

Installation and Operating Instructions

Before operating this product, read all installation, commissioning, and operating instructions. Failure to follow these instructions could result in product damage or cause a hazardous condition. Check the ratings and installation requirements provided to ensure the product is suitable for the intended application.

Installation Instructions:

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<i>(should be completed at time of installation)</i>	

SMARTLINK™ Reference Tables:

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QUICK START OPERATION:

The following pages describe in detail each of the installation and operating steps listed above. **System configuration or valve characterization can be eliminated for those applications** that do not require adjustments of the factory default min/max valve positions, interface relay min/max position limits, electronic "lock" settings, or the linear valve position profile (0 to 80 degrees versus 4 to 20mA command).



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Installation Instructions

Required components

The minimum SMARTLINK™ system requires an order for 1 Control Interface and 1 Valve Actuator assembly as shown below.

DIN rail-mounted interface relays, 24VDC supply, terminal block assembly, a pre-wired DIN rail assembly and a NEMA 4X enclosed panel are all options available from Maxon.

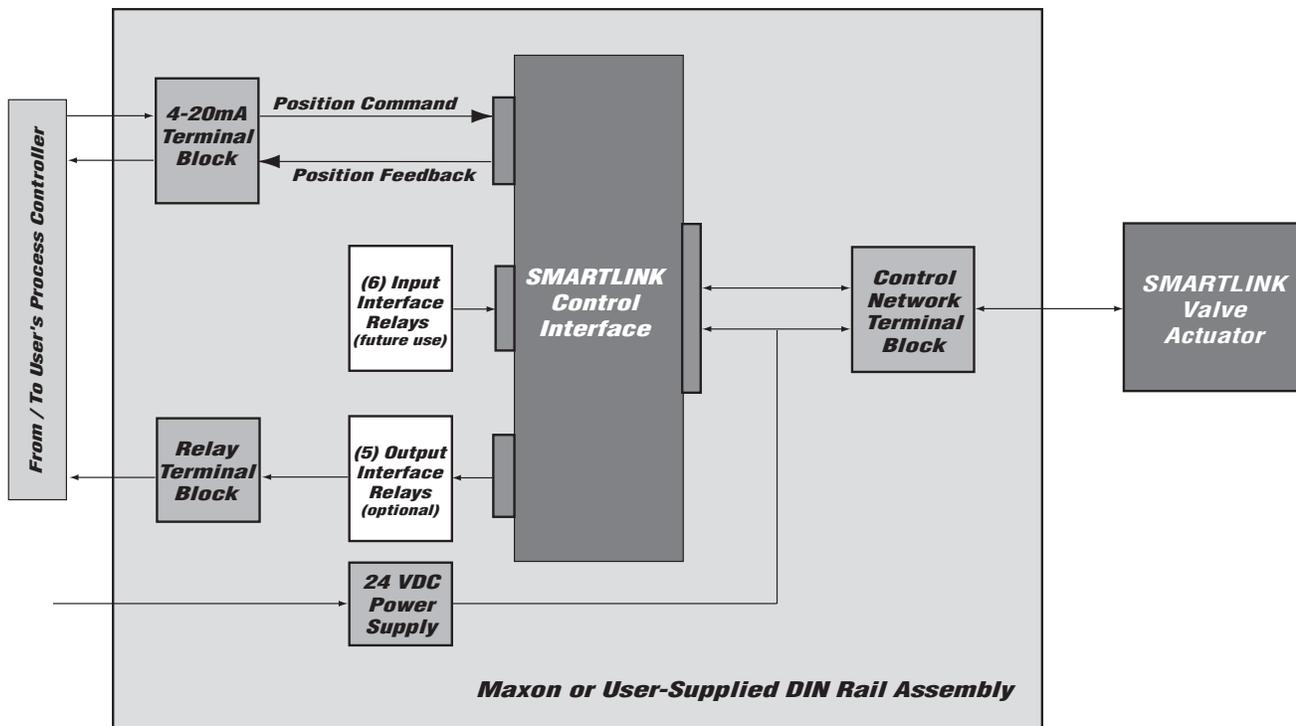
Mechanical installation

of the SMARTLINK™ Intelligent Valve and Actuator Assembly requires the following:

- Mount the SMARTLINK™ Control Interface along with any optional interface relays on a DIN rail within an appropriate electrical enclosure or cabinet, and
- Install the SMARTLINK™ Valve Actuator assembly in any orientation within the pipe train.

The system block diagram below indicates the sources and destinations of the electrical wiring required by the SMARTLINK™ Control Interface and Actuator Assembly.

**SMARTLINK™ Intelligent Valve and Actuator Assembly
Block Diagram**



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The **basic electrical installation** requires the following wiring:

- **Low voltage 4-20mA signal wiring** from the user's process controller to the SMARTLINK™ Control Interface. Wiring of the 4-20mA position feedback signal is optional and may not be needed for specific applications.
- **Communications wiring** between the SMARTLINK™ Control Interface and Valve Actuator.
- **Low-voltage supply wiring** between a 24VDC supply and the SMARTLINK™ Control Interface. A pre-wired Maxon DIN Rail Assembly can be supplied that includes this wiring.
- **Low voltage DC relay coil wiring** from the SMARTLINK™ Control Interface to output interface relays. All interface relays are optional. A pre-wired Maxon DIN Rail Assembly can be supplied that includes this wiring to the relays.

- **120/230 VAC output relay wiring** from the output interface relay contacts to the user's process control equipment. This wiring is not required if output interface relays are not required for the application.
- **120/230 VAC supply wiring** between a user's fused power source and the 24VDC power supply.

Electrical wiring should be performed in accordance with all local and NEC 1 codes. See Reference Table 1 and Table 2 (pages 7300-S-18 and 19) for summaries of all of the input/output terminals for the Control Interface and Valve Actuator. Reference Table 3 (page 7300-S-19) summarizes the maximum wiring length, type, and size for all terminations.

Typical wiring diagram of a SMARTLINK™ Valve Actuator Assembly is shown on the following page.

With Maxon-supplied pre-wired DIN rail assembly

If the Control Interface is shipped as part of the Maxon pre-wired DIN rail assembly, the electrical installation is simplified because the 24VDC power supply and interface relays are provided and wired to the Control Interface. The electrical installation for the pre-wired DIN rail assembly requires the following:

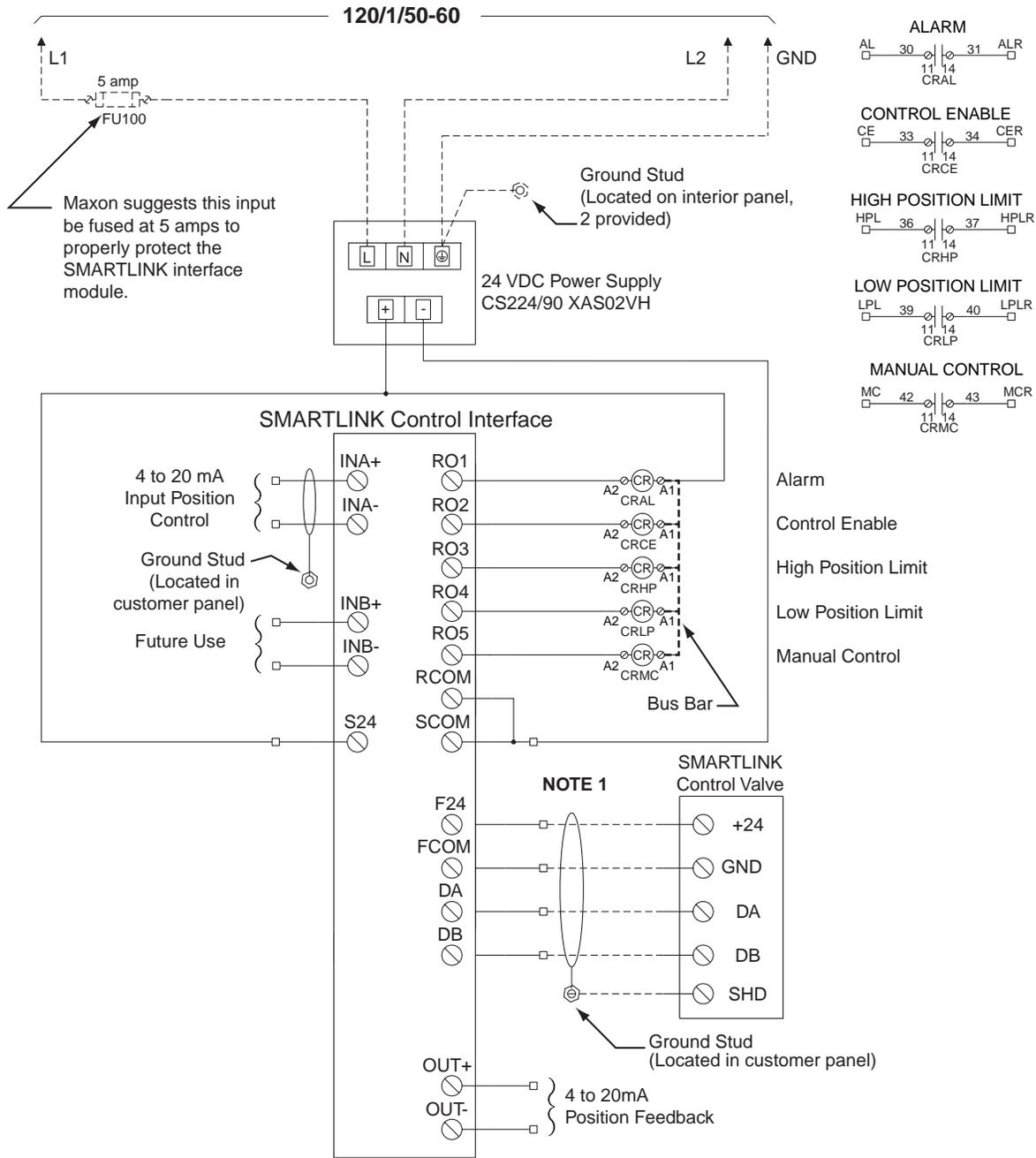
- **Low voltage 4-20mA signal wiring** from the user's process controller to the SMARTLINK™ DIN rail assembly. Wiring of the 4-20mA position feedback signal is optional.
- **Communications wiring** between the SMARTLINK™ Control Interface and Valve Actuator.

- **120/230 VAC output relay wiring** from the output interface relay contacts to the user's process control equipment. This wiring is not required if output interface relays are not required.
- **120/230 VAC supply wiring** between a user's fused power source and the 24VDC power supply.

All electrical wiring should be performed in accordance with all local and NEC 1 codes. Reference Table 4 (page 7300-S-20) summarizes all of the input/output terminals for the DIN rail assembly and Reference Table 5 (page 7300-S-21) summarizes the maximum wiring length, type, and size for all DIN rail assembly terminations.

Installation Instructions

Typical SMARTLINK™ Wiring



NOTE 1: Recommended wire color code for SMARTLINK™

Component Terminal Designation	Cable	
	Maxon #59829 (not to exceed 100 ft.)	Beldon #30861 (not to exceed 300 ft.)
F24 / +24	white / orange	brown
FCOM / GND	orange	blue
DA	white / blue	white
DB	blue	black

Operating Instructions

The installer should perform the following commissioning steps for the SMARTLINK™ Control Interface and Actuator Assembly:

- **Wiring checkout** prior to applying power
- **Operational checkout** after applying power
- **System configuration** if required by the application
- **Valve characterization** if required by the application

Understanding the SMARTLINK™ Control Interface

Lights and switches:

The lights and switches of the SMARTLINK™ Control Interface allow the user to:

- Display and change configuration parameters (i.e. loss of signal position and emergency standby position),
- Display the operating mode of the valve and indicate alarm conditions,
- “Lock” the device electronically to prevent tampering,
- Customize the position profile of the valve, and
- Locally control movement of the valve.

SMARTLINK™ Control Interface Switch & Light Functions



MAN Light - Unit in Manual Positioning Mode when lit.

RUN Light - Unit in Run Mode when lit;

Unit in Position Setup Mode when RUN or MAN lights are both blinking.

ALM Light - Alarm exists when lit; Unit is locked if blinking.

0 - 9 Lights - Indicates valve position index when unit is in Manual or Position Setup Mode; Also indicates command number selected by rotary CMD SEL switch, configuration settings, alarm codes and lock passcodes.

ENTER Switch - Momentary pushbutton for command entry and saving configuration or valve position changes.

MODE Switch - 3 positions: (1) RUN (down) places unit in Run Mode which positions valve by 4-20mA input, (2) Command Entry (middle) for selecting user command with rotary switch, and (3) CMD abc (up, with momentary action) for command set selection.

ADJUST Switch - 3 positions: (1) STANDBY (down) for emergency valve movement to its standby position when unit is not in Run Mode, (2) ADJ (middle) enables valve movement in tenth degree steps when using the INC/DEC switch in Manual and Position Setup Mode, and (3) INDEX enables valve positioning moves to the 19 position indexes when using the INC/DEC switch in Manual Mode.

INC/DEC Switch - 3 positions: INC and DEC (up & down, with momentary action) for valve opening and closing in Manual or Position Setup Mode; also used for changing configuration settings. Middle position has no function.

Command Set Lights - Identifies which command set (a, b, or c) is currently selected (when blinking) or active (when not blinking).

CMD SEL (Rotary) Switch - Selects command number, 0 thru 7.

Operating Instructions

Wiring Checkout

Before applying power to the SMARTLINK™ Control Interface and SMARTLINK™ Valve Actuator Assembly, perform the following wiring checkout:

- 1) Verify that 120 VAC is **not** connected directly to SMARTLINK™ Control Interface and Valve Actuator Assembly. Both devices are powered by a 24VDC supply. All output interface relay wiring from the Control Interface is connected to 24VDC relay coils.
- 2) Verify the proper wire type and maximum wire length requirements are satisfied for all connections.
- 3) Verify color code connections are correct on the 24V/Data Connector of both the Control Interface and Valve Actuator Assembly.
- 4) Measure the resistance between earth ground at the user's panel enclosing the Control Interface and each of the four signals wired to the Valve Actuator: F24 (Field +24VDC), FCOM (Field Common), DA (Data-A), and DB (Data-B). The resistance should indicate an open circuit (i.e., a resistance value greater than 10⁶ Ohms). If an open circuit is not measured, damage or incorrect wiring of the control network cable exists and must be corrected.
- 5) Verify proper termination of shields for the 4-20mA cables and the control cable between the Control Interface and Valve Actuator Assembly.
- 6) If Maxon SMARTLINK™ Interface Relays are not provided with the Control Interface, verify that all required relays have a coil rating less than 30VDC and 100mA. The output interface relay coils are connected to the Control Interface, RO1 through RO5 terminals of the Relay Output driver connector.

Refer to SMARTLINK™ Reference Tables 1 through 5 (pages 7300-S-18 to 21) for all termination definitions and wiring/shielding requirements.

Operational Checkout

Apply power to the SMARTLINK™ Control Interface and SMARTLINK™ Valve Actuator Assembly and perform the following operational checkout:

- 1) Verify the Control Interface Alarm light is off and the Run light is on after powering up the system. If the alarm light is on, see page 7300-S-15 to determine the cause of the alarm and corrective actions.
- 2) Place the user's process controller into manual mode or temporarily replace the 4-20mA position command with a simulated 4-20mA current loop. With the Control Interface command switch in the "Run" position, move the position command signal slowly from 4mA to 20mA and verify valve movement. The position of the valve can be visually observed by the "OPEN" or "CLOSED" markings on the machined coupling that connects the actuator to the valve shaft. If the application requires the 4-20mA position feedback signal, measure this feedback current loop while changing the position command and verify that the two currents (input vs. output) are approximately equal after pausing at several intermediate positions.
- 3) If the process controller cannot be placed in manual mode or if a simulated command signal cannot be produced, the SMARTLINK™ assembly can be placed in a local manual mode. (Refer to Command A-0 and the general command entry instructions on page 7300-S-11). Once the system is in manual mode, drive the valve to its full open and closed positions using the INC/DEC switch on the Control Interface.
- 4) If installed, verify operation of each output interface relay by measuring the presence and disappearance of voltage on the relay's contact. If a DIN Rail Assembly is supplied with the Control Interface, the terminals for each relay contact are shown in Reference Table 6 on page 7300-S-22. The Control Interface relay driver output terminals are also provided in Reference Table 6 to assist in testing of interface relays when not supplied and pre-wired by Maxon.



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Configuration settings

There are 8 SMARTLINK configuration settings that can be changed through execution of the commands below, using the switches and lights on the Control Interface. Detailed explanations of each setting appear in Reference Table 7: SMARTLINK™ System Configuration Summary on page 7300-S-23.

Command Name	Command Number	Factory Default
Select LOS Position	B-0	No position change
Select Standby Position	B-2	Position Index 0
Select Control Deadband	B-3	0.06% Deadband
Set High Limit Position Threshold	B-4	80.0 degrees
Set Low Limit Position Threshold	B-5	0.0 degrees
Set Auto Ramp Adjust On/Off	B-6	Auto Ramp ON
Enter New Lock Combination	C-4	Passcode: 0, 0, 0, 0
Select Lock Enable/Disable	C-5	Lock Disable

Review the factory default settings before changing any of the system configuration settings; in many applications, modification of the default settings is not necessary. If a setting does need to be changed, follow the procedure outlined below.

Procedure for Changing a System Configuration Setting:

- a) Select and enter the required system configuration command.
- b) After the command is entered, one of the numbered (0-9) lights will be on, indicating the current configuration setting. (For example: If the lock configuration is set to #0, Lock Disable, the 0 light will be solidly lit after Command C-5, Lock Enable/Disable, is entered successfully.)
- c) Select the desired configuration setting by using the INC/DEC switch. As the INC/DEC switch is momentarily pushed up or down, the selected setting changes as indicated by turning on the corresponding numbered light (0-9).
- d) Push the ENTER button after the desired configuration setting is selected. The numbered light that is lit to indicate the selected configuration will momentarily turn off indicating the command is complete and the configuration setting is saved.
- e) To confirm the correct setting is saved, re-enter the command and verify the new setting by the numbered light (0-9) indication.



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Operating Instructions

Characterizing the valve

Valve characterization is necessary for changing the relationship between valve position and the 4-20mA position command. This process permits field adjustment of the "installed" valve characteristic without mechanically adjusting the valve or external linkages.

The SMARTLINK™ is pre-set to a linear slope, but can be customized using either the 10 Point Characterization procedure (below) or the 19 Point Characterization procedure (page 7300-S-9).

10 Point Characterization

SMARTLINK™ is shipped with the configuration setting to easily adjust valve positions at 10 of the 19 position indexes and automatically set the positions at the other 9 (intermediate) indexes.

SMARTLINK™ 10 Point Valve Characterization Procedure:

- a) Place the process controller that commands SMARTLINK™ in manual mode and connect a 4-digit current meter on the 4-20mA position output. Execute Command B-6 and verify the Auto Ramp function is set to #1, Auto Ramp ON. If not set correctly, refer to page 7300-S-7 or Reference Table 7 on page 7300-S-23.
- b) Execute Command A-2, Enter Position Setup Mode. In this mode, both the yellow and green run lights will be flashing. The position command signal determines which of the 19 position indexes can be modified as shown by the blinking numbered lights. Move the process controller's output to either 0% (Index #0) or 100% (Index #9) to begin characterization.
- c) With the ADJUST switch in the middle (ADJ) position, push the INC/DEC switch up or down to change the valve position. Each push of the INC/DEC switch moves the valve 0.1 degrees. If the switch is held in the up or down position for more than 3 seconds, the valve will move in 0.5-degree steps up to a total travel of 8 degrees from the stored valve position. (All the numbered lights will momentarily flash when this 8-degree limit is reached.) After moving the valve to the desired position, press the ENTER button to save the position setting. Record the valve position feedback in mA or %.
- d) Move the controller's output to the % or mA setting in the commissioning table (shown on page 7300-S-17) for each consecutive whole digit index and repeat the adjustment procedure in Step c. With the auto ramp function ON, adjustment at only the 10 whole digit indexes is necessary because positions at the intermediate indexes (0.5, 1.5, etc.) are automatically set to a value half way between the positions of the whole number indexes (0, 1, 2, etc).
- e) Execute Command C-6 to save the profile as a backup. Move the MODE switch to the RUN position and put the user's process controller in AUTO.



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Operating Instructions

Characterizing the valve

19 Point Characterization

There are applications that require precision adjustment throughout the actuator's control range. For these applications, adjustment of all 19 positions is necessary using the procedure below.

SMARTLINK™ 19 Point Valve Characterization Procedure:

- a) Place the process controller that commands SMARTLINK™ in manual mode and connect a 4-digit current meter on the 4-20mA position output. Execute Command B-6 and set the auto ramp function to setting #0, Auto Ramp OFF. (Refer to page 7300-S-7 or the Reference Table on page 7300-S-23 for changing configuration settings.)
- b) Execute Command A-2, Enter Position Setup Mode. In this mode, both the yellow and green run lights will be flashing. The position command signal determines which of the 19 position indexes can be modified as shown by the blinking numbered lights. Move the process controller's output to either 0% (Index #0) or 100% (Index #9) to begin characterization.
- c) With the ADJUST switch in the middle (ADJ) position, push the INC/DEC switch up or down to change the valve position. Each push of the INC/DEC switch moves the valve 0.1 degrees. If the switch is held in the up or down position for more than 3 seconds, the valve will move in 0.5-degree steps up to a total travel of 8 degrees from the stored valve position. (All the numbered lights will momentarily flash when this 8-degree limit is reached.) After moving the valve to the desired position, press the ENTER button to save the position setting. Record the valve position feedback in mA or %.
- d) Move the controller's output to the next % or mA setting in the commissioning table (shown on page 7300-S-17) and repeat the adjustment procedure in Step c for all 19 position indexes. With the auto ramp function OFF, the positions of adjacent indexes are not automatically ramped. Therefore, all 19 position indexes should be visited during this procedure and adjusted if necessary.
- e) Execute Command C-6 to save the profile as a backup. Move the MODE switch to the RUN position and put the user's process controller in AUTO.

If an unsafe operating condition is observed while characterizing the SMARTLINK™ in a parallel positioning combustion application, follow the instructions below:

1. When SMARTLINK™ is in the Position Setup Mode for valve characterization, the ADJUST switch can be pushed to the STANDBY position (down). This action will immediately move the valve to the Standby position, overriding the 4-20mA position command.
2. The factory default Standby position is the valve position at Index #0, the minimum position in the profile. While the ADJUST switch is in this position, no commands can be executed. The Standby position function is inhibited when the MODE switch is in the RUN position (down).



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Operating Instructions

User commands

There are 3 SMARTLINK™ command sets (a, b, and c) as listed below. Entry requirements for each command (if applicable) are listed at right. Detailed descriptions of the following user commands are shown in Reference Tables 8 through 10 (pages 7300-S-24 through 7300-S-29).

Command Set "A"	A-0	Enter Manual Positioning Mode	Position command \leq 4mA
	A-1	Display Alarm Codes	
	A-2	Enter Valve Position Setup Mode	Position command = 4 to 20mA
	A-3	Reserved for Future Use	
	A-4	Reserved for Future Use	
	A-5	Set Max Position and Min/Max Ramp	Position command = 20mA
	A-6	Set Min Position and Min/Max Ramp	Position command = 4mA
	A-7	Unlock Valve Configuration	Unit must be "locked"
Command Set "B"	B-0	Select Loss of Signal Position	
	B-1	Reserved for Future Use	
	B-2	Select Standby Position	
	B-3	Select Deadband	
	B-4	Set High Limit Position Threshold	Unit in Manual Mode
	B-5	Set Low Limit Position Threshold	Unit in Manual Mode
	B-6	Set Auto Ramp Adjust On/Off	
	B-7	Reserved for Future Use	
Command Set "C"	C-0	Check Valve Calibration	For Maxon-trained technician only
	C-1	Calibrate Valve	For Maxon-trained technician only
	C-2	Enable Valve Calibration / Check	For Maxon-trained technician only
	C-3	Reset Factory Default Settings	Unit in Position Setup Mode
	C-4	Enter New Lock Combination	Unit "unlocked" to modify
	C-5	Select Lock Enable / Disable	Unit "unlocked" to modify
	C-6	Save Profile as Backup	
	C-7	Restore Backup Profile	Unit in Position Setup Mode



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Operating Instructions

User commands

General Command Entry Instructions:

1. A user command can be performed only when the following conditions are all satisfied:
 - a.) MODE switch is not in the RUN position,
 - b.) one of the green command set lights (a, b, c) is blinking,
 - c.) ADJUST switch is not in the STANDBY position, and
 - d.) unit is “unlocked”. (Condition d. is not required for Command A-7, Unlock Valve Configuration and Command A-1, Display Alarm Codes.)
 - e.) For some commands, the unit must be in a specific mode or have the correct 4-20mA command signal (see command entry requirements listed on page 7300-S-10 or in Reference Tables 8 through 10 on pages 7300-S-24 through 29).
2. If the a, b, or c command set light is not blinking, momentarily push the MODE switch in the CMD abc position (up) or, change the position of the rotary CMD SEL switch. This will start the command set light blinking and permit a command to be entered.
3. Select the desired command set by momentarily pushing the MODE switch upward to the CMD abc position. Subsequent CMD abc switch entries will change the command set selection as indicated by the green command set (a, b, c) lights.
4. Select the desired command number by changing the position of the rotary CMD SEL switch. When one of the command set lights is blinking, the command number selected is indicated by the corresponding numbered (0-9) light being lit.
5. After the command set and number are selected, press the ENTER button. If all of the numbered lights flash momentarily after the Enter button is pushed, a command entry error has occurred and the command was not executed. If an entry error occurs, check if the unit is locked (i.e. alarm light blinking) or the ADJUST switch is in the STANDBY position. If neither condition exists, check the specific entry requirements of the command.



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Locking the unit and entering passcodes

The SMARTLINK™ Control Interface is shipped with the lock function disabled and a factory default 4-digit passcode or “combination” of 0,0,0,0. To lock the unit for the first time and change the default passcode, the lock function must first be enabled (Command C-5) and the default passcode entered (Command A-7). After the lock function is enabled and the unit is “unlocked”, a new passcode can be entered using Command C-4. If you forget the passcode, call Maxon for the “master” passcode.

Procedure for Enabling the “Lock” Configuration Setting (Command C-5):

- a) If the alarm light is blinking, the lock function is already enabled and the unit is in a “locked” state. Before changing the passcode, the unit must be unlocked by entering the current passcode (Command A-7) using the procedure below.
- b) If the alarm light is not blinking, select and enter Command C-5, Lock Enable/Disable.
- c) After the command is entered, one of the numbered (0-9) lights will be on, indicating the current configuration setting. If the #1 light is on, the lock function is already enabled and the procedure below can be performed to change the passcode. If the #0 light is on, the lock function is disabled.
- d) To select the #1 setting (Lock Enable), momentarily push the INC/DEC switch in the up position. The #1 light will now be on, indicating the new setting is selected.
- e) Push the ENTER button. The #1 light will turn off indicating the command is complete and the configuration setting is saved. The unit is now locked and the alarm light will be blinking. To change the current passcode, perform the following two procedures (Command A-7 & C-4).

Procedure for Entering the Current “Lock” Passcode (Command A-7):

- a) Select and enter Command A-7, Unlock Valve Configuration.
- b) After the command is entered, the INC/DEC switch is used to select the first passcode digit. The digit selected is indicated by a numbered light (0-9).
- c) Once the first digit of the passcode is selected, push the ENTER button once. The numbered light should momentarily turn off indicating the entry was accepted.
- d) Repeat step b and c for the 2nd, 3rd, and 4th passcode digits. If the passcode was entered incorrectly, all the numbered lights will momentarily flash after entry of the 4th and final passcode digit. If the passcode was correct, the alarm light will stop flashing and will be turned off completely if no other alarms exist.
- e) To change the current passcode, perform the procedure (Command C-4) on the following page.



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Operating Instructions

Locking the unit and entering passcodes (continued)

Procedure for Entering a New “Lock” Passcode (Command C-4):

- a) To enter a new lock passcode, the lock function must be enabled (Command C-5) and the current passcode must be entered (i.e. the unit must be “unlocked” using Command A-7). See the 2 previous procedures if these two command entry requirements have not been satisfied.
- b) Select and enter Command C-4, Enter New Lock Combination.
- c) After the command is entered, the INC/DEC switch is used to select the first new passcode digit. The digit selected is indicated by a numbered light (0-9).
- d) Once the first new digit of the passcode is selected, push the ENTER button once. The numbered light should momentarily turn off indicating the entry was accepted. Write down the new digit for later use.
- e) Repeat steps c and d for the 2nd, 3rd, and 4th passcode digits, remembering to write down each passcode digit as they are entered.
- f) Verify the new passcode by re-locking the unit (MODE switch to the RUN position and then back to the middle, Command Entry position), and entering the new passcode using Command A-7 as described in the procedure on the previous page.

Manual override of the 4-20mA position command input signal

Command A-0, Enter Manual Positioning Mode, is used to override the 4-20mA position command input. (*This command should not be used when the valve is in an operating process that requires continuous positioning based on the 4-20mA input signal.*)

Procedure for Entering Manual Positioning Mode (Command A-0):

- a) To enter the Manual Positioning Mode, the position command input signal must be first driven to 4ma or less.
- b) Select and enter Command A-0, Enter Manual Positioning Mode. If the numbered lights flash momentarily after entering Command A-0: 1.) the position command may not be less than 4mA, 2.) the adjustment mode switch may be in the STANDBY position, or 3.) unit may be “locked” to prevent tampering.
- c) After entering the command, the yellow manual (MAN) light will be on and RO5 (Relay Output driver #5) will energize the Manual Control relay (if installed). The INC/DEC switch can be used to move the valve open or closed. If the adjustment mode switch is in the INDEX position, the INC/DEC switch is used to move between the 19 position “indexes”. If the adjustment mode switch is in the ADJ position, pushing the INC/DEC switch up or down changes the valve position in 1.0 degree steps. If the INC/DEC switch is held in the up or down position, the position is continuously adjusted until the maximum or minimum position is reached. When the max or min position setpoint is reached, all the numbered lights will momentarily flash.

This command should not be executed when the valve is part of an operating process that requires continuous, closed-loop valve positioning.

- d) To return control back to the 4-20mA position command input, move the MODE switch to the RUN position (down).



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Operating Instructions

High and low valve position limits

The high and low limits are automatically set when the user adjusts the maximum (Index #19) and minimum (Index #0) valve position settings. If different high and low limits are required (other than the default or automatically set limits), Command B-4 and Command B-5 can be executed using the procedure below.

Command B-4 is a configuration command that is used to adjust the high limit position threshold. Relay driver Output #3, RO3 will energize the optional High Position Limit relay when the valve position is equal to or greater than the stored high limit position threshold. The high limit threshold has a factory default of 80.0 degrees and is automatically set to 1.0 degree less than the maximum valve position when modified using Command A-2, Enter Position Setup Mode, or A-5, Set Max Position & Min/Max Ramp. **If the factory default or automatic 1.0 degree offset is acceptable, execution of Command B-4 is not necessary.**

Command B-5 is a configuration command that is used to adjust the low limit position threshold. Relay driver Output #4, RO4 will energize the optional Low Position Limit relay when the valve position is less than or equal to the stored low limit position threshold. The low limit threshold has a factory default of 0.0 degrees and is automatically set to 1.0 degree above the minimum valve position when modified using Command A-2, Enter Position Setup Mode, or A-6, Set Min Position & Min/Max Ramp. **If the factory default or automatic 1.0 degree offset is acceptable, execution of Command B-5 is not necessary.**

Procedure for Manually Adjusting the High or Low Limit Position Threshold (Command B-4 or B-5):

- a) Before entering Command B-4 (or B-5), the unit must be in the Manual Positioning Mode. (Execute Command A-0, as described on page 7300-S-13 or in Reference Table 8 on page 7300-S-24).
- b) With the unit in Manual Positioning Mode (as indicated by the yellow, MAN light on) and the ADJUST switch in the "ADJ" middle position, select and enter Command B-4 (or B-5). After command entry, the valve will be driven to the high (or low) limit position.
- c) To change the valve position in +/-1.0 degree steps, momentarily push the INC/DEC switch up or down. If the INC/DEC switch is held in the up or down position, the valve position setpoint is continuously changed in +/-1.0 degree steps.
- d) After moving the valve to the desired high (or low) limit position, push the ENTER button to save the new setting. When the ENTER button is pressed, the numbered light(s) and command set 'b' light will momentarily turn off, indicating the new value has been stored.
- e) To return control back to the 4-20mA position command input, move the MODE switch to the RUN position (down). The unit is now in RUN mode.



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Operating Instructions

Alarm codes

If the alarm light is on or flashing, view the alarm condition by executing Command A-1, Display Alarm Codes. After command entry, the INC/DEC switch is used to scroll through the alarm codes. The cause of the alarm can be determined by observing the numbered lights turned on and matching the pattern to a table entry below.

Alarm Code (Lights ON)	Alarm Name	Alarm Description, Possible Cause, and Corrective Action
Actuator Alarm Light # Pattern		
0,1	Position Overshoot	Actuator detected problem with position control. If alarm persists, replace valve actuator.
0,2	Position Breakaway	Actuator detected problem holding commanded position. Check valve's operating differential pressure and compare with specification. If alarm persists and measured pressure does not exceed valve rating, replace actuator.
0,1,2	Sticky Valve	Actuator could not position to within 0.1 degree. Check if there is debris in the valve inhibiting movement and command the valve open and close. If alarm persists and no debris is found, replace actuator.
0,3	Stuck Valve	Actuator could not position to within 0.1 degree. Re-power the actuator. Check if there is debris in the valve inhibiting movement and command the valve open and close. If alarm persists and no debris is found, replace actuator.
0,1,3	Temperature	Actuator senses out-of-specification ambient temperature. Check temperature of actuator's enclosure and remove heat source or promote circulation if too hot. If actuator ambient temperature is within specification, replace valve actuator.
0,2,3	Calibration	Actuator is not calibrated. Contact Maxon Corporation.
0,1,2,3	DC Supply Voltage	Actuator senses improper +24VDC supply. Check for heavily loaded power supply, a failed supply, or cable length out-of-specification.
0,4	Reset	Actuator detected a reset condition due to improper software execution, high electrical noise, improper shielding, or electronics failure. If alarm persists after checking for noise source and proper shielding, replace actuator.
0,1,4	Hardware	Actuator detected hardware failure. If alarm persists after re-powering actuator, replace actuator.
Control Interface Alarm Light # Pattern		
1,2	Communication	Control Interface/ Valve Actuator communication timeout occurred. Check for an intermittent control cable (4-wire cable and shield) connection. Replace Control Interface or Valve Actuator if control cable connections are sound.
1,3	Memory	Control Interface detected data corruption. Reset factory defaults and re-commission valve actuator. If alarm persists, replace Control Interface.
1,2,3	Lock	Control Interface is "locked" and user has moved command switch from the RUN position to the Command Entry (middle) position. A flashing alarm light also indicates this condition. Move command switch to the RUN position or unlock the unit by entering Command A-7 followed by the 4-digit passcode.
1,4	Reset	Control Interface detected a reset condition due to improper software execution, high electrical noise, improper shielding, or electronics failure. If alarm persists after checking for noise source and proper shielding, replace Control Interface.
Notes:		
1.) If the alarm light is not on or flashing, no alarm conditions exist.		
2.) If the alarm light is on or flashing, view the alarm code by executing Command A-7, Display Alarms. After command entry, the INC/DEC switch is used to scroll through the alarm codes. The cause of the alarm can be determined by observing the numbered lights turned on and matching the pattern to a table entry above.		



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Operating Instructions

Actuator Replacement

The SMARTLINK™ valve actuator assembly is factory-calibrated to ensure 0.1 degree positioning accuracy. Therefore, the following actuator replacement procedures should be performed by Maxon personnel or maintenance personnel trained specifically by Maxon.

Actuator Removal:

1. Disable the process controller connected to SMARTLINK™ and turn off power. Remove the actuator access cover using a 4mm Allen wrench and verify the green power light is OFF.
2. Record the wire color code sequence and then disconnect the four wires and shield from the terminal block. Disconnect any conduit fittings.
3. Loosen the clamp collar set screw with a 3/16" Allen wrench.
4. Remove the four M6x1x18 mm screws connecting the actuator to the adapter with a 4mm Allen wrench.
5. Remove the actuator by holding the actuator housing and pulling the actuator away from the valve.

Actuator Reinstallation:

1. Inspect the actuator shaft and verify that the 1/8" square 1/2" long key is completely seated in the shaft slot.
2. Verify the clamp collar is loose and position the screw head on the left when looking at the clamp collar at the top.
3. Place the actuator shaft with key into the clamp collar. Slide the keyed shaft into the coupling key slot, then rotate the actuator housing so the alignment pin mates with the pin hole in the valve adapter. The parts are a clearance fit but should slip together with little force. Apply pressure until the actuator is flat against the adapter. **Do not apply an excessive force.** If the sub-assemblies do not mate together, recheck that the clamp is loose and the key is pressed to the bottom of the key slot.
4. **Verify that the valve will close completely.** With the valve closed, the coupling hard-stop pin should be centered and touching the hard-stop set screw.
5. With valve in the fully closed position, assemble the actuator to the valve adapter with four M6x1x18 mm fasteners using Loctite 242. Use a

torque wrench with a 4mm Allen bit to apply 18in-lbs of torque in an alternating diagonal tightening sequence.

6. With the valve in the fully closed position, verify that the clamp collar is seated flush against the coupling shoulder. Tighten the stainless steel clamp collar with a torque wrench and 3/16" Allen bit to 110 in-lbs.
7. Make the necessary water-tight electrical conduit connection. Re-connect the four wires to the terminal strip per the original color code sequence. Re-connect the shield wire to the terminal strip, keeping it less than 1" in length.
8. Apply power to the SMARTLINK™ System. Verify the green power light is ON.
9. Reinstall the access cover and torque the four fasteners to 18 in-lbs. using a 4mm Allen wrench.
10. With the Control Interface, execute Command C-2 (Enable Valve Calibration/Check) which places the actuator in a command mode for calibration. When the command is entered, if all the lights flash on the Control Interface, the command was not executed. When the command is properly executed, the green diagnostic (DIAG) light in the actuator terminal block compartment will be off and the unit will no longer respond to 4-20mA position commands.
11. Execute Command C-1 (Calibrate Valve) which closes the valve until the hard-stop is found, establishes a new home (or 0 degree) position, and moves the valve through all 800 positions. The command takes 2 or 3 minutes to execute during which half of the numbered lights on the Control Interface flash on and off. When the command is finished, the Control Interface will flash all of the numbered lights ON if the command was not successful. If the calibration failed, repeat the command a second time.
12. Execute Command C-0 to check the new calibration. This command takes less than 90 seconds and will flash half of the numbered lights during execution. At the end of command execution, if all the number lights on the Control Interface flash ON and then OFF, the calibration test failed. Re-mount the valve to the assembly as described above and repeat the calibration procedure. If the calibration test passed, cycle power to the actuator and check for a calibration alarm. (The actuator's green diagnostic light should now be flashing and the alarm light on the Control Interface should be off.)
13. Re-enable the process controller commanding SMARTLINK™.

Operating Instructions

Maxon SMARTLINK™ Commissioning Table (should be completed at time of installation)

Serial No. / Install Date: _____

Position Index	Interface Output (Light #'s)	Position Command (%)	Position Command (mA)	Custom Position (% or mA)	Factory Default (degs)	Field Readings ("wc, O2%, etc.)
0	0	00.00%	4.000		0.0	
0.5	0, 1	05.56%	4.889		4.4	
1	1	11.11%	5.778		8.9	
1.5	1, 2	16.67%	6.667		13.3	
2	2	22.22%	7.556		17.8	
2.5	2, 3	27.78%	8.444		22.2	
3	3	33.33%	9.333		26.7	
3.5	3, 4	38.89%	10.222		31.1	
4	4	44.44%	11.111		35.6	
4.5	4, 5	50.00%	12.000		40.0	
5	5	55.56%	12.889		44.4	
5.5	5, 6	61.11%	13.778		48.9	
6	6	66.67%	14.667		53.3	
6.5	6, 7	72.22%	15.556		57.8	
7	7	77.78%	16.444		62.2	
7.5	7, 8	83.33%	17.333		66.7	
8	8	88.89%	18.222		71.1	
8.5	8, 9	94.44%	19.111		75.6	
9	0	100.00%	20.000		80.0	
Low Limit	---	---	---		00.0	
High Limit	---	---	---		80.0	

Configuration Command Name (& Number)	Factory Default (& Configuration Setting Number)	Field Configuration Setting
Select Loss of Signal (LOS) Position (B-0)	No Position Change (#4)	
Select Standby Position (B-2)	Position Index 0 (#0)	
Select Control Deadband (B-3)	0.06% Deadband (#2)	
Set High Limit Position Threshold (B-4)	80.0 degrees (N/A)	
Set Low Limit Position Threshold (B-5)	0.0 degrees (N/A)	
Set Auto Ramp Adjust ON/OFF (B-6)	Auto Ramp ON (#1)	
Enter New Lock Passcode (C-4)	Passcode: 0,0,0,0 (N/A)	
Select Lock Enable/Disable (C-5)	Lock Disable (#0)	



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SMARTLINK™ Reference Tables

Table 1: SMARTLINK™ Control Interface Input / Output Terminal Description

Terminal Name (Abbreviation)	Description
24V / Data Connector	
Field 24VDC Power (F24)	Output: Valve actuator +24VDC power; 25Watts peak, 12Watts average
Field Common (FCOM)	Output: Valve actuator +24VDC common
Data A (DA)	Input / Output: Communications network data 'A' signal
Data B (DB)	Input / Output: Communications network data 'B' signal
Supply 24VDC (S24)	Input : Power supply +24VDC; 25Watts peak, 12Watts average
Supply Common (SCOM)	Input: Power supply common
4-20mA Connector	
4-20mA In A + (INA+)	Input: 4-20mA valve position command, current into + and out of - terminal; 4mA = minimum position; 20mA = maximum position
4-20mA In A - (INA-)	
4-20mA In B + (INB+)	Reserved for future use
4-20mA In B - (INB-)	
4-20mA Out + (OUT+)	Output: 4-20mA valve position feedback, current out of + and into – terminal; 4mA = 0.0 degrees; 20mA = 80.0 degrees; valve position = [current (mA) – 4.0mA] / 16.0mA * 80.0 degrees (for non-characterized valve actuator)
4-20mA Out - (OUT-)	
Relay Input Connector	
Relay In 1 (RI1)	Input: Reserved for future use
Relay In 2 (RI2)	Input: Reserved for future use
Relay In 3 (RI3)	Input: Reserved for future use
Relay In 4 (RI4)	Input: Reserved for future use
Relay In 5 (RI5)	Input: Reserved for future use
Relay In 6 (RI6)	Input: Reserved for future use
Relay Output Connector	
Relay Out 1 (RO1)	Output: Alarm relay driver output; External interface relay coil voltage is connected to Supply Common (SCOM) through RO1, an open collector transistor output, if one or more of the following alarm conditions exist: valve communications, memory fault, valve actuator alarm, or tamper alarm.
Relay Out 2 (RO2)	Output: Control Enable relay driver output; External interface relay coil voltage is connected to Supply Common (SCOM) through RO2, an open collector transistor output, if none of the following alarm conditions exist: valve communications, memory fault, or stuck valve alarm.
Relay Out 3 (RO3)	Output: High Position Limit relay driver output; External interface relay coil voltage is connected to Supply Common (SCOM) through RO3, an open collector transistor output, if valve position >= high limit position.
Relay Out 4 (RO4)	Output: Low Position Limit relay driver output; External interface relay coil voltage is connected to Supply Common (SCOM) through RO3, an open collector transistor output, if valve position <= low position limit position.
Relay Out 5 (RO5)	Output: Manual Control relay driver output; External interface relay coil voltage is connected to Supply Common (SCOM) through RO3, an open collector transistor output, if control interface is in manual control mode.
Relay Common (RCOM)	Output and Input Relay Common



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SMARTLINK™ Reference Tables

Table 2: SMARTLINK™ Valve Actuator Input / Output Terminal Description

Terminal Name (Abbreviation)	Description
24V / Data Connector	
Field 24VDC Power (+24)	Input: Valve actuator +24VDC power; 25Watts peak, 12Watts average
Field Common (GND)	Input: Valve actuator +24VDC common
Data A (DA)	Input / Output: Communications network data 'A' signal
Data B (DB)	Input / Output: Communications network data 'B' signal
Shield (SHD)	Field device shield

Table 3: SMARTLINK™ Control Interface Wiring Specifications

Terminal Name (Abbreviation)	Wiring Specification (Maximum Length, Type, Min/Max Size, and special requirements)
24V / Data Connector	
Field 24VDC Power (F24)	100 feet maximum length; Maxon P/N 59829, Connect-Air International P/N W22P-1005, or equivalent; EIA Level 4 cable, 2 twisted pair with shield, 22 AWG; Suggested wiring color code convention: Orange/White (F24), Orange (FCOM), Blue (DA), Blue/White (DB); Requires shield wire termination at both ends. Shield should be connected to earth ground as it enters the enclosure for the Control Interface with a maximum length of 2 inches.
Field Common (FCOM)	
Data A (DA)	
Data B (DB)	
	300 feet maximum length; Belden P/N 3086A; 2 twisted pair with shield; 16 AWG – power pair, 20 AWG - data pair; Suggested wiring color code convention: Brown (F24), Blue (FCOM), White (DA), Black (DB); Requires shield wire termination on both ends. Shield should be connected to earth ground as it enters the enclosure for the Control Interface with a maximum length of 2 inches.
Supply 24VDC (S24)	No length limitations other than voltage drop considerations versus wire size constraints; +24VDC; 1A/25Watt maximum; 14 to 22 AWG
Supply Common (SCOM)	
4-20mA Connector	
4-20mA In A + (INA+)	1000 feet maximum length; Belden 9535, 2-conductor, 100% shield coverage, 300V 80C (UL 2464, CSA PCC FT 4) or equivalent; Inputs (INA+/- & INB+/-); Requires shield wire termination at Control Interface end. Shield should be connected to earth ground as it enters the enclosure for the Control Interface with a maximum length of 2 inches. Output (OUT+/-) shield should be terminated at user's controller end.
4-20mA In A - (INA-)	
4-20mA In B + (INB+)	
4-20mA In B - (INB-)	
4-20mA Out + (OUT+)	
4-20mA Out - (OUT-)	
Relay Input Connector	
Relay In 1 (RI1)	Not applicable
Relay In 2 (RI2)	
Relay In 3 (RI3)	
Relay In 4 (RI4)	
Relay In 5 (RI5)	
Relay In 6 (RI6)	
Relay Output Connector	
Relay Out 1 (RO1)	No length limitations; 30 VDC max & 100 mA max; 14 to 22 AWG; Follow local codes for wire type.
Relay Out 2 (RO2)	
Relay Out 3 (RO3)	
Relay Out 4 (RO4)	
Relay Out 5 (RO5)	
Relay Common (RCOM)	



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SMARTLINK™ Reference Tables

Table 4: SMARTLINK™ DIN Rail Assembly Input / Output Terminal Description

Terminal Designator: Name (Abbreviation)	Description
Power Supply VAC Terminals	
Line Voltage (L1)	Provided only if optional DC supply is provided 120 to 230 VAC power source, 50-60Hz
Neutral (L2)	Neutral
Ground (GND)	Earth Ground
Relay Output Terminal Block	
Alarm (AL)	Output: Alarm relay contact, Normally open, 6A, 250VAC/DC max; Contacts closes if one or more of the following alarms exist: valve communications, memory fault, valve actuator alarm, or tamper alarm.
Alarm Return (ALR)	
Control Enable (CE)	Output: Control Enable relay contact; Normally open, 6A, 250VAC/DC max; Contact opens if one or more of the following alarm conditions exist: valve communications, memory fault, or stuck valve alarm.
Control Enable Return (CER)	
High Position Limit (HPL)	Output: High Position relay contact; Normally open, 6A, 250VAC/DC max; Contact closes if valve position \geq high limit position.
High Position Limit Return (HPLR)	
Low Position Limit (LPL)	Output: Low Position Limit relay contact; Normally open, 6A, 250VAC/DC max; Contact closes if valve position \leq low position limit position.
Low Position Limit Return (LPLR)	
Manual Control (MC)	Output: Manual Control relay contact; Normally open, 6A, 250VAC/DC max; Contact closes if Control Interface is in manual control mode.
Manual Control Return (MCR)	
4-20mA Terminal Block	
4-20mA In A + (INA+)	Input: 4-20mA valve position command, current into + and out of - terminal; 4mA = minimum position; 20mA = maximum position
4-20mA In A - (INA-)	
4-20mA In B + (INB+)	Reserved for future use
4-20mA In B - (INB-)	
4-20mA Out + (OUT+)	Output: 4-20mA valve position feedback, current out of + and into - terminal; 4mA = 0.0 degrees; 20mA = 80.0 degrees; valve position = $[\text{current (mA)} - 4.0\text{mA}] / 16.0\text{mA} * 80 \text{ degs}$ (for non-characterized valve actuator)
4-20mA Out - (OUT-)	
Network Terminal Block	
Field 24VDC Power (F24)	Output: Communications network +24VDC power
Field Common (FCOM)	Output: Communications network common
Data A (DA)	Input / Output: Communications network data 'A' signal
Data B (DB)	Input / Output: Communications network data 'B' signal
24VDC Terminal Block	
Supply 24VDC Power (S24)	Pre-wired only if optional DC supply is provided 24VDC power source; 1A peak current
Supply Common (SCOM)	24VDC power source common



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SMARTLINK™ Reference Tables

Table 5: SMARTLINK™ DIN Rail Assembly Wiring Specifications

Terminal Designator: Name (Abbreviation)	Wiring Specification (Maximum Length, Type, Min/Max Size, and special requirements)
VAC Terminal Block	
Line Voltage (L1) Neutral (L2) Ground (GND)	No length limitations; 14 to 22 AWG; Follow all local and NEC 1 wiring codes; Protective Earth should also be connected to the ground lug of the enclosure that houses the Control Interface.
Relay Output Terminal Block	
Alarm (AL) Alarm Return (ALR) Control Enable (CE) Control Enable Return (CER) High Position Limit (HPL) High Position Limit Return (HPLR) Low Position Limit (LPL) Low Position Limit Return (LPLR) Manual Control (MC) Manual Control Return (MCR)	No length limitations; 14 to 22 AWG; Follow all local and NEC 1 wiring codes.
4-20mA Terminal Block	
4-20mA In A + (INA+) 4-20mA In A - (INA-) 4-20mA In B + (INB+) 4-20mA In B - (INB-) 4-20mA Out + (OUT+) 4-20mA Out - (OUT-)	1000 feet maximum length; Belden 9535, 2-conductor, 100% shield coverage, 300V 80C (UL 2464, CSA PCC FT 4) or equivalent; Inputs (INA+/- & INB+/-); Requires shield wire termination at enclosure that houses the Control Interface end. Shield should be connected to the ground lug with a maximum length of 2 inches. Output (OUT+/-) shield should be terminated at user's controller end.
Network Terminal Block	
Field 24VDC Power (F24) Field Common (FCOM) Data A (DA) Data B (DB)	100 feet maximum length; Maxon P/N 59829, Connect-Air International P/N W22P-1005, or equivalent; EIA Level 4 cable, 2 twisted pair with shield, 22 AWG; Suggested wiring color code convention: Orange/White (F24), Orange (FCOM), Blue (DA), Blue/White (DB); Requires shield wire termination at both ends. Shield should be connected to ground lug of enclosure that houses the Control Interface with a maximum length of 2 inches. 300 feet maximum length; Belden P/N 3086A; 2 twisted pair with shield; 16 AWG – power pair, 20 AWG - data pair; Suggested wiring color code convention: Brown (F24), Blue (FCOM), White (DA), Black (DB); Requires shield wire termination on both ends. Shield should be connected to earth ground as it enters the enclosure for the Control Interface with a maximum length of 2 inches.
24VDC Terminal Block	
Supply 24VDC Power (S24) Supply Common (SCOM)	No wiring required if optional supply and pre-wiring are specified; If supply is not provided, no length limitations exist other than voltage drop considerations versus wire size constraints; 14 to 22 AWG; Follow all local and NEC 1 codes



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SMARTLINK™ Reference Tables

Table 6: SMARTLINK™ Interface Relay Checkout Procedures

SMARTLINK™ DIN-Rail Assembly Terminal Number: Name (Abbreviation)	SMARTLINK™ Control Interface Relay Driver Terminal Name (Abbreviation)	Checkout Procedure to verify proper relay contact operation
Relay Output Terminal Block	Relay Output Drivers	
Alarm (AL) Alarm Return (ALR)	Relay Out 1 (RO1)	Temporarily disconnect the Data A or B signal to the Valve Actuator. Within a few seconds, the Alarm relay (connected to the Control Interface RO1 terminal) should be energized.
Control Enable (CE) Control Enable Return (CER)	Relay Out 2 (RO2)	After power up, the Control Enable relay (connected to the Control Interface RO2 terminal) should normally be energized. Temporarily disconnect the Data A or Data B signal to the Valve Actuator. Within a few seconds, the Control Enable relay should not be energized.
High Position Limit (HPL) High Position Limit Return (HPLR)	Relay Out 3 (RO3)	Perform Operational Checkout Step #2 or #3 (page 7300-S-6) to move the valve actuator throughout its full travel range. With the valve in its maximum position, the High Position Limit relay (connected to the Control Interface RO3 terminal) should be energized. With the valve commanded to a position 95% or less than its maximum position, the relay should not be energized.
Low Position Limit (LPL) Low Position Limit Return (LPLR)	Relay Out 4 (RO4)	Perform Operational Checkout Step #2 or #3 (page 7300-S-6) to move the valve actuator throughout its full travel range. With the valve in its minimum position, the Low Position Limit relay (connected to the Control Interface RO4 terminal) should be energized. With the valve commanded to a position 5% or more above its minimum position, the relay should not be energized.
Manual Control (MC) Manual Control Return (MCR)	Relay Out 5 (RO5)	After power up, the Manual Control relay (connected to the Control Interface RO5 terminal) should not be energized. Put the SMARTLINK™ in a local manual mode as described on page 7300-S-13. Once the system is put in manual mode, the Manual Control relay should be energized.



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SMARTLINK™ Reference Tables

Table 7: SMARTLINK™ System Configuration Summary

System configuration of SMARTLINK™ is accomplished through execution of the commands shown below, using the switches and lights on the Control Interface.

Before performing any system configuration function, review the factory default settings. In many applications, modification of the default configuration is not necessary.

Configuration Function (Command #)	Factory Default (Configuration #)	Description
Select LOS Position (B-0)	No position change (#4)	Desired valve position when a loss of signal (L.O.S.) event occurs. A loss of signal condition exists if the position command signal drops below 0.05mA. Configuration setting #0, 1, 2, and 3 correspond to the positions defined at index #0, 3, 6, and 9, respectively. Setting #4 corresponds to no position change (i.e. actuator remains in last position before loss of signal).
Select Standby Position (B-2)	Position Index 0 (#0)	Desired valve position when adjustment mode switch is placed in the STANDBY position. (The STANDBY function is not active when the unit is in RUN mode.) Configuration setting #0, 1, 2, and 3 correspond to the positions defined at index #0, 3, 6, and 9, respectively.
Select Control Deadband (B-3)	0.06% Deadband (#2)	Control deadband placed around the position command input signal to eliminate unwanted actuator movement caused by electrical noise on the 4-20mA position command. Configuration setting #0, 1, 2, 3, 4, and 5 correspond to a deadband of 0, 0.03, 0.06, 0.13, 0.16, and 0.19%, respectively.
Set High Limit Position Threshold (B-4)	80.0 degrees (N/A)	Relay driver Output #3 (RO3) will energize the High Position Limit relay when the valve position is \geq high position limit threshold. This value is automatically set to 1.0 degree less than the maximum valve position when modified using Commands A-2 or A-5.
Set Low Limit Position Threshold (B-5)	0.0 degrees (N/A)	Relay driver Output #4 (RO4) will energize the Low Position Limit relay when the valve position is \leq low position limit threshold. This value is automatically set to 1.0 degree above the minimum valve position when modified using Commands A-2 or A-6.
Set Auto Ramp Adjust On/Off (B-6)	Auto Ramp ON (#1)	The automatic ramp function is used during the Valve Position Setup Mode to create a linear position ramp between the position being adjusted and the two adjacent position indexes. This provides a position "smoothing" of the valve profile and simplifies valve characterization. Setting #0 is Auto Ramp OFF and setting #1 is ON.
Enter New Lock Combination (C-4)	Passcode: 0,0,0,0 (N/A)	4-digit electronic passcode to prevent tampering. The passcode is required to modify the configuration only if the lock is enabled. See Select Lock Enable/Disable configuration below.
Select Lock Enable / Disable (C-5)	Lock Disable (#0)	Enable / Disable selection of the electronic "lock" function. If enabled, the stored passcode must be entered to modify any configuration or valve profile data. Setting #0 and #1 correspond to Lock Disable and Lock Enable, respectively.

Changing a System Configuration Setting:

- Select and enter the required system configuration command.
- After the command is entered, one of the numbered (0-9) lights will be on, indicating the current configuration setting. (For example: If the lock configuration is set to #0, Lock Disable, the 0 light will be solidly lit after Command C-5, Lock Enable/Disable, is entered successfully).
- Select the desired configuration setting by using the INC/DEC switch. As the INC/DEC switch is momentarily pushed up or down, the selected setting changes as indicated by turning on the corresponding numbered (0-9) light.
- Push the ENTER button after the desired configuration setting is selected. The numbered light that is lit to indicate the selected configuration will momentarily turn off indicating the command is complete and the configuration setting is saved.
- To confirm the correct setting is saved, re-enter the command and verify the new setting by the numbered (0-9) light indication.



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SMARTLINK™ Reference Tables

Table 8: SMARTLINK™ User Commands - Command Set 'A'

SMARTLINK™ Commands Number: Name	Description of command purpose and usage
Command Set 'A'	
A-0: Enter Manual Positioning Mode	<p>Command A-0 is used to enter a Manual Positioning Mode that overrides the 4-20 ma, position command input. To execute Command A-0, the position command signal must first be driven to 4ma or less. If the numbered lights flash momentarily after entering Command A-0;</p> <p>a.) the position command may not be less than 4mA, b.) the adjustment mode switch may be in the STANDBY position, or c.) unit may be "locked" to prevent tampering.</p> <p>After entering Command A-0, the yellow manual light on the Control Interface will be on and RO5 (Relay Output driver #5) will energize the Manual Control relay (if installed). Once this command has been entered, the INC/DEC switch can be used to move the valve open or close. If the adjustment mode switch is in the INDEX position, the INC/DEC switch is used to move between the 19 electronic position "indexes". (See Commissioning Sheet on page 7300-S-17 for the factory default valve positions for each index).</p> <p>If the adjustment mode switch is in the ADJ position, pushing the INC/DEC switch up or down changes the valve position in 1.0 degree steps. If the INC/DEC switch is held in the up or down position, the position is continuously adjusted until the max/min position is reached. <i>This command should not be executed when the valve is part of an operating process that requires continuous, closed-loop valve positioning.</i></p>
A-1: Display Alarm Codes	<p>After entering Command A-1, the INC/DEC switch is used to scroll through all current alarm conditions. If the red alarm ("ALM") light on the Control Interface is on, one or more alarm condition exists. (See page 7300-S-15 for Alarm Codes.)</p>
A-2: Enter Valve Position Setup Mode	<p>Command A-2 is used to enter the Valve Position Setup Mode for modifying the 19 position profile. To execute Command A-2, the position command signal must be 4 ma or greater. (If the numbered lights flash momentarily after entering Command A-0, the adjustment mode switch may be in the STANDBY position, or the unit may be "locked" to prevent tampering.)</p> <p>After entering Command A-2, both the yellow manual light and green run light will be flashing along with 1 or 2 of the numbered lights that are used to indicate the valve's position index. The flashing lights indicate that one of the 19 position indexes can now be modified using the INC/DEC switch. (For example, if the #1 and #2 light are flashing, position index 1.5 can be adjusted.) The position command signal determines which of the 19 position indexes can be modified. With the adjustment mode switch in the ADJ position, pushing the INC/DEC switch up or down changes the valve position in +/-0.1 degree steps. If the INC/DEC switch is held in the up or down position for more than 3 seconds, the valve position is changed in 0.5 degree steps. After moving the valve to the desired position, the Enter button must be pressed to save the position setting. When the Enter button is pressed, the blinking position index lights (0-9) and command set light 'a' will momentarily turn off. See Commissioning Sheet on page 7300-S-17 for a complete description of the valve characterization procedure.</p> <p>In the Position Setup mode a maximum movement of 8 degrees from the stored position is permitted. When the 8 degree limit is reached all of the position index lights will momentarily flash on. If the adjustment mode switch is in the INDEX position, valve positioning is inhibited and is indicated by a momentary flash of the position index lights if an INC/DEC switch adjustment is attempted. Valve positioning is also inhibited if the position command signal is less than 0.05 ma and is indicated by turning off the position index lights.</p>
A-3: Reserved for future use	N/A
A-4: Reserved for future use	N/A

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SMARTLINK™ Reference Tables

Table 8: SMARTLINK™ User Commands - Command Set 'A' (continued)

SMARTLINK™ Commands Number: Name	Description of command purpose and usage
Command Set 'A'	
A-5: Set Max Position & Min/Max Ramp	<p>Command A-5 is used to enter the Valve Position Setup Mode for adjusting the maximum position (index #9) and setting a linear position ramp from the minimum to maximum stored positions. To execute Command A-5, the position command signal must be 20mA, +/-0.15mA. (If the numbered lights flash momentarily after command entry, the position command input is not 20mA or the adjustment mode switch is in the STANDBY position.) After entering the command, both the yellow manual light and green run light will be flashing along with a flashing #9 light. The valve's maximum position can now be modified using the INC/DEC switch. If the adjustment mode switch is in the ADJ position, pushing the INC/DEC switch up or down changes the valve position in +/- 0.1 degree steps. If the INC/DEC switch is held in the up or down position for more than 3 seconds, the valve position is changed in 0.5 degree steps. After moving the valve to the desired position, the Enter button must be pressed to save the position setting. When the Enter button is pressed, the #9 position index light and the command set light 'a' will momentarily turn off.</p> <p>In the Position Setup mode a maximum movement of 8 degrees from the stored position is permitted. When the 8 degree limit is reached all of the position index lights will momentarily flash on. If the adjustment mode switch is in the INDEX position, valve positioning is inhibited and is indicated by a momentary flash of the position index lights when an INC/DEC adjustment is attempted. After the command is entered, valve positioning is also inhibited if the command signal changes from 20mA.</p>
A-6: Set Min Position & Min/Max Ramp	<p>Command A-6 is used to enter the Valve Position Setup Mode for adjusting the minimum position (index #0) and setting a linear position ramp from the minimum to maximum positions. To enter Command A-6, the position command signal must be 4mA, +/-0.15mA. Adjustment of the minimum position is performed identical to adjustment of the maximum position, Command A-5.</p>
A-7: Unlock Valve Configuration	<p>Command A-7 permits entry of a 4-digit passcode to "unlock" the system configuration and position profile for user modification. A flashing alarm light indicates a "locked" unit. If the alarm light is not flashing, the unit is already unlocked and the numbered lights will flash momentarily if command entry is attempted. After the command is entered, the INC/DEC command is used to select a passcode digit as indicated by the lights. Once selected, the Enter button should be pushed and the process repeated 3 more times. If the 4-digit passcode is correct, the alarm light will stop flashing and be turned off if no other alarms exist. To re-lock the unit, move the command switch to the RUN position</p>



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SMARTLINK™ Reference Tables

Table 9: SMARTLINK™ User Commands- Command Set 'B'

SMARTLINK™ Commands Number: Name	Description of command purpose and usage
Command Set 'B'	
B-0: Select Loss of Signal (LOS) Position	<p>Command B-0 is a configuration command that permits selection of valve position when a loss of signal event occurs (below 0.05mA). After Command B-0 is entered, the current configuration is shown by one of the numbered lights. Select an L.O.S. configuration, #0,1,2,3, or 4, using the INC/DEC switch and push the Enter button after the desired configuration is indicated by the numbered lights.</p> <p>Configuration #0,1,2, and 3 correspond to the positions defined at index #0, 3, 6, and 9 (max), respectively. (See Commissioning Sheet on page 7300-S-17 for the default valve position for each index). Configuration #4 corresponds to no position change (actuator remains in last position before loss of signal). The factory default configuration is #4.</p>
B-1: Reserved for future use	N/A
B-2: Select Standby Position	<p>Command B-2 is a configuration command that permits selection of the STANDBY valve position. After command entry, the current configuration is shown by one of the numbered lights. Select a standby position configuration, #0-3, using the INC/DEC switch and push the Enter button after the desired configuration is indicated by the numbered lights. Configuration #0,1,2, and 3 correspond to the positions defined at index #0, 3, 6, and 9 (max), respectively. (See Commissioning Sheet on page 7300-S-17 for the default position for each index).</p> <p>The STANDBY position is useful if an emergency situation occurs during Valve Position Setup and the user wants the valve to immediately move to a "safe" position, regardless of the 4-20mA position command. The valve moves to the STANDBY position when the adjustment mode switch is in the downward "STANDBY" position.</p>
B-3: Select Deadband	<p>Command B-3 is a configuration command that is used to select the deadband placed around the position command input signal. If the input signal contains spurious noise, hunting of the actuator may occur. It is recommended that the source of the noise is eliminated or the 4-20mA cable type is verified as well as its shield and ground connections. If the noise cannot be eliminated, the deadband can be increased as a last resort.</p> <p>After Command B-3 is entered, the current configuration is shown by one of the numbered lights. Select a deadband configuration, #0-5, using the INC/DEC switch and push the Enter button after the desired configuration is indicated by the numbered lights. Configuration #0,1,2,3,4 and 5 correspond to a deadband of 0, 0.03, 0.06, 0.13, 0.16 and 0.19%, respectively. The factory default configuration is #2, 0.06%.</p>
B-4: Set High Limit Position Threshold	<p>Command B-4 is a configuration command that is used to adjust the high limit position threshold. Relay driver Output #3 (RO3) will energize the High Position Limit relay when the valve position is equal to or greater than the stored high limit position threshold. The factory default is 80.0 degrees and is automatically set to 1.0 degree less than the maximum valve position when modified using Commands A-2 or A-5. If the factory default or automatic 1.0 degree offset (from a user-selected maximum) is acceptable, this configuration is not necessary.</p> <p>To execute Command B-4, the valve system must be in the Manual Mode (See Command A-0). With the unit in Manual Mode and adjustment mode switch in the "ADJ" middle position, push the Enter button and the valve will be driven to the stored value. Then push the INC/DEC switch up or down to change the valve position in +/-1.0 degree steps. If the INC/DEC switch is held in the up or down position, the valve position is continuously changed in +/-1.0 degree steps. After moving the valve to the desired high limit position, the Enter button must be pressed to save the setting. When the Enter button is pressed, the position index and command set 'b' lights will momentarily turn off, indicating the new value has been stored.</p>

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SMARTLINK™ Reference Tables

Table 9: SMARTLINK™ User Commands - Command Set 'B' (continued)

SMARTLINK™ Commands Number: Name	Description of command purpose and usage
Command Set 'B'	
B-5: Set Low Limit Position Threshold	<p>Command B-5 is a configuration command that is used to adjust the low limit position threshold. Relay driver Output #4 (RO4) will energize the Low Position Limit relay when the valve position is less than or equal to the stored low limit position threshold. The factory default is 0.00 degrees and is automatically set to 1.0 degree above the minimum valve position when modified using Commands A-2 or A-6. If the factory default or automatic 1.0 degree offset (from a user-selected minimum) is acceptable, this configuration is not necessary.</p> <p>To execute Command B-5, the valve system must be in the Manual Mode (See Command A-0). With the unit in Manual Mode and adjustment mode switch in the "ADJ" middle position, push the Enter button and the valve will be driven to the stored value. Then push the INC/DEC switch up or down to change the valve position in +/-1.0 degree steps. If the INC/DEC switch is held in the up or down position, the valve position is continuously changed in +/-1.0 degree steps. After moving the valve to the desired low limit position, the Enter button must be pressed to save the setting. When the Enter button is pressed, the position index and command set 'b' lights will momentarily turn off, indicating the new value has been stored.</p>
B-6: Set Auto Ramp Adjust On/Off	<p>Command B-6 is a configuration command that is used to set on or off the automatic ramp function. The factory default is Auto Ramp ON, configuration #1. Configuration #0 is Auto Ramp OFF.</p> <p>After command entry, the current configuration is shown by one of the numbered lights. Select Auto Ramp ON, #1, or Auto Ramp OFF, #0 using the INC/DEC switch and push the Enter button after the desired configuration is indicated by the numbered lights.</p> <p>The automatic ramp function is used during the Valve Position Setup Mode to create a linear position ramp between the position being adjusted and the two adjacent position indexes. This provides a position "smoothing" of the valve profile and simplifies valve characterization because only 10 of the 19 position indexes (i.e. index 0, 1, 2, 3,instead of 0, 0.5, 1.0, 1.5, etc.) require adjustment. For custom valve characterization that requires precision adjustment of each of the 19 position indexes, the Auto Ramp function should be OFF.</p>
B-7: Reserved for future use	N/A



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SMARTLINK™ Reference Tables

Table 10: SMARTLINK™ User Commands - Command Set 'C'

SMARTLINK™ Commands Number / Name	Description of command purpose and usage
Command Set 'C'	
C-0: Check Valve Calibration	For use by Maxon-trained field personnel.
C-1: Calibrate Valve	For use by Maxon-trained field personnel.
C-2: Enable Valve Calibration / Check	For use by Maxon-trained field personnel.
C-3: Reset Factory Default Settings	Command C-3 is a configuration command that is used to reset all system configuration and valve position data with the exception of the backup position profile. To execute Command C-3, the valve system must first be in Position Setup Mode (See Command A-2). With the unit in Position Setup Mode and Command C-3 selected, push the Enter button. Light #3 and the command set 'c' light should momentarily turn off indicating the reset is complete.
C-4: Enter New Lock Combination	<p>Command C-4 is a configuration command that is used to enter a new 4-digit electronic passcode to prevent tampering. To execute Command C-4, the electronic "lock" must be enabled and the unit must be in the "unlocked" state. (A locked unit is indicated by a flashing alarm light.) If all the numbered lights momentarily flash after command entry, the "lock" function is disabled or the unit is currently locked. See Command C-5 to enable the lock function or Command A-7 to unlock the unit.</p> <p>After the command is entered, the INC/DEC command is used to select a passcode digit as indicated by the numbered lights. After the first digit is selected, the Enter button should be pushed and the numbered light and command set light 'c' momentarily turn off. Repeat the previous digit entry process 3 more times for a total of 4 digits. After the 4th digit is entered, the number #4 light will turn on and the command set 'c' light will begin to flash, indicating that a new 4-digit passcode has been saved and the command is complete.</p> <p>If the 4-digit passcode is forgotten, call Maxon for assistance. The factory default 4-digit passcode is 0-0-0-0.</p>
C-5: Select Lock Enable / Disable	<p>Command C-5 is a configuration command that is used to enable or disable the electronic "lock" function. The factory default is configuration #0, Lock Disable. Configuration #1 is Lock Enable.</p> <p>To execute Command C-5, the unit must be in the unlocked state. (The alarm light will be flashing rapidly if the unit is locked. See Command A-7 to unlock the device.) After command entry, the current configuration is shown by one of the numbered lights. Select either configuration #0 or #1 using the INC/DEC switch and push the Enter button after the desired configuration is indicated by the numbered lights.</p>

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SMARTLINK™ Reference Tables

Table 10: SMARTLINK™ User Commands - Command Set 'C' (continued)

SMARTLINK™ Commands Number / Name	Description of command purpose and usage
Command Set 'C'	
C-6: Save Profile as Backup	<p>Command C-6 is a configuration command that is used to save the currently stored valve position profile. This command is used in conjunction with C-7, Restore Backup Profile, to help ensure that a proven valve position profile can be restored without re-commissioning if a factory default reset is accidentally performed or incorrect position adjustments are made during the commissioning process.</p> <p>To execute Command C-6, the valve system must first be in Position Setup Mode (See Command A-2). With Command C-6 selected and the unit in Position Setup Mode, push the Enter button. Light #6 and the command set 'c' light should momentarily turn off, indicating the command has been executed.</p>
C-7: Restore Backup Profile	<p>Command C-7 is a configuration command that is used to restore a backup valve position profile as the current operating profile. This command is used in conjunction with C-6, Save Profile as Backup, to help ensure that a proven valve position profile can be restored without re-commissioning if a factory default reset is accidentally performed or incorrect position adjustments are made during the commissioning process.</p> <p>To execute Command C-6, the valve system must first be in Position Setup Mode (See Command A-2). With the unit in Position Setup Mode and Command C-7 selected, push the Enter button. Light #7 and the command set 'c' light should momentarily turn off, indicating the command has been executed.</p>

General Command Entry Instructions:

- A user command can be performed only when the following conditions are all satisfied:
 - MODE switch is not in the RUN position,
 - one of the green command set lights (a, b, c) is blinking,
 - ADJUST switch is not in the STANDBY position, and
 - unit is "unlocked". (Condition d. is not required for Command A-7, Unlock Valve Configuration and Command A-1, Display Alarm Codes.)
 - For some commands, the unit must be in a specific mode or have the correct 4-20mA command signal (see command entry requirements listed on page 7300-S-10 or in Reference Tables 8 through 10 on pages 7300-S-24 through 29).
- If the a, b, or c command set light is not blinking, momentarily push the MODE switch in the CMD abc position (up) or, change the position of the rotary CMD SEL switch. This will start the command set light blinking and permit a command to be entered.
- Select the desired command set by momentarily pushing the MODE switch upward to the CMD abc position. Subsequent CMD abc switch entries will change the command set selection as indicated by the green command set (a, b, c) lights.
- Select the desired command number by changing the position of the rotary CMD SEL switch. When one of the command set lights is blinking, the command number selected is indicated by the corresponding numbered (0-9) light being lit.
- After the command set and number are selected, press the ENTER button. If all of the numbered lights flash momentarily after the Enter button is pushed, a command entry error has occurred and the command was not executed. If an entry error occurs, check if the unit is locked (i.e. alarm light blinking) or the ADJUST switch is in the STANDBY position. If neither condition exists, check the specific entry requirements of the command.



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