dc input is optionally available; refer to Optional Features section. 10 to 50 mA input/output is also available for shelf-mounted controllers (760CSA); refer to Model Code.											
1 to 5 V dc Voltage Input	4	1 to 5 V dc input is standard on all housing-mounted controllers that have a 30-pin plug socket on the rear of the housing. All other controllers will accept 1 to 5 V dc by removing the input resistors.											
Thermocouple Input (requires E93 Temperature Transmitter, or equivalent)	1	Linearization of displayed value is provided as follows:											
		<table border="1"> <thead> <tr> <th>Thermocouple</th> <th>Temperature Range</th> </tr> </thead> <tbody> <tr> <td>Type J</td> <td>-20 to +760°C (-4 to +1400°F)</td> </tr> <tr> <td>Type K</td> <td>-20 to +1380°C (-4 to +2500°F)</td> </tr> <tr> <td>Type E</td> <td>-130 to +540°C (-200 to +1000°F)</td> </tr> </tbody> </table>	Thermocouple	Temperature Range	Type J	-20 to +760°C (-4 to +1400°F)	Type K	-20 to +1380°C (-4 to +2500°F)	Type E	-130 to +540°C (-200 to +1000°F)			
Thermocouple	Temperature Range												
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Type K	-20 to +1380°C (-4 to +2500°F)												
Type E	-130 to +540°C (-200 to +1000°F)												
1 to 9999 Hz Frequency Input	2	Input pulse rates, voltage levels, and field power are compatible with Foxboro E83 Series Vortex Flowmeter, and with Foxboro 81 or 82 Series Turbine Flowmeter having a preamplifier input.											
Resistance Temperature Detector (RTD) Input	1	Platinum, per IEC 100 or SAMA* 100 (RC 21-4) temperature curves. Linearization of displayed value is provided, as follows:											
			<table border="1"> <thead> <tr> <th></th> <th>IEC 100</th> <th>SAMA 100</th> </tr> </thead> <tbody> <tr> <td>Range</td> <td>-200 to +850°C (-330 to +1562°F)</td> <td>-200 to + 600°C (-330 to +1100°F)</td> </tr> <tr> <td>Span</td> <td>110 to 1000°C (200 to 1800°F)</td> <td>110 to 800°C (200 to 1440°F)</td> </tr> </tbody> </table>		IEC 100	SAMA 100	Range	-200 to +850°C (-330 to +1562°F)	-200 to + 600°C (-330 to +1100°F)	Span	110 to 1000°C (200 to 1800°F)	110 to 800°C (200 to 1440°F)	
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*Scientific Apparatus Makers Association

FUNCTIONAL SPECIFICATIONS (Cont.)
Discrete Input Signals

One or two contact or transistor switch inputs, 5 V dc nominal open circuit voltage, 1 mA maximum current. For remote status changes such as A/M, R/L, W/P, EXT ACK, and tracking functions.

Output Signals**TWO NONISOLATED ANALOG OUTPUTS**

Control output (can be conditioned) and auxiliary output.

- Control: 4 to 20 mA into 500 Ω maximum. 10 to 50 mA input/output into 660 Ω maximum is optionally available for shelf-mounted controllers. Isolated output option is also available.
- Auxiliary Output: 1 to 5 V dc into 2 k Ω minimum. Can be used for measurement, set point, control, or conditional input signals.

TWO DISCRETE OUTPUTS

Two nonisolated open collector transistor (NPN) switch outputs. For status indication of A/M, R/L, W/P, and alarms. Contact ratings are 50 V dc maximum, 250 mA maximum. Leakage current is 100 μ A maximum.

Transmitter Power Supply

Standard controller provides 25 V dc field power for two 4 to 20 mA transmitters. Each transmitter connection has a 250 Ω limiting resistor. Controller with optional 10 to 50 mA output provides 65 V dc field power for one transmitter. Output is current-limited to 55 mA.

Alarms

Up to three absolute, and one deviation, high-low alarms are available.

- Two absolute alarms are configurable for the measurement signal, and one absolute alarm for the output signal.
- Deviation alarm senses the difference between the set point and measurement (error signal).
- Alarm status is indicated by a combination of alphanumeric display, the bar graphs, and the contact outputs.
- Alarm dead band is adjustable between 0 and 10% of span.

Supply Voltage (As specified; fused.)**ac SUPPLY VOLTAGE**

24, 100, 120, 220, or 240 V; all +10, -15%
47 to 63 Hz, at 30 VA maximum

dc SUPPLY VOLTAGE

24 V +20%, -10%; at 1 A maximum

Input Filter

Adjustment time, 0 to 10 min. Second order Butterworth filter.

Front Panel

The controller can be configured and operated entirely from the front panel with no external equipment required. By using the keypad and the display, complete process information can be read, and all controller settings can be changed (see Figure 1). The front panel consists of the following parts:

- Alphanumeric display consisting of two lines of 9 characters each, graphics display of three 50-segment bar graphs, and status indicators.
- The displays are highly-visible fluorescent. The numerical quantities have a resolution of $\pm 0.1\%$ of upper range value. The bar graphs have a resolution of $\pm 2\%$ of span.
- Keypad of 8 keys. Keys must be pressed for a minimum of 0.2 seconds. Switches are normally-open contacts, closing to a common lead.

Environmental Operating Limits**TEMPERATURE**

5 and 50 $^{\circ}$ C (40 and 120 $^{\circ}$ F)

HUMIDITY

5 and 95%

Execution Rate

10 times per second.

Memory

All configuration and operating parameters are stored in a nonvolatile memory. Should a power failure occur, essential control settings and last operating conditions are saved indefinitely. No batteries are used.

Control Adjustments**PROPORTIONAL BAND**

1 to 8000%.

INTEGRAL

0.014 to 200 minutes/repeat.

DERIVATIVE

0 to 100 minutes.

Other Control Adjustments

- Non-Linear Extender to PID
- EXACT Control
- Ratio: 0 to 5
- Calculations (each input can have a gain and/or bias, and can be combined together in a variety of mathematical equations).
- Characterizer (available on two signals at 20 segments each, including non-linear extender, assignable).
- Logic (AND, NAND, OR, XOR, NOR, and NOT on two contact inputs)
- Signal Conditioning (square, square root, characterizer, RTD and thermocouple (TC) linearizing).

PERFORMANCE SPECIFICATIONS

Accuracy at Numeric Display

In percent of span, unless otherwise noted. Refer to table below.

Parameter	Accuracy
Set Point	
Local	±0.1%
Remote	±0.1%
Ratio	±0.1%
Input	
Analog	±0.1%
Frequency	±0.1%
RTD	±0.5 °C
Output	
Valve	±0.5%
Retransmitted (linear)	±0.25%
Linearization	
RTD	±0.5 °C
Thermocouple	±0.5 °C
Control Modes	
Prop. Band	±5% of setting
Integral	±5% of setting ≥ 0.1 min
Derivative	±5 s for < 0.1 min
Alarm Settings	
Absolute	±0.1%
Deviation	±0.1%
Calculations	±0.1%

Supply Voltage Effect

±0.1% of span (maximum) for a +10% or -15% change in ac voltage within normal operating conditions; or a +20% or -10% change in dc voltage within normal operating conditions.

Ambient Temperature Effect

Maximum error, in percent of span, for a 30°C (55°F) change in temperature within normal operating limits. See table below.

Parameter	Maximum Error in % of Span
Set Point	
Local	±0.1%
Remote	±0.5%
Input	
Analog	±0.5%
Frequency	±0.2%
RTD	±0.5%
Output	
Valve	±0.5%
Retransmitted	±0.5%

Humidity Effect

Maximum error, in percent of span, from reference conditions to 95% R.H., measured at a wet-bulb temperature of 30°C (80°F) is ±0.1% for all conversions, calculations and settings.

Frequency Response

Analog input to output conversion flat to 3 Hz.

Output Noise

0.25% peak to peak

PHYSICAL SPECIFICATIONS

Signal Connections (on rear panel)

760CNA (HOUSING MOUNTING)

- 32-position terminal block, with compression terminals, for wire sizes up to 2.5 mm² (14 AWG), or,
- 30-pin socket for use with a 2AK or 2AKQ SPEC 200 cable.

760CSA (SHELF MOUNTING)

- 30-pin socket for use in 202S Shelf with 32-position terminal block and cord set. Terminal block has compression terminals for wire sizes up to 2.5 mm² (14 AWG).
- 20-pin socket for retrofit use in all Foxboro shelves using 20-position terminal block and cord set.

Power Connections (on rear panel)

760CNA (HOUSING MOUNTING)

3-position terminal strip with 8-32 screw connections.

760CSA (SHELF MOUNTING)

3-position power cord connector.

Mounting

760CNA

Controller with integral housing is mounted to panel. Refer to "Dimensions--Nominal" section.

760CSA

Mounts in a 202S Series Shelf; or with retrofit installations, in EH, 101, or 102 Series Shelves.

Approximate Mass

4.5 kg (10 lb)

MODEL CODE - 760CNA

Description	Model
SINGLE STATION MICRO Controller, Housing Mounting	760CNA
<u>Nominal Supply Voltage and Frequency</u>	
120 V ac, 50/60 Hz	-A
220 V ac, 50/60 Hz	-B
240 V ac, 50/60 Hz	-C
24 V dc	-D
24 V ac, 50/60 Hz	-E
100 V ac, 50/60 Hz	-J
<u>Housing and Signal Connections</u>	
32-Position Terminal Block on Rear of Housing. Standard 4 to 20 mA dc input(a,b)	T
30-Pin Plug Socket on Rear of Housing. Standard 1 to 5 V dc Input(c)	C
Controller Chassis without Housing	W
<u>Optional Features</u>	
Isolated Output Signal (Output Number 1 only)	1
RTD Input (Input Number 1 only)	2

(a)Available 10 to 50 mA dc input. Specify AS Code SIG.

(b)Will accept 1 to 5 V dc input by removing input resistor.

(c)Will accept 4 to 20 mA dc or 10 to 50 mA dc, respectively, by addition of 250 Ω or 100 Ω voltage dropping resistors at input terminations.

MODEL CODE - 760CSA

Description	Model
SINGLE STATION MICRO Controller, Shelf Mounting - Standard 4 to 20 mA dc Input(a)	760CSA
<u>Signal Connector</u>	
20-Pin Signal Connector, Quick Disconnect	-2
30-Pin Signal Connector, Quick Disconnect	-3
<u>Nominal Supply Voltage and Frequency</u>	
120 V ac, 50/60 Hz	-A
220 V ac, 50/60 Hz	-B
240 V ac, 50/60 Hz	-C
24 V dc	-D
24 V ac, 50/60 Hz	-E
100 V ac, 50/60 Hz	-J
<u>Optional Features</u>	
Isolated 4 to 20 mA Control Output Signal (Output Number 1 only)	1
RTD Input (Input Number 1 only). Not available with 20-pin Signal Connector, Code -2.	2
0 to 50 mA dc Input Signals and 10 to 50 mA dc Control Output Signal. Not available with 24 V Supply (Code -D or Code -E).	3

(a)Will accept 1 to 5 V dc input by removing input resistor.

PRODUCT SAFETY SPECIFICATIONS

Electrical Classification

Testing Laboratory, Types of Protection, and Area Classification	Conditions of Certification	Electrical Safety Design Code
CSA certified for use in Ordinary Locations.	Panel-mounted controllers without a housing are not approved.	CS-E/CG-A
CSA certified for Class I, Groups A, B, C, and D, Division 2.	10 to 50 mA options and panel-mounted controllers without a housing are not approved. Temperature Class T6.	CS-E/CN-A
FM certified for use in Ordinary Locations.	10 to 50 mA options are Foxboro certified only. See below.	CS-E/FG-A
FM certified for Class I, Groups A, B, C, and D, Division 2.	10 to 50 mA options are not approved. Temperature Class T6.	CS-E/FN-A
Foxboro certified for use in Ordinary Locations.	Controllers with 10 to 50 mA input and output options.	CS-E/XG-F

OPTIONAL FEATURES

10 to 50 mA dc Current Input

A 10 to 50 mA dc current input is optionally available for housing-mounted controllers with a 32-position terminal block on the rear of the housing (760CNA-□T). Specify Auxiliary Specification (AS) Code SIG.

Surge Suppressor

A surge suppressor is optionally available for use with serial communication input when external wiring is located near transient producing sources such as meters, solenoids, high voltages, etc. Specify AS Code SURSUP.

ACCESSORIES

Configuration Copy Accessory

All of the operating configuration is stored in a nonvolatile, random access memory module (NOVRAM). The copy accessory permits the entire contents of the memory module to be quickly copied into another NOVRAM, either a spare or one from another controller. Specify part number K0143DV for the copy accessory, and part number K0143SA for a spare NOVRAM.

Panel Cutout Adapter Bezels

For 760CNA Controllers only. Used when replacing E Series Housing-Mounted Electronic CONSOTROL Control Stations and 54 Series Pneumatic CONSOTROL Control Stations with 760CNA Controllers. Two bezels are required for each panel cutout. See table below.

To Replace	Bezel Part Number	Quantity Required
E-3 Single Unit Electronic Housing with one 760CNA	K0143DG	2
E-6 Double Unit Electronic Housing or 54 Series Pneumatic CONSOTROL Control Station with two 760CNA's	K0143DH	2
E-9 Triple Unit Electronic Housing with two 760CNA's	K0143DJ	2
E-9 Triple Unit Electronic Housing with three 760CNA's. Width of existing cutout must be increased by 13 mm (0.5 in)	K0143DK	2

Shelf Conversion Parts

To convert 101, 102, 202, and EH Shelves to accept a 760CSA Controller replacing an electronic or pneumatic instrument. Specify model of both shelf and instrument being replaced.

Replacement Shelf Signal Connector Assembly

For installing 760CSA-3 Shelf-Mounted Controller (with 30-pin receptacles) into existing 101, 102, 202, and EH Series Shelves. Connector set assembly for 102, 202, and EH Shelves includes plug, cable, and terminal block. Specify part number K0143CG for 4 to 20 mA inputs. And specify part number K0143EF for 10 to 50 mA inputs. Assembly for 101 Shelf cable with quick-disconnect plug on one end and screw-in plug on other end. Input range is 1 to 5 V dc. Convertible to 4 to 20 or 10 to 50 mA dc input by addition of 250 or 100 Ω resistor, respectively. Specify cable Model 2AKQ. When ordering this accessory, a replacement power cord is also required (see Replacement Power Cord section).

Replacement Power Cord

Required when ordering a Replacement Shelf Signal Connector Assembly. Available with power plug at each end (plug type), with power plug on one end with a long extension, or power plug on one end with a short extension type. See table below.

Power Cord Type	Approximate Length	Part Number
Plug Type (Plug at each end)	1.2 m (4 ft)	N0139CA
Long Extension Type (Plug on one end)	5.6 m (18.5 ft)	N0139CB
Short Extension Type (Plug on one end)	1.2 m (4 ft)	N0139TZ

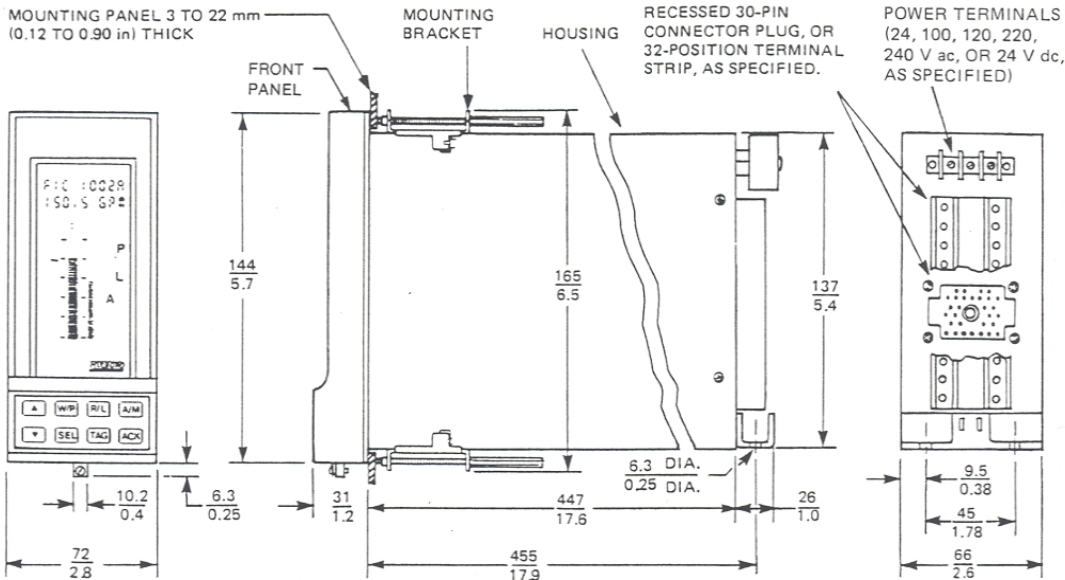
Computer Based Training Package

Consists of a software program that operates on any IBM-compatible personal computer that has a 256K RAM (minimum) and MS-DOS 2.0 release. The package includes a keyboard overlay so that designated keys on the computer clone the functions of the controller front panel keyboard. Specify part number L0121AA.

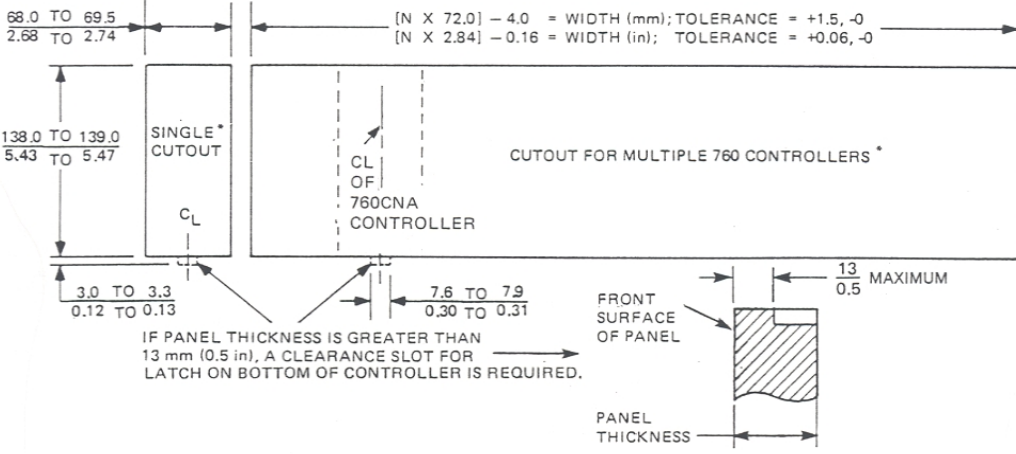
DIMENSIONS – NOMINAL

mm
in

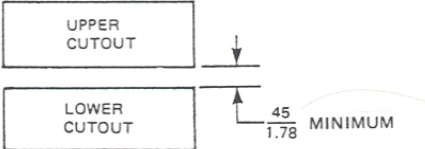
761CNA CONTROLLER--HOUSING MOUNTING



PANEL CUTOUT DIMENSIONS



*IF PANEL HAS MORE THAN ONE CUTOUT, ALLOW 45 mm (1.78 in) VERTICAL DISTANCE BETWEEN CUTOUTS AS SHOWN BELOW. THIS PROVIDES 36 mm (1.4 in) SPACING BETWEEN CONTROLLERS.



DIMENSIONS – NOMINAL (Cont.)
760CSA CONTROLLER--SHELF MOUNTING
FOR 760CSA SHELF DIMENSIONS,
REFER TO APPLICABLE DIMENSIONAL PRINT IN TABLE BELOW.

For Shelf Model	Use Dimensional Print
EH	DP 018-510
101	DP 017-441
102	DP 017-410
202S	DP 202-100

ORDERING INSTRUCTIONS

1. Model Number
2. Optional Features
3. Accessories
4. Customer Tag Data

NOTE

For 760CSA (Shelf-Mounted Controller), refer to GS 2A-12A1 A, GS 2B-12B1 B, GS 2B-12B1 A, and PSS 2E-2A1 C for shelves and cord sets for the EH, 101, 102, and 202S Shelves, respectively.

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