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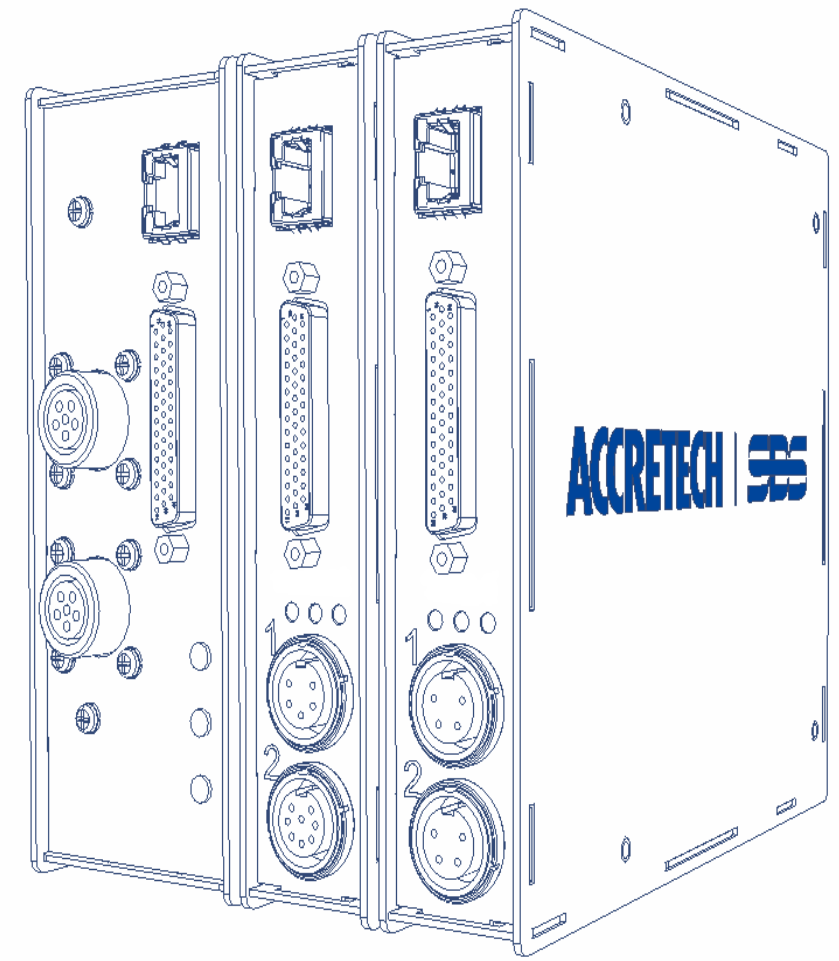
OPERATIONS MANUAL

SB-6500 Series

SB 6500

Profinet Interface

Engineering Confidence for Precision Grinding



ENGINEERING CONFIDENCE.
BUILT WORLDWIDE.

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Operations Manual

For the

SBS Profinet Interface

For Use with Model SB-6500 Series Control Units

LL-6800

Revision 1.0 (GSD 2026-11-12)

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Benefits of Profinet

- Increases throughput by saving setup time.
- Easy to install and operate.
- Works with existing SBS installations.
- Backed by world-class SBS customer service.
- Works over the common RJ45 (Ethernet) connector.
- Easily integrates within the Siemens Simatic ecosystem (TIA Portal).

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1 Introduction

This guide provides the information needed to configure and to use the Profinet interface of the SB-6500. It does not explain how to access the specific data fields once the data is in the Profinet controller, or PLC, since this varies between controllers.

To configure most Profinet Controllers, first complete the following steps.

1. Connect the RJ45 ethernet network cable to the SB-6500.
2. Load the GSDML file into the Profinet controller (PLC). The GSDML file can be downloaded from the SBS software downloads portal.
3. Assign a device name for the SB-6500 using Profinet DCP.
4. Define the configuration of the SB-6500 in the controller.
5. Define the input and output octets in the controller.
6. Connect the input and output octets to the controller's internal control logic.

1.1 Network and Device Configuration

IP address: By default, the SB-6500 obtains its IP address through DHCP. If no DHCP server is available, it falls back to a link-local IP address (169.254.x.x).

GSDML file: The current GSDML file, version 2026-11-12, can be downloaded from the SBS software downloads portal.

Device name: By default, the SB-6500 modules have no Profinet device name. A device name must be assigned using Profinet DCP (step 3 above) before the controller can establish a connection.

Slots and subslots: The I/O configuration of each module is fixed. Each module exchanges all of its cyclic input and output data through a single slot and subslot, at the octet offsets given in "Parameters."

Connection loss: Module operation is not affected if the Profinet connection is lost. All output bits and values received from the controller remain in the state they were in before the connection was lost.

2 Profinet

2.1 I/O Overview

This section explains how SB-6500 handles input and output control points for all modules in the SB-6500 series. It assumes a general knowledge of the use of Profinet. Output is defined as data from the Profinet controller to the SB-6500. Input is defined as data from SB-6500 to the Profinet controller.

The SB-6500 has a few control points. Most of these control points are single bit, yes/no type functions. Others, such as Errors A–H, require 8 bits (octet). Still others, such as RPM indication, require 16 or more bits (two or more octets). The various bit type control points are gathered to form octets. To determine the specific location within an octet, see "Parameters."

The device gathers all the octets for a specific module into a contiguous group of octets. The system specifies the octet offset from the beginning of the group of octets. This holds true for input or output control points. For information about where the octet holding a specific control point is found in a group of octets, see "Parameters."

2.2 Parameters

The following table lists the SB-6500 Profinet outputs and inputs. All balancer types have identical Profinet interfaces, so they are grouped together. The octet position shown is the position offset for each individual module, starting with the first octet for that module in position 0.

Any octet or bit position that is not listed for a module is reserved. For example, output octets +3 to +13 and input octets +6 to +17 are reserved for every module except the Gauge. Leave reserved output bits at 0, and ignore the contents of reserved input bits.

Balancer			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
Clear Error	1	+0	0
Go to Idle Mode	1	+0	1
Load Job	1	+0	2
Set Job	8	+1	0–7
	8	+2	0–7
Start Balance	1	+14	0
Stop Balance	1	+14	1
Home Weights (NonContact)	1	+14	2
RPM Error Disable	1	+14	7

Balancer			
Inputs from SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
Clearable Error Active	1	+0	0
Not Idle Mode	1	+0	1
Active Job	8	+1	0–7
	8	+2	0–7
Errors A-H	8	+3	0–7
Errors I-P	8	+4	0–7
Errors Q-X	8	+5	0–7
Vibration Amplitude	8	+18	0–7
	8	+19	0–7
Vibration Amplitude (Vib Sensor 2)	8	+20	0–7
	8	+21	0–7
Vibration Phase	8	+26	0–7
	8	+27	0–7
Vibration Phase (Vib Sensor 2)	8	+28	0–7
	8	+29	0–7
RPM	8	+30	0–7
	8	+31	0–7
	8	+32	0–7
	8	+33	0–7
Manual Mode	1	+34	0
Auto Mode	1	+34	1
Hydro Mode	1	+34	2
NonContact Module	1	+34	3
RPM Error Disabled	1	+34	4
Balance Out of Tolerance	1	+35	0
Balance Out of Tolerance 2	1	+35	1
Balance Out of Tolerance (Vib Sensor 2)	1	+35	2
Balance Out of Tolerance 2 (Vib Sensor 2)	1	+35	3
Balance in Progress	1	+35	4
Failed Balance / System Inoperative	1	+35	5
Weights Homed (NonContact)	1	+35	6

AEMS			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
Clear Error	1	+0	0
Go to Idle Mode	1	+0	1
Load Job	1	+0	2
Set Job	8	+1	0–7
	8	+2	0–7
Reset Crash Latch	1	+14	0
Learn Mode	1	+14	1
Learn Work Pass	1	+14	2
Learn Air Pass	1	+14	3
Save Learn	1	+14	4
Set Zero-Offset	1	+14	5
Clear Zero-Offset	1	+14	6

AEMS			
Inputs from SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
Clearable Error Active	1	+0	0
Not Idle Mode	1	+0	1
Active Job	8	+1	0–7
	8	+2	0–7
Errors A-H	8	+3	0–7
Errors I-P	8	+4	0–7
Errors Q-X	8	+5	0–7
AE Signal Value	8	+18	0–7
	8	+19	0–7
Learn Saved	1	+20	0
Sensor Number	3	+20	1–3
Cycle Running	1	+20	4
Fluid Sensor	1	+20	5
Learn Active	1	+20	6
Gap	1	+21	0
Limit 1	1	+21	1
Limit 2	1	+21	2
Limit 3	1	+21	3
Limit 4	1	+21	4
Crash	1	+21	5
Zero-Offset Listening	1	+22	0
Learn Work Ready	1	+22	1
Learn Air Ready	1	+22	2
Learn Cycle Band Selected	4	+22	3–6
Zero-Offset Value	8	+23	0–7
	8	+24	0–7
Learn W/A Ratio	8	+25	0–7
	8	+26	0–7

ExactControl™			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
Clear Error	1	+0	0
Set Learn Cycle Job	8	+1	0–7
	8	+2	0–7
Learn Mode	1	+14	1
Learn Work Pass	1	+14	2
Learn Air Pass	1	+14	3
Save Learn	1	+14	4
Channel 1: Job Select	8	+15	0–7
	8	+16	0–7
Channel 1: Start-Stop	1	+17	0
Channel 1: Teach	1	+17	1
Channel 2: Job Select	8	+18	0–7
	8	+19	0–7
Channel 2: Start-Stop	1	+20	0
Channel 2: Teach	1	+20	1
Channel 3: Job Select	8	+21	0–7
	8	+22	0–7
Channel 3: Start-Stop	1	+23	0
Channel 3: Teach	1	+23	1
Channel 4: Job Select	8	+24	0–7
	8	+25	0–7
Channel 4: Start-Stop	1	+26	0
Channel 4: Teach	1	+26	1

ExactControl™			
Inputs from SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
Clearable Error Active	1	+0	0
Not Idle Mode	1	+0	1
Learn Cycle Job	8	+1	0–7
	8	+2	0–7
Errors A-H	8	+3	0–7
Errors I-P	8	+4	0–7
Errors Q-X	8	+5	0–7
Learn Cycle Band Selected (Sensor A)	4	+18	0–3
Learn Cycle Band Selected (Sensor B)	4	+18	4–7
Learn Active	1	+19	0
Learn Work Ready	1	+19	1
Learn Air Ready	1	+19	2
Learn Saved	1	+19	3
Fluid Sensor Attached (Sensor A)	1	+19	4
Fluid Sensor Attached (Sensor B)	1	+19	5
Learn W/A Ratio (Sensor A)	8	+20	0–7
	8	+21	0–7
Learn W/A Ratio (Sensor B)	8	+22	0–7
	8	+23	0–7
Sensor Number (Sensor A)	4	+24	0–3
Sensor Number (Sensor B)	4	+24	4–7
AE Sensor Signal Level (Sensor A)	8	+25	0–7
	8	+26	0–7
AE Sensor Signal Level (Sensor B)	8	+27	0–7
	8	+28	0–7
Analog 1 Signal Level	8	+29	0–7
	8	+30	0–7
Analog 2 Signal Level	8	+31	0–7
	8	+32	0–7
Channel 1: Param Changed	1	+33	0
Channel 2: Param Changed	1	+33	1

ExactControl™ (continued)

ExactControl™			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**

Gauge			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
Clear Error	1	+0	0
Load Job	1	+0	2
Go to Auto mode	1	+0	3
Go to Manual mode	1	+0	4
Requested Job	8	+1	0–7
	8	+2	0–7
Next Job	1	+3	0
Previous Job	1	+3	1
Zero set G1	1	+8	0
Zero set G2	1	+8	1
Requested offset value M1	8	+12	0–7
	8	+13	0–7
	8	+14	0–7
	8	+15	0–7
Set offset value M1	1	+16	0
Plus Shift M1	1	+16	1
Minus Shift M1	1	+16	2
Requested offset value M2	8	+20	0–7
	8	+21	0–7
	8	+22	0–7
	8	+23	0–7
Set offset value M2	1	+24	0
Plus Shift M2	1	+24	1
Minus Shift M2	1	+24	2
Requested SizeShift Meas. No.	8	+28	0–7
	8	+29	0–7
Load SizeShift Meas. No.	1	+30	0
Enable SizeShift	1	+30	1
Disable SizeShift	1	+30	2
SizeShift Zero set G1	1	+31	0
SizeShift Zero set G2	1	+31	1

Gauge			
Inputs from SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
Clearable Error Active	1	+0	0
Operation mode	1	+0	2
Active Job	8	+1	0–7
	8	+2	0–7
Error bits (see Gauge Error Bits)	8	+4	0–7
	8	+5	0–7
	8	+6	0–7
	8	+7	0–7
	8	+8	0–7
	8	+9	0–7
	8	+10	0–7
	8	+11	0–7
	8	+12	0–7
	8	+13	0–7
	8	+14	0–7
	1	+15	0
Resolution	8	+20	0–7
	8	+21	0–7
Unit	2	+22	0–1
Raw Data G1	8	+24	0–7
	8	+25	0–7
	8	+26	0–7
	8	+27	0–7
Post-Zero Data G1	8	+28	0–7
	8	+29	0–7
	8	+30	0–7
	8	+31	0–7
Over status G1	2	+32	0–1
Zero set status G1	2	+32	2–3
Raw Data G2	8	+36	0–7
	8	+37	0–7
	8	+38	0–7
	8	+39	0–7
Post-Zero Data G2	8	+40	0–7
	8	+41	0–7
	8	+42	0–7
	8	+43	0–7

Gauge (continued)

Gauge			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**

Gauge (continued)

Gauge			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**

Gauge			
Inputs from SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
Grading point value (SZ3/SZ2) M1	8	+80	0–7
	8	+81	0–7
	8	+82	0–7
	8	+83	0–7
Grading point value (SZ4/SZ3) M1	8	+84	0–7
	8	+85	0–7
	8	+86	0–7
	8	+87	0–7
Grading point value (SZ5/SZ4) M1	8	+88	0–7
	8	+89	0–7
	8	+90	0–7
	8	+91	0–7
Grading point value (SZ6/SZ5) M1	8	+92	0–7
	8	+93	0–7
	8	+94	0–7
	8	+95	0–7
Grading point value (SZ7/SZ6) M1	8	+96	0–7
	8	+97	0–7
	8	+98	0–7
	8	+99	0–7
S-CUT value M1	8	+100	0–7
	8	+101	0–7
	8	+102	0–7
	8	+103	0–7
Measurement Data M1	8	+104	0–7
	8	+105	0–7
	8	+106	0–7
	8	+107	0–7
Over status M1	2	+108	0–1
S-CUT valid M1	1	+108	2

Gauge (continued)

Gauge			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**

Gauge (continued)

Gauge			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**

Gauge (continued)

Gauge			
Outputs to SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**

Gauge			
Inputs from SB-6500	**Total Bits**	**Position**	
		Octet	**Bit**
SizeShift Zero set status M1 G2	2	+181	1–2
Use of calculation M2 G1	1	+182	0
SizeShift Zero set status M2 G1	2	+182	1–2
Use of calculation M2 G2	1	+183	0
SizeShift Zero set status M2 G2	2	+183	1–2
Grading result Rank M1	8	+184	0–7
	8	+185	0–7
Grading result Rank name M1	8	+186	0–7
	8	+187	0–7
	8	+188	0–7
	8	+189	0–7
	8	+190	0–7
	8	+191	0–7
Grading result Rank M2	8	+192	0–7
	8	+193	0–7
Grading result Rank name M2	8	+194	0–7
	8	+195	0–7
	8	+196	0–7
	8	+197	0–7
	8	+198	0–7
	8	+199	0–7

2.3 Balancer Outputs

Output Parameter	Definition
Clear Error	1 = Clear all clearable errors currently occurring. The 0 to 1 transition causes the actual clearing. See input bit “Clearable Error Active”. 0 = No operation
Go to Idle Mode	1 = The 0 to 1 transition will change the module’s state to its idle state. 0 = No operation
Load Job	1 = The 0 to 1 transition will change the module’s current job to the job specified in the “Set Job” output parameter. 0 = No operation
Set Job	Specify the job to be loaded in these bits. The balancer has 8 loadable jobs. This parameter is 1-indexed and setting an inaccessible job here will cause the job number to clamp to the nearest accessible job. This is a 16-bit big-endian unsigned integer.
Start Balance	1 = The 0 to 1 transition will start an automatic balance cycle. 0 = No operation
Stop Balance	1 = While this bit is 1, any automatic balance operation in progress is stopped, and an automatic balance operation cannot be started from either the hardware or software interface. The AUTO button on the user interface remains functional. This output acts on the state of the bit, not on a 0 to 1 transition. 0 = No operation.
Home Weights	1 = Starts the cycle that moves the weights to the home position. The 0 to 1 transition starts the cycle. Only valid for non-contact balancers which contain a home sensor. 0 = No operation.
RPM Error Disable	1 = Disable Error J, “No RPM Signal”. The 0 to 1 transition causes this change to occur. 0 = Enable Error J, “No RPM Signal”. The 1 to 0 transition causes this change to occur.

2.4 Balancer Inputs

Input Parameter	Definition
Clearable Error Active	When this bit is set, an error has occurred and needs to be serviced or cleared. Clear it by setting the “Clear Error” bit in Outputs to the SB-6500.
Not Idle Mode	1 = Not Idle. In this state, the Profinet interface cannot initiate some functions. See output bit “Go to Idle Mode”. 0 = Idle. Profinet can initiate all functions.
Active Job	The current active job number. A big-endian 16-bit unsigned integer 0 = Off 1–8 = Job number 1 to 8.
Errors (A-X)	These bits indicate individual errors. For the bit assigned to each error code, see “SBS Error Reporting.” For a description of each error, refer to the operation manual for that module.
Vibration Amplitude	The vibration amplitude in units of 0.01 microns p-p. These 2 bytes that make up this unsigned 16-bit integer are in big-endian format.
Vibration Amplitude (Vib Sensor 2)	Same as above, for vibration sensor 2.
Vibration Phase	The actual vibration phase in units of 0.1 degrees. These 2 bytes that make up this unsigned 16-bit integer are in big-endian format.
Vibration Phase (Vib Sensor 2)	Same as above, for vibration sensor 2.
RPM	The actual RPM. The bytes that make up this field are in big-endian format, representing a standard 32-bit unsigned integer.
Manual Mode	If this bit is 1 it indicates that this balancer is acting as a manual balancer.
Auto Mode	If this bit is 1 it indicates that this balancer is acting as an automatic balancer.
Hydro Mode	If this bit is 1 it indicates that this balancer is acting as a Hydrokompenser.
NonContact Module	If this bit is 1 it indicates that this balancer is a NonContact balancer.
RPM Error Disabled	If this bit is 1 Error J will never occur as it is disabled. If this bit is 0 Error J may occur if its conditions are met.
Balance Out of Tolerance	This bit is 1 when the sensed vibration level exceeds the operator-defined Tolerance level.
Balance Out of Tolerance (Vib Sensor 2)	Same as above, for vibration sensor 2.

Input Parameter	Definition
Balance Out of Tolerance 2	The bit is 1 when the sensed vibration level exceeds the operator-defined Critical Tolerance.
Balance Out of Tolerance 2 (Vib Sensor 2)	Same as above, for vibration sensor 2.
Balance in Progress	When this bit is 1, an automatic balance cycle is in progress.
Failed Balance/System Inoperative	This bit is 1 when an automatic balance cycle fails or the system currently has any error occurring other than Error A or Error J. See Errors (A-X) for more information.
Weights Homed	1 = This bit is 1 if a weight homing cycle has completed. It remains as 1 until the next weight homing cycle is started.

2.5 AEMS Outputs

Output Parameter	Definition
Clear Error	1 = Clear all clearable errors currently occurring. The 0 to 1 transition causes the actual clearing. See input bit “Clearable Error Active”. 0 = No operation
Go to Idle Mode	1 = The 0 to 1 transition will change the module’s state to its idle state. 0 = No operation
Load Job	1 = The 0 to 1 transition will change the module’s current job to the job specified in the “Set Job” output parameter. 0 = No operation
Set Job	Specify the job to be loaded in these bits. The AEMS module has 64 loadable jobs. This parameter is 1-indexed and setting an inaccessible job here will cause nothing to happen. This means trying to load “Job 0” or any job greater than Job 64 will not do anything. This is a 16-bit big-endian unsigned integer.
Reset Crash Latch	1 = The 0 to 1 transition will reset the crash latch if it is latched. 0 = No operation
Learn Mode	1 = Start the AE learn cycle. The 0 to 1 transition causes the module to start a learn cycle. 0 = The 1 to 0 transition causes the module to immediately stop/cancel any ongoing learn cycle.
Learn Work Pass	1 = Start the AE learn cycle’s Work Pass. The 0 to 1 transition starts gathering work data and the 1 to 0 transition stops data gathering. 0 = No operation. The function of this output is valid only when Learn Mode is active and Learn Work Ready is on.
Learn Air Pass	1 = Start the AE learn cycle’s Air Pass. The 0 to 1 transition starts gathering air data and the 1 to 0 transition stops data gathering. 0 = No operation. The function of this output is valid only when Learn Mode is active and Learn Air Ready is on. In the default work-then-air order, a work pass must occur before Learn Air Ready turns on.
Save Learn	1 = Save and commit the recommended settings from the current learn cycle. The 0 to 1 transition causes the action. 0 = No operation. The function of this output is valid only when Learn Mode is active and Learn Cycle Band Selected has a non-zero value.

Output Parameter	Definition
Set Zero-Offset	1 = Set the present level as zero (0). The 0 to 1 transition causes the 6500 module to monitor the incoming AE values. The 1 to 0 transition causes the 6500 module to set the zero-offset to the highest value seen during monitoring. 0 = No operation. The function of this output is valid only when Learn Mode is off.
Clear Zero-Offset	1 = Clear the zero-offset by setting it back to 0. The 0 to 1 transition causes the action. The function of this output is valid only when Learn Mode = 0. 0 = No operation.

2.6 AEMS Inputs

Input Parameter	Definition
Clearable Error Active	When this bit is set, an error has occurred and needs to be serviced or cleared. Clear it by setting the “Clear Error” bit in Outputs to the SB-6500.
Not Idle Mode	1 = Not Idle. In this state, the Profinet interface cannot initiate some functions. See output bit “Go to Idle Mode”. 0 = Idle. Profinet can initiate all functions.
Active Job	The current active job number. This is a 16-bit big-endian unsigned integer. 0 = Off 1–64 = Job number 1 to 64.
Errors (A-X)	These bits indicate individual errors. For the bit assigned to each error code, see “SBS Error Reporting.” For a description of each error, refer to the operation manual for that module.
AE Signal Value	The actual acoustic energy level in units of saturation percentage. The 2 bytes that make up this unsigned 16-bit integer field are in big-endian format. Compute the total 16-bit value as Saturation % = (AE Signal Value / 655.35).
Learn Saved	1 = New parameters were saved because of the most recent Learn Cycle. Stays on until a new Learn Cycle is started. 0 = Parameters not saved during Learn or new Learn Cycle started.
Sensor Number	The number of the currently active sensor. This 3-bit value is 0-indexed: 0 = sensor 1 through 7 = sensor 8.
Cycle Running	This bit is 1 when the system is graphing the current AE signal.
Fluid Sensor	1 = Fluid sensor is currently attached. 0 = Fluid sensor is not currently attached.
Learn Active	1 = Learn state active. 0 = Learn state inactive.
Gap	This bit is 1 when the actual acoustic energy level is above the operator-defined **Gap** value for the current job.
Limit 1	This bit is 1 when the actual acoustic energy level is above the operator-defined **Limit 1** value for the current job.
Limit 2	This bit is 1 when the actual acoustic energy level is above the operator-defined **Limit 2** value for the current job.
Limit 3	This bit is 1 when the actual acoustic energy level is above the operator-defined **Limit 3** value for the current job.
Limit 4	This bit is 1 when the actual acoustic energy level is above the operator-defined **Limit 4** value for the current job.

Input Parameter	Definition
Crash	This bit is 1 when the actual acoustic energy level is above the operator-defined **Crash** value for the current job. This bit latches if the “Crash Latch” setting is turned on. It can be cleared by clearing errors or through the “Reset Crash Latch” parameter.
Zero-Offset Listening	The module is listening to the current signal while this is high. The highest value seen during this listening interval is set as the new zero-offset.
Learn Work Ready	The Learn Cycle is at the Work Pass stage. While this is on a work pass may be started then stopped.
Learn Air Ready	The Learn Cycle is at the Air Pass stage. While this is on an air pass may be started then stopped.
Learn Cycle Band Selected	The best band from the current learn cycle. Value is set after the final pass of the learn cycle ends. Saving the learn cycle at this point will use this band as the selected band. No band has been selected if this value is 0.
Zero-Offset Value	The zero-offset value in units of saturation percentage. The 2 bytes that make up this unsigned 16-bit integer field are in big-endian format. Compute the total 16-bit value as Zero-Offset % = (Zero-Offset Value / 655.35).
Learn W/A Ratio	The Work-to-Air ratio found in the current Learn Cycle. This value is reset back to 0 when the current learn cycle ends and is set after the final pass of the learn cycle ends. The 2 bytes that make up this unsigned 16-bit integer field are in big-endian format with each increment representing an increase of 0.1 in the ratio value.

2.7 ExactControl™ Outputs

Output Parameter	Definition
Clear Error	1 = Clear all clearable errors currently occurring. The 0 to 1 transition causes the actual clearing. See input bit “Clearable Error Active”. 0 = No operation
Set Learn Cycle Job	Specify the job to be loaded for the next Profinet-controlled learn cycle in these bits. Valid values are from 1 to 255. Job 0 will select the last job displayed for edit. This is a 16-bit big-endian unsigned integer.
Learn Mode	1 = Start the AE learn cycle on the job set by the Set Learn Cycle Job output. The 0 to 1 transition causes the module to start a learn cycle. A learn cycle will only start if a learn can occur for the selected job (the job must have at least one instance using an AE sensor). 0 = The 1 to 0 transition causes the module to immediately stop/cancel any ongoing learn cycle.
Learn Work Pass	1 = Start the AE learn cycle’s Work Pass. The 0 to 1 transition starts gathering work data and the 1 to 0 transition stops data gathering. 0 = No operation. The function of this output is valid only when Learn Mode is active and Learn Work Ready is on.
Learn Air Pass	1 = Start the AE learn cycle’s Air Pass. The 0 to 1 transition starts gathering air data and the 1 to 0 transition stops data gathering. 0 = No operation. The function of this output is valid only when Learn Mode is active and Learn Air Ready is on. A work pass must first occur before Learn Air Ready will turn on.
Save Learn	1 = Save and commit the recommended settings from the current learn cycle. The 0 to 1 transition causes the action. 0 = No operation. The function of this output is valid only when Learn Mode is active and Learn Cycle Band Selected has a non-zero value.
Channel X: Job Select	Job number selected for Software Channel X. Valid values are from 1 to 255. Job 0 will select the last job displayed for edit. This is a 16-bit big-endian unsigned integer.

Output Parameter	Definition
Channel X: Start-Stop	1 = Start Teach or Start Process monitoring of the selected job. The 0 to 1 transition causes the actual start. 0 = Stop process monitoring or stop data teach acquisition. The 1 to 0 transition causes the actual stop. The function of this output is valid only when Learn Mode = 0.
Channel X: Teach	1 = Start will cause Teach operation. 0 = Start will cause Process monitoring operation. The function of this output is valid only when Learn Mode = 0.

2.8 ExactControl™ Inputs

Input Parameter	Definition
Clearable Error Active	When this bit is set, an error has occurred and needs to be serviced or cleared. Clear it by setting the “Clear Error” bit in Outputs to the SB-6500.
Not Idle Mode	1 = Not Idle. In this state, the Profinet interface cannot initiate some functions. 0 = Idle. Profinet can initiate all functions.
Learn Cycle Job	The job number for which a learn cycle is currently running. This is a 16-bit big-endian unsigned integer. 0 = No learn cycle is running. 1–255 = Job number 1 to 255.
Errors (A-X)	These bits indicate individual errors. For the bit assigned to each error code, see “SBS Error Reporting.” For a description of each error, refer to the operation manual for that module.
Learn Cycle Band Selected	The best band from the current learn cycle. Value is set after the Air Pass step ends. Saving the learn cycle at this point will use this band as the selected band. No band has been selected if this value is 0.
Learn Active	1 = Learn state active. 0 = Learn state inactive.
Learn Work Ready	The Learn Cycle is at the Work Pass stage. While this is on a work pass may be started then stopped.
Learn Air Ready	The Learn Cycle is at the Air Pass stage. While this is on an air pass may be started then stopped.
Learn Saved	1 = New parameters were saved because of the most recent Learn Cycle. Stays on until a new Learn Cycle is started. 0 = Parameters not saved during Learn or new Learn Cycle started.
Fluid Sensor Attached	1 = Fluid sensor is currently attached. 0 = Fluid sensor is not currently attached.
Learn W/A Ratio	The Work-to-Air ratio found in the current Learn Cycle. This value is reset back to 0 when the current learn cycle ends and is set after the Air Pass step ends. The 2 bytes that make up this unsigned 16-bit integer field are in big-endian format with each increment representing an increase of 0.1 in the ratio value.
Sensor Number A	The number of the first currently active sensor.
Sensor Number B	The number of the second currently active sensor.

Input Parameter	Definition
AE Sensor Signal Level	The actual acoustic energy level in units of saturation percentage. The 2 bytes that make up this unsigned 16-bit integer field are in big-endian format. Compute the total 16-bit value as Saturation % = (AE Signal Value / 655.35).
Analog X Signal Level	The analog signal's voltage level in units of saturation percentage. The 2 bytes that make up this unsigned 16-bit integer field are in big-endian format. Compute the total 16-bit value as Saturation % = (Analog Signal Value / 655.35).
Channel X: Param Changed	A Job Parameter for the currently running job on Channel X has been changed. The job must be restarted for these changes to take effect.
Channel X: Executing Job Number	0 = No job executing on this channel. Else, the job number of the job that is executing. This is a 16-bit big-endian unsigned integer.
Channel X: Digital Outputs 1–14	1 = The indicated digital output is active. 0 = The indicated digital output is inactive.
Channel X: Teach	1 = The channel is operating in Teach mode. 0 = The channel is not operating in Teach mode.
Channel X: Infeed Enable	1 = The channel is running a job. (OK to run the job cycle). 0 = The channel is not running a job. There may be an error.

2.9 Gauge Outputs

In the Gauge tables, G1 and G2 are the module's two gauge inputs, and M1 and M2 are its two measuring items. A parameter that exists for each of them is described once, with Gx or Mx standing for G1/G2 or M1/M2.

Output Parameter	Definition
Clear Error	1 = Request clearing of the current error. The result is shown by the error bits. 0 = No operation
Load Job	1 = Request a switch to the job number specified in the "Requested Job" output parameter. The result is shown by input "Active Job". 0 = No operation
Go to Auto mode	1 = Request a switch to AUTO mode. The result is shown by input "Operation mode". If the module cannot switch to AUTO mode, an error occurs. 0 = No operation
Go to Manual mode	1 = Request a switch to MANUAL mode. The result is shown by input "Operation mode". 0 = No operation
Requested Job	The job number to switch to with "Load Job", as a 16-bit unsigned integer.
Next Job	1 = Request a switch to the job number after the one in input "Active Job". The result is shown by input "Active Job". 0 = No operation
Previous Job	1 = Request a switch to the job number before the one in input "Active Job". The result is shown by input "Active Job". 0 = No operation
Zero set Gx	1 = Request a zero set of Gx. The result is shown by input "Zero set status Gx". 0 = No operation
Requested offset value Mx	The correction amount to set for Mx with "Set offset value Mx", as a signed 32-bit integer.
Set offset value Mx	1 = Request Mx to set the offset value specified in "Requested offset value Mx". The result is shown by input "Offset value Mx". If the offset limit is exceeded, error bit OffsetLimitErrorMx is set. 0 = No operation
Plus Shift Mx	1 = Request an immediate grade plus shift on Mx. 0 = No operation

2.10 Gauge Inputs

Measured values (raw data, data after zero set, offset, grade, grading point, S-CUT and measurement values) are signed 32-bit integers. Each is converted to a value according to the “Unit” and “Resolution” inputs.

Input Parameter	Definition
Clearable Error Active	1 = There is an error. Clear it by setting the “Clear Error” bit in Outputs to the SB-6500. 0 = No errors
Operation mode	1 = AUTO mode 0 = MANUAL mode
Active Job	The active job number, as a 16-bit unsigned integer.
Error bits	Each bit indicates one gauge error. See “Gauge Error Bits.”
Resolution	The resolution of the measured values: 10, 100 or 1000. The step size each value gives depends on “Unit”: 10 = 0.01 µm, 0.00001 mm or 0.001 mil 100 = 0.1 µm, 0.0001 mm or 0.01 mil 1000 = 1 µm, 0.001 mm or 0.1 mil
Unit	0 = µm 1 = mm 2 = mil
Raw Data Gx	The raw data of Gx.
Post-Zero Data Gx	The data of Gx after zero set.
Over status Gx	0 = Not OVER 1 = +OVER 2 = −OVER 3 = OVER
Zero set status Gx	0 = Zero set incomplete 1 = Zero set OK 2 = Zero set NG
Calculation Mx	The calculation formula of Mx, as a character string of up to 11 characters.
Offset value Mx	The correction amount of Mx.
External grade value Mx	The external grade amount of Mx.
Grading point number Mx	The judgment score of Mx. The range is 0 to 7, but it becomes 0 only at a factory reset, and the settable range is 2 to 7.
Grading point value (SZ1/SZ0) to (SZ7/SZ6) Mx	The grading points of Mx, from the SZ1/SZ0 grading point to the SZ7/SZ6 grading point.

Input Parameter	Definition
S-CUT value Mx	The S-CUT value of Mx.
Measurement Data Mx	The measurement value of Mx.
Over status Mx	0 = Not OVER 1 = +OVER 2 = −OVER 3 = OVER
S-CUT valid Mx	1 = Valid 0 = Invalid
SizeShift Meas. No.	The measuring item number selected for size shift.
SizeShift Valid	1 = Size shift control ON 0 = Size shift control OFF
SizeShift Exist	1 = Size shift valid 0 = Size shift invalid
Use of calculation Mx Gx	1 = Gx is included in the calculation for Mx. 0 = Gx is not included in the calculation for Mx.
SizeShift Zero set status Mx Gx	0 = Zero setting of Gx in the Mx calculation is not complete 1 = Zero setting of Gx in the Mx calculation is OK 2 = Zero setting of Gx in the Mx calculation is NG
Grading result Rank Mx	The grading result rank of Mx: 0 = No judgment 1 = SZ0, 2 = SZ1, and so on up to 8 = SZ7
Grading result Rank name Mx	The name of the grading result rank of Mx, as a character string of up to 5 characters.

2.11 SBS Error Reporting

The SBS modules report errors using letter codes A through X. Each error code is assigned one bit in the Errors A–H, Errors I–P and Errors Q–X input octets. Letters are assigned in order beginning with the most significant bit (bit 7) of the first octet, as shown in the following table.

Input Octet	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Errors A–H (+3)	A	B	C	D	E	F	G	H
Errors I–P (+4)	I	J	K	L	M	N	O	P
Errors Q–X (+5)	Q	R	S	T	U	V	W	X

For a description of each error code, refer to the operation manual for the module concerned.

The Gauge module does not use letter codes. It reports each error in its own input bit, as listed in “Gauge Error Bits.”

2.12 Gauge Error Bits

The Gauge module reports each error in its own input bit, at input octets +4 to +15. A bit is 1 while its error is occurring. The following table lists each bit with the message the gauge shows for it.

Octet	Bit	Error Bit	Message
+4	0	DMessageStartError	**Hardware error** An error has been detected at startup.
+4	1	MotherBoardOtherError	**Hardware error** An error has been detected on the motherboard.
+4	2	StorageRepairAnomaly Error	**Internal storage error** CFast repair error.
+4	3	StorageOutOfFreeSpace Error	**Internal storage error** There is not enough free space in the CFast.
+4	4	StorageAccessError	**Internal storage error** CFast access error has occurred.
+4	5	StoragePowerFailureError	**Internal storage error** CFast power supply error.
+4	6	DivisionError	**System error** A system error has occurred.
+4	7	MemoryExcessError	**System error** A system error has occurred.
+5	0	InvalidSystemCallError	**System error** A system error has occurred.
+5	1	InvalidSegmentError	**System error** A system error has occurred.
+5	2	InvalidPageAccessError	**System error** A system error has occurred.
+5	3	AlignmentCheckError	**System error** A system error has occurred.
+5	4	StackSmashingError	**System error** A system error has occurred.
+5	5	PowerFailureError	**System error** A system error has occurred.
+5	6	EndKeyError	**System error** A system error has occurred.
+5	7	ManageUpdateProgError	**Update execution error** The update program failed to start.
+6	0	GaugeConnectionErrorG1	**Gauge connection error: G1** A gauge disconnection has been detected. Check the connector or the cable.

Octet	Bit	Error Bit	Message
+6	1	GaugeConnectionErrorG2	**Gauge connection error: G2** A gauge disconnection has been detected. Check the connector or the cable.
+6	2	ZeroIncompleteErrorG1	**Zero set not completed: G1** Zero set is not completed. Perform zero set.
+6	3	ZeroIncompleteErrorG2	**Zero set not completed: G2** Zero set is not completed. Perform zero set.
+6	4	CalibrationIncomplete ErrorG1	**Calibration not completed: G1** Calibration is not completed. Perform calibration.
+6	5	CalibrationIncomplete ErrorG2	**Calibration not completed: G2** Calibration is not completed. Perform calibration.
+6	6	ZeroLimitErrorG1	**Zero limit error: G1** Zero limit error has occurred. Check the zero master state, and perform gauge mechanical adjustment.
+6	7	ZeroLimitErrorG2	**Zero limit error: G2** Zero limit error has occurred. Check the zero master state, and perform gauge mechanical adjustment.
+7	0	CalibrationLimitErrorG1	**CAL limit error: G1** CAL limit error has occurred. Check the settings and perform the calibration.
+7	1	CalibrationLimitErrorG2	**CAL limit error: G2** CAL limit error has occurred. Check the settings and perform the calibration.
+7	2	AutomasterIncomplete ErrorM1	**Automaster not completed: M1** Auto master is not completed. Perform auto master.
+7	3	AutomasterIncomplete ErrorM2	**Automaster not completed: M2** Auto master is not completed. Perform auto master.
+7	4	AutocalIncompleteError M1	**Auto CAL not completed: M1** Auto CAL is not completed. Perform auto CAL. The auto CAL function can be set as enabled (ON) or disabled (OFF) in the measuring item settings.
+7	5	AutocalIncompleteError M2	**Auto CAL not completed: M2** Auto CAL is not completed. Perform auto CAL. The auto CAL function can be set as enabled (ON) or disabled (OFF) in the measuring item settings.
+7	6	AutomasterLimitErrorM1	**Automaster limit error: M1** Auto master limit error has occurred. Perform gauge setup.

Octet	Bit	Error Bit	Message
+7	7	AutomasterLimitErrorM2	**Automaster limit error: M2** Auto master limit error has occurred. Perform gauge setup.
+8	0	AutocalLimitErrorM1	**Auto CAL limit error: M1** Auto CAL limit error has occurred. Check the settings and perform auto CAL again.
+8	1	AutocalLimitErrorM2	**Auto CAL limit error: M2** Auto CAL limit error has occurred. Check the settings and perform auto CAL again.
+8	2	AutomasterAdjacency ErrorM1	**Automaster adjacency error: M1** Auto master adjacency error has occurred. Perform auto master again.
+8	3	AutomasterAdjacency ErrorM2	**Automaster adjacency error: M2** Auto master adjacency error has occurred. Perform auto master again.
+8	4	SizeshiftZeroIncomplete ErrorM1G1	**Size reg. zero not completed: M1 G1** Size registration is not completed. Perform size registration zero set.
+8	5	SizeshiftZeroIncomplete ErrorM1G2	**Size reg. zero not completed: M1 G2** Size registration is not completed. Perform size registration zero set.
+8	6	SizeshiftZeroIncomplete ErrorM2G1	**Size reg. zero not completed: M2 G1** Size registration is not completed. Perform size registration zero set.
+8	7	SizeshiftZeroIncomplete ErrorM2G2	**Size reg. zero not completed: M2 G2** Size registration is not completed. Perform size registration zero set.
+9	0	SizeshiftCalibration IncompleteErrorM1G1	**Size reg. CAL not completed: M1 G1** Size registration is not completed. Perform size registration CAL.
+9	1	SizeshiftCalibration IncompleteErrorM1G2	**Size reg. CAL not completed: M1 G2** Size registration is not completed. Perform size registration CAL.
+9	2	SizeshiftCalibration IncompleteErrorM2G1	**Size reg. CAL not completed: M2 G1** Size registration is not completed. Perform size registration CAL.
+9	3	SizeshiftCalibration IncompleteErrorM2G2	**Size reg. CAL not completed: M2 G2** Size registration is not completed. Perform size registration CAL.
+9	4	SizeshiftZeroLimitError M1G1	**Size reg. zero limit error: M1 G1** Size registration zero limit error has occurred. Check if the gauge and master are installed correctly.

Octet	Bit	Error Bit	Message
+9	5	SizeshiftZeroLimitError M1G2	**Size reg. zero limit error: M1 G2** Size registration zero limit error has occurred. Check if the gauge and master are installed correctly.
+9	6	SizeshiftZeroLimitError M2G1	**Size reg. zero limit error: M2 G1** Size registration zero limit error has occurred. Check if the gauge and master are installed correctly.
+9	7	SizeshiftZeroLimitError M2G2	**Size reg. zero limit error: M2 G2** Size registration zero limit error has occurred. Check if the gauge and master are installed correctly.
+10	0	SizeshiftCalibrationLimit ErrorM1G1	**Size reg. CAL limit error: M1 G1** Size registration CAL limit error has occurred. Check the setting, and then perform size registration CAL again.
+10	1	SizeshiftCalibrationLimit ErrorM1G2	**Size reg. CAL limit error: M1 G2** Size registration CAL limit error has occurred. Check the setting, and then perform size registration CAL again.
+10	2	SizeshiftCalibrationLimit ErrorM2G1	**Size reg. CAL limit error: M2 G1** Size registration CAL limit error has occurred. Check the setting, and then perform size registration CAL again.
+10	3	SizeshiftCalibrationLimit ErrorM2G2	**Size reg. CAL limit error: M2 G2** Size registration CAL limit error has occurred. Check the setting, and then perform size registration CAL again.
+10	4	OffsetLimitErrorM1	**Offset limit error: M1** Offset limit error has occurred. Perform gauge setup.
+10	5	OffsetLimitErrorM2	**Offset limit error: M2** Offset limit error has occurred. Perform gauge setup.
+10	6	ZeroShiftLimitErrorM1	**External grade limit error: M1** External grade limit error has occurred. Perform gauge setup.
+10	7	ZeroShiftLimitErrorM2	**External grade limit error: M2** External grade limit error has occurred. Perform gauge setup.
+11	0	GradingPointErrorM1	**Grading point setting error: M1** The magnitude relationship between the grading points is invalid. Please modify it.
+11	1	GradingPointErrorM2	**Grading point setting error: M2** The magnitude relationship between the grading points is invalid. Please modify it.

Octet	Bit	Error Bit	Message
+11	2	CalculationErrorM1	**Arithmetic expression error: M1** The arithmetic expression is invalid. Please modify the setting.
+11	3	CalculationErrorM2	**Arithmetic expression error: M2** The arithmetic expression is invalid. Please modify the setting.
+11	4	MemorySyncErrorM1	**Synchronization error: M1** An error has been detected with the synchronization cycle for the memory function.
+11	5	MemorySyncErrorM2	**Synchronization error: M2** An error has been detected with the synchronization cycle for the memory function.
+11	6	ManufactM1	**Processing error detection: M1** A sizing error has been detected.
+11	7	ManufactM2	**Processing error detection: M2** A sizing error has been detected.
+12	0	BackupDataLostError	**Backup data lost** The backup data has been lost. All set values will be initialized.
+12	1	ReqRebootError	**Reboot required** This configuration change requires system reboot. Please reboot the system.
+12	2	StorageSpaceWarnError	**Storage capacity insufficient** Log storage was interrupted because of lack of internal storage. If the problem does not improve after rebooting, please contact customer support.
+12	3	ConditionFileError	**Condition file error** The condition file cannot be read. Check the condition file.
+12	4	ConditionFileEncodeError	**Condition file error** The condition file cannot be read because it is encoded incorrectly. Check the condition file.
+12	5	ConditionFileLineFeed CodeError	**Condition file error** The condition file cannot be read because the line feed code is invalid. Check the condition file.
+12	6	ConditionFileSystemLimit Error	**Condition file error** The condition file cannot be read because the specifications don't match. Check the condition file.

Octet	Bit	Error Bit	Message
+12	7	ConditionFileParamError	**Condition file error** Some settings were initialized because the condition file contained incorrect values. Check the condition file.
+13	0	GaugeInfoFileReadError	**Gauge information error** Failed to read the gauge information file.
+13	1	GaugeInfoFileFormatError	**Gauge information error** Failed to read the gauge information file.
+13	2	GaugeInfoFileGaugeOver Error	**Gauge information error** Failed to read the gauge information file.
+13	3	GaugeInfoFileVersiont Error	**Gauge information error** Failed to read the gauge information file.
+13	4	EthernetConnectionError	**Ethernet error** Ethernet communication has been disconnected. Check the connectors.
+13	5	EthernetCommunication TimeoutError	**Ethernet error** Ethernet communication has timed out. Check the connection state and the state of the connected device.
+13	6	EthernetDhcpTimeout Error	**Ethernet error** IP address automatic acquisition failed.
+13	7	EthernetConnection RefusedError	**Ethernet error** Ethernet communication failed. Check the connection state and the state of the connected device.
+14	0	EthernetConfReadError	**Ethernet setting error** Failed to read the Ethernet setting file. The settings have been initialized.
+14	1	EthernetConfFormatError	**Ethernet setting error** Failed to read the Ethernet setting file. The settings have been initialized.
+14	2	EthernetGeneralFailure Error	**Ethernet setting error** An error has occurred. If the error occurs repeatedly, please contact customer support.
+14	3	AutoOpeError	**CAUTION** This action cannot be executed during AUTO mode.
+14	4	ZeroIncompleteError	**CAUTION** Zero set is not completed. Perform zero set.
+14	5	CalibrationIncomplete Error	**CAUTION** Calibration is not completed. Perform calibration.
+14	6	SizeshiftZeroIncomplete Error	**CAUTION** Perform size registration zero set first.

Octet	Bit	Error Bit	Message
+14	7	SizeshiftRefOriError	**CAUTION** The size registration reference setting is inconsistent. Check the setting of the measurement item that refers to this item.
+15	0	SizeshiftRefDesError	**CAUTION** The size registration reference setting is inconsistent. The same gauge must be included in the arithmetic equation for the references.

2.13 Application Notes

2.13.1 AEMS Learn Cycle Sequence

A learn cycle is always run on the AEMS module's active job. It consists of two passes: a work pass and an air pass. By default, the module performs the work pass first and the air pass second, but it can instead be set to perform the air pass first. Confirm which order your module is set to before starting, since the passes must be run in that order.

1. Set Learn Mode (output +14, bit 1) to 1. The 0 to 1 transition starts the learn cycle. Keep Learn Mode at 1 for the entire learn cycle.
2. Check that Learn Active (input +20, bit 6) has turned on. If it has not, no learn cycle is running. An active error can prevent a learn cycle from starting, and can also stop a learn cycle that is in progress.
3. Wait for the ready bit for the first pass: Learn Work Ready (input +22, bit 1) for a work pass, or Learn Air Ready (input +22, bit 2) for an air pass.
4. Set the matching pass output, Learn Work Pass (output +14, bit 2) or Learn Air Pass (output +14, bit 3), to 1 to start gathering data. Set it back to 0 to stop.
5. Wait for the ready bit for the second pass, then run the second pass in the same way using the other pass output.
6. When the final pass has finished, the module sets Learn W/A Ratio (input +25 to +26) and Learn Cycle Band Selected (input +22, bits 3–6).
7. To keep the result, set Save Learn (output +14, bit 4) from 0 to 1. The module saves the selected band, and Learn Saved (input +20, bit 0) reads 1 until the next learn cycle is started.

To discard the result instead, set Learn Mode to 0 at any point before Save Learn is set. The 1 to 0 transition cancels the learn cycle, and nothing is saved.

2.13.2 Errors A and J While Spindle Stopped

The interpretation of SBS error codes A and J depends on both timing and RPM. The SB-6500 reports these errors any time the RPM signal is not present (error J), or when the RPM signal is present but is either below 25 RPM or above 200,000 RPM (error A). SB-6500 does not know whether the lack of RPM is intended and valid (stopped spindle), so it always reports the status of RPM using these error codes. The Profinet controller or PLC must interpret these errors since they can determine whether the spindle is rotating.

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MODELS COVERED IN THIS MANUAL

SB-6518 | SB-6532 | SB-6522 | SB-6522-8 | SB-6560 | SB-6560-8

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