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SBS Profibus DP Interface Guide

for SB-5500 Series Controls

LL-5800, Rev. 1.5

This guide uses English language setup screens for one particular Profibus master as reference.
Your setup screens will vary in layout and language use.

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Introduction

This guide will provide needed information to configure and use the Profibus interface of the SB-5500.

This guide doesn't attempt to explain how to access the specific data fields once the data is "inside" the Profibus master / PLC since this will vary greatly from one master to another master.

The following steps must first be carried out to configure Profibus.

- Connect the SB-5500 to the Profibus network cable.
- Load GSD file into the Profibus master.
- Enter the SB-5500 device station address.
- Define the configuration of the SB-5500 in the Profibus master.
- Define the input/output bytes/bits within the Profibus master.
- Set parameters.

Network Cable

This is normally a 9 pin D-shell attached to one or two 'purple' colored cable(s). Simply plug the 9 pin D-shell into the 9 pin connector on the back of the SB-5500 labeled 'PROFIBUS'. Now the network cable termination must be checked and possibly adjusted. Each 9 pin D-shell connector will typically have provisions in it for termination with a means to enable or disable the termination, again typically a switch. The Profibus device at the furthest most ends of the cable must have the termination turned on. All other termination must be turned off. This means that if the SB-5500 is added at one end by extending the network cable, the new 9 pin D-shell will have its termination enabled and the previous end 9 pin D-shell termination will now be disabled.

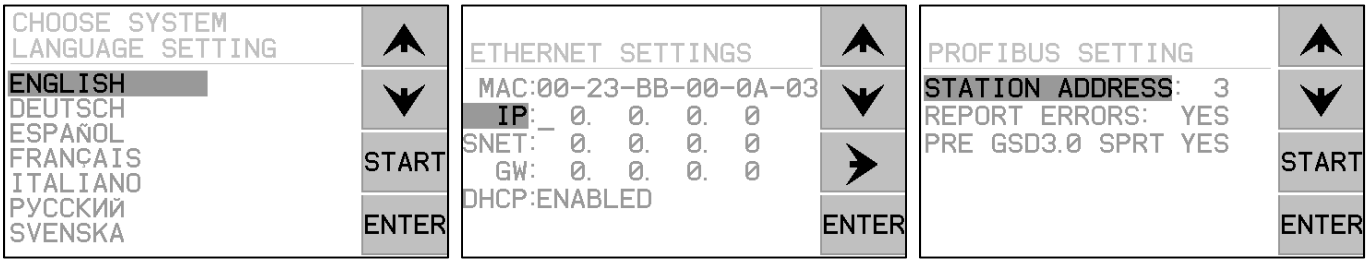
GSD File

This file contains various definitions that the Profibus master requires to interact with a piece of equipment. Each different piece of equipment will have its own unique GSD. The GSD file for the SB-5500 can be downloaded from the SBS website at www.grindingcontrol.com. Unzip the file. Two files are provided. One is the actual GSD file and is named 'SCH_0C7D.GSD'. The other file is an icon file and is named 'sbs.dib'. This file is not absolutely needed; some Profibus masters have a place for a company logo to be placed. The loading of the GSD into the Profibus master is very dependent on the master being used, so consult the reference manual for the Profibus master in use.

SB-5500 Profibus Setup and Station Address

The station address must be a unique address with in the Profibus network the SB-5500 is to be connected to. The address can only be entered into the SB-5500 during power up. Connect power and turn on the SB-5500. The company logo screen is displayed and lights on the front panel are illuminated to verify operation. During this short time, the SETUP button is available. Pressing this button will enter setup mode for the controller.

The Setup screens allow the user to select: Operational language, Ethernet settings, Profibus Setting. These setup screens must be accessed sequentially to get to the Profibus Setup. Continue to press the 'ENTER' button to move through the screens.



While in Setup mode:

- Press ENTER to save current settings on the screen and/or proceed to the next Setup screen
- Press CANCEL to cancel unsaved settings on the screen and/or proceed to the next screen
- Press START to cancel unsaved settings, exit Setup mode, and start operation.

Once in the Profibus Settings screen, use the up/down arrows to select a menu item then press Enter to edit that item. The up/down arrows change the selected digit and the left arrow will move between digits. The control unit can be operated without a physical keypad/display assembly attached. SBS provides a Windows software program "Virtual Keypad (VKP)" which acts as a virtual keypad/display. This must be installed on the pc and the controller must be connected to the pc via USB to set the Profibus Station address.

See the SBS Error Reporting section of this guide for an explanation of the "Report Errors" and "PRE GSD3.0 SPRT" menu items.

Once the station address has been set, push 'ENTER' and the controller will begin normal operations.

Define SB-5500 Configuration

1) This step informs the Profibus master about the specific configuration of the specific SB-5500 being connected to the network. The easiest way to define the SB-5500 is to use the auto scan device that the Profibus master may have. This can locate the SB-5500, automatically get its station address and device card configuration. Without auto scan, this information will all have to be entered manually.

2) The first step is to inform the Profibus master that there is a new SB-5500 connected to the network. This will vary from master to master so consult the reference manual for the specific master. The master that was used to develop the SB-5500 Profibus interface presents a list of devices it knows about and the new device is picked from this list. The list is derived from all the GSD files that have been loaded.

3) With the SB-5500 defined, the station address for it can be entered. Again this process will vary from master to master.

4) At this point the specific configuration of the device cards within the SB-5500 is entered. The SB-5500 has five modules that must be defined. All five modules must be defined, even the empty or unused card slots in the control. The first module will always be 'MAIN'. The method used in each type of Profibus master will vary. The master that was used for the SB-5500 development presents a list that is derived from the GSD file and the user picks the entry that corresponds to the device card that is in each slot of the SB-5500. The GSD file for the SB-5500 provides an 'EMPTY' device card for the unused slots. This is repeated until all five modules are defined.

List of modules that can be present in an SB-5500:

Module Name	Description
Main	Control motherboard
Mechanical Balancer	Card for cabled mechanical balancers, errors>diagnosis field
Mechanical Balancer wo Diag	Card for cabled mechanical balancers, errors>data field
Manual Balancer	Card for manual balance, errors>diagnosis field
Manual Balancer wo Diag	Card for manual balance, errors>data field
Hydrokompenser Balancer	Card for Hydrokompenser balancer, errors>diagnosis field
Hydrokompenser Balancer wo Diag	Card for Hydrokompenser balancer, errors>data field
Non-Contact Balancer	Card for non-contact mechanical balancers, errors>diagnosis field
Non-Contact Balancer wo Diag	Card for non-contact mechanical balancers, errors>data field
AEMS	Card for AEMS monitoring, errors>diagnosis field
AEMS wo Diag	Card for AEMS monitoring, errors>data field
EXACTDRESS	Card for ExactDress monitoring, errors>diagnosis field
EXACTDRESS wo Diag	Card for ExactDress monitoring, errors>data field
Empty	empty card slot, no card installed

(following example screens are shown in English)

Example 1: A fully defined SB-5500 with one device card installed.

Slot	Idx	Module	Symbol	Type	I Addr.	I Len.	Type	O Addr.	O Len.
0	1	Main	Module1	IB	0	1	QB	0	1
1	1	Mechanic	Module2	IB	1	8	QB	1	1
2	1	Empty	Module3						
3	1	Empty	Module4						
4	1	Empty	Module5						

Example 2: A fully defined SB-5500 with two device cards.

Slot	Idx	Module	Symbol	Type	I Addr.	I Len.	Type	O Addr.	O Len.
0	1	Main	Module1	IB	0	1	QB	0	1
1	1	Empty	Module2						
2	1	Non-Cont	Module3	IB	1	8	QB	1	1
3	1	Empty	Module4						
4	1	Mechanic	Module5	IB	9	8	QB	2	1

5) At this point, the specific meanings of the various bytes/bits for the I/O control points must be entered. This must be manually entered as the GSD file doesn't provide a means to handle this step. Again, the process to enter this information will vary from Profibus master to master. The Profibus master used to develop the SB-5500 interface provides an input dialog box where the byte offset / bit offset is selected, then the logic name, size of field, and byte swapping (for 16/32 bit size words) is entered.

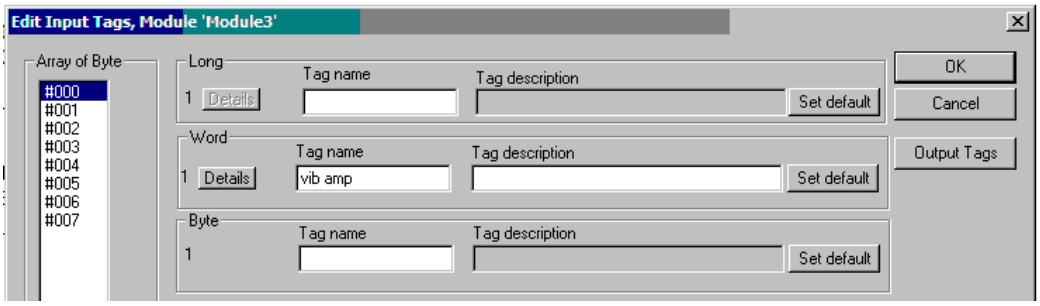
Example of Control Points Entry

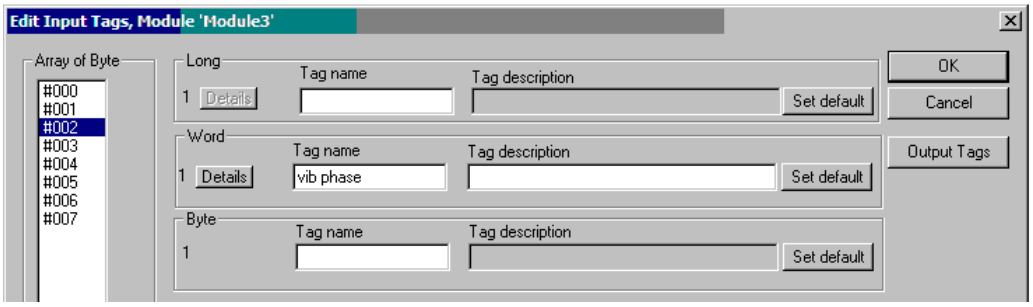
The follow pictures show the various inputs and outputs for the above example. Both 16 bit words and bit definitions are shown. Only module 1 and module 3 are shown.

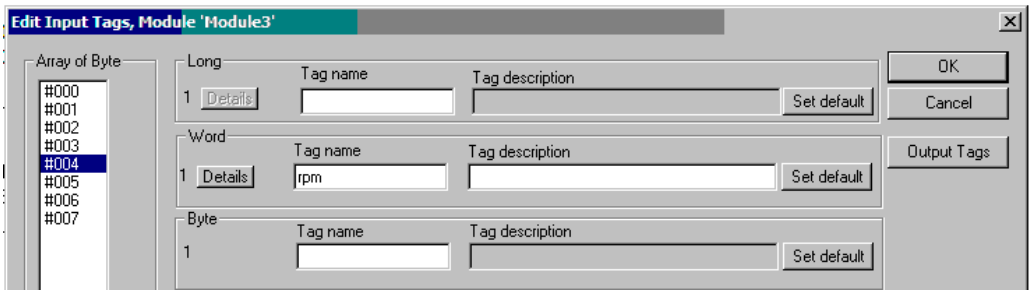
The input for 'Main':

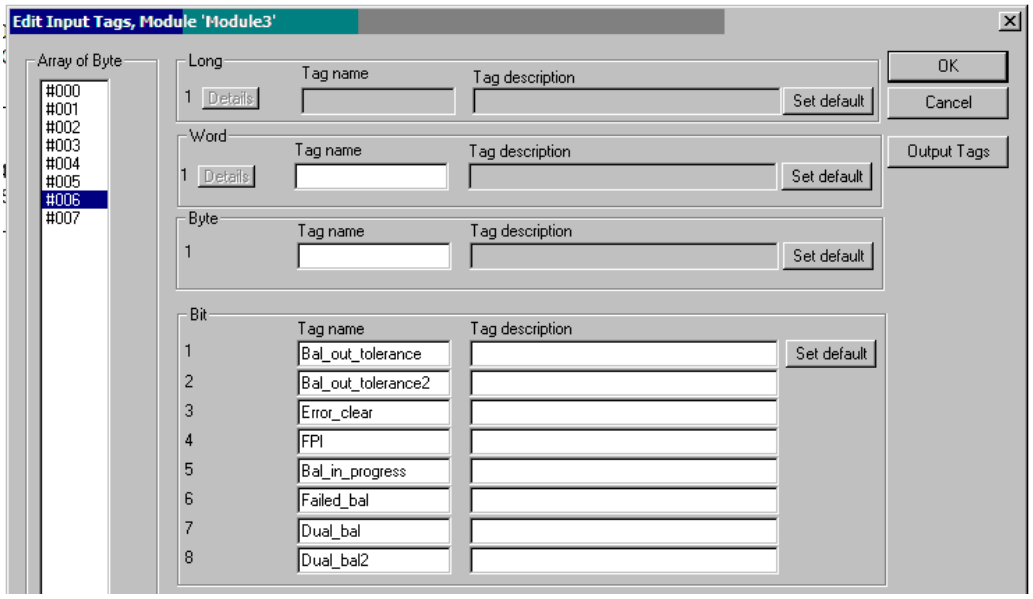
The output for 'Main':

The inputs for Module 3:

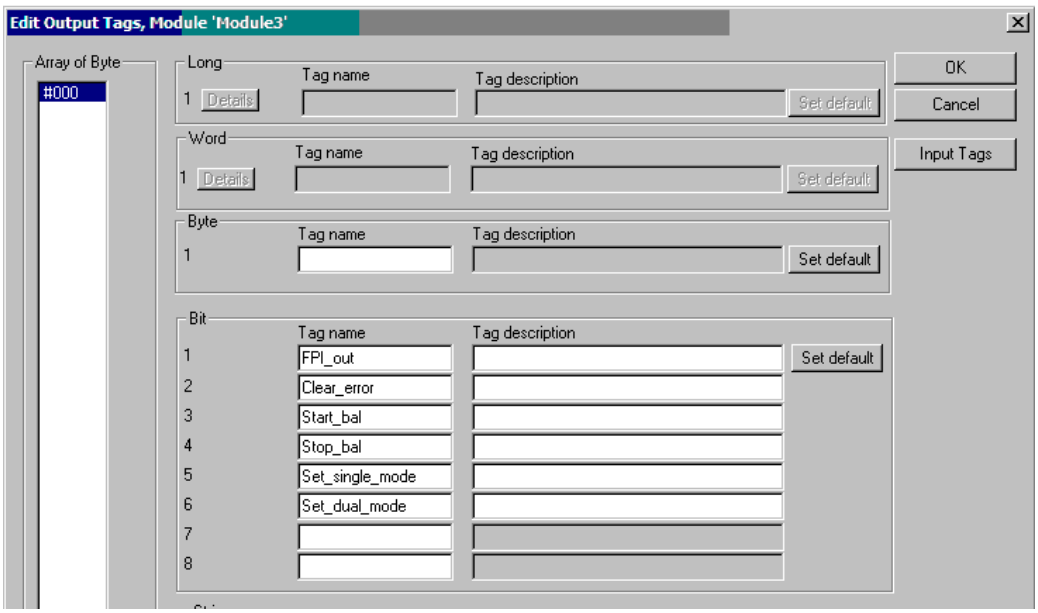








The outputs for Module 3:



Define the input/output bytes/bits within the Profibus master

The following section gives an explanation of how the SB-5500 handles input/output control points with the many possible combinations of device cards that it can handle. A general knowledge of Profibus implementation is assumed in the following description. This section does not cover the structure of the parameter list, or diagnosis (error) list, since that is well documented by the GSD file. Output is defined as data from the Profibus Master to the SB-5500, Input as data from the SB-5500 to the Profibus Master.

The SB-5500 has a number of control points. Most of these control points are single bit yes/no type functions. Others such as job number require 8 bits (octet), still others such as rpm indication require 16 bits (two octets). The various bit type control points are gathered together to form octets. The specific location within an octet can be determined by looking at the Profibus DP Parameters table in the following section of this guide. All the octets for a specific device card are gathered together into a contiguous group of octets for the device. The parameters table indicates where the octet holding a specific control point can be found at in this group. The octet offset is specified from the beginning of the group of octets. This holds true for input or output control points.

The SB-5500 Profibus interface should be understood as a combined interface for a number of Profibus modules. The Controller Main is the base module supporting the separately installed device cards in device slots 1-4. Each module has its own number of input and output data octets. Each contiguous group of octets from each module are collected together into one large data field whenever the Profibus Master requests input from the SB-5500. All input data octets are sent even if the same data has been sent before. When the Profibus Master wants to send data to one or more of the modules in an SB-5500, it will send all output data to all modules even if the output data for a module has not changed. All the various output data octets will be sent to the SB-5500 as one data field. The SB-5500 then separates this data field into a contiguous group of octets for each module, finally sending each module a contiguous group of octets.

The SB-5500 will merge all input data (input to Profibus Master) and separate all output data (output from Profibus Master) for each of the installed modules to or from the single data field as needed. This is done based the type of device card installed in each numbered device slot. Data octets to/from Main are always first in the data field, followed by the data octets for slot1, followed by the data octets for slot2, followed by the data octets for slot3, followed by the data octets for slot4. If one or more of the slots are empty, the data octets of the next installed slot will immediately follow the preceding octets. By knowing the number of data octets used by each device card and the slot the device card is in, the offset into the large data field is determined. Some examples of SB-5500 with installed device cards follow:

Output to SB-5500:

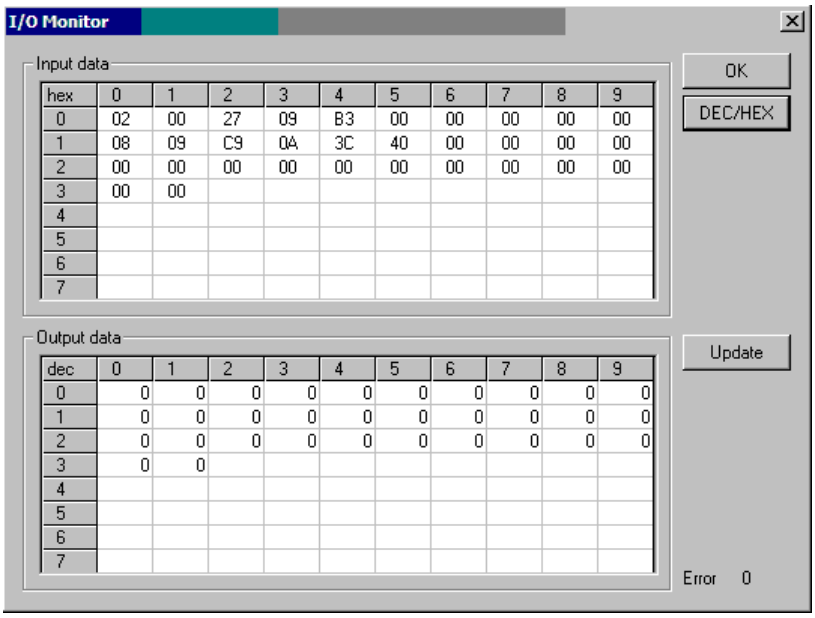
Device Slot#	Installed Module	Number of Octets Sent	Octet Position(s) in Data Field
Main	Main	1	0
1	Manual Balancer	1	1
2	Hydro Balancer	2	2, 3
3	(empty)		
4	AEMS	2	4, 5

Input from SB-5500:

Device Slot#	Installed Module	Number of Octets Sent	Octet Position(s) in Data Field
Main	Main	1	0
1	Hydro Balancer	8	1 - 8
2	(empty)		
3	Mech. Balancer	8	9 - 16
4	Manual Balancer	8	17 -24

The next several screens show how the various device cards are put together.

This screen showing all the “raw” input bytes and output bytes from the SB-5500 in example 2. Note: more data is shown then is in the actual data transfers. This is a general purpose debugging screen.



hex	0	1	2	3	4	5	6	7	8	9
0	02	00	27	09	B3	00	00	00	00	00
1	08	09	C9	0A	3C	40	00	00	00	00
2	00	00	00	00	00	00	00	00	00	00
3	00	00								
4										
5										
6										
7										

dec	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0								
4										
5										
6										
7										

This screen shows ‘MAIN’ (module 1) input and output fully decoded. The offset is the actual byte offset from the start of the “large data block” describe above. Inputs are donated by the large ‘I’ at the beginning of each line. Outputs are donated by the large ‘O’ at the beginning of each line.

Tag Name	Type	Offset	Value
I master fpi	Bit	0.0 Master Assignment	Off Good,non specific
I fp installed	Bit	0.1 Master Assignment	On Good,non specific
O fpi	Bit	0.0 Master Assignment	Off Good,non specific

This screen shows module 3 input and output fully decoded. The offset is the actual byte offset from the start of the “large data block” describe above. Here the individual bits have been defined as a byte (output) and a word (input) so they can be processed at the same time.

Tag Name	Type	Offset	Value
I vib amp	16-bit unsigned integer (word)	1 Master Assignment	67 VT_UI2 Good,non specific
I vib phase	16-bit unsigned integer (word)	3 Master Assignment	752 VT_UI2 Good,non specific
I rpm	16-bit unsigned integer (word)	5 Master Assignment	0 VT_UI2 Good,non specific
I status	16-bit unsigned integer (word)	7 Master Assignment	1 VT_UI2 Good,non specific
O Output	8-bit unsigned integer (byte)	1 Master Assignment	0 VT_UI1 Good,non specific
	(2 Byte)		

This screen shows module 5 input and output fully decoded. The offset is the actual byte offset from the start of the “large data block” describe above.

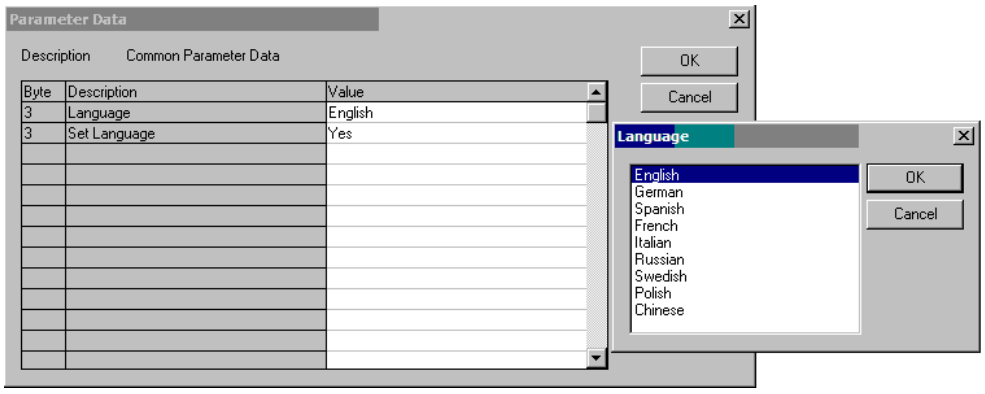
Tag Name	Type	Offset	Value
I vibration amplitude	16-bit unsigned integer (word)	9 Master Assignment	10 VT_UI2 Good,non specific
I vibration phase	16-bit unsigned integer (word)	11 Master Assignment	2289 VT_UI2 Good,non specific
I rpm	16-bit unsigned integer (word)	13 Master Assignment	2620 VT_UI2 Good,non specific
I bal out of tolerance	Bit	15.0 Master Assignment	Off Good,non specific
I bal out of tolerance 2	Bit	15.1 Master Assignment	Off Good,non specific
I error needs to be cleared	Bit	15.2 Master Assignment	Off Good,non specific
I front panel inhibit	Bit	15.3 Master Assignment	Off Good,non specific
I balance in progress	Bit	15.4 Master Assignment	Off Good,non specific
I failed balance	Bit	15.5 Master Assignment	Off Good,non specific
I dual balancing type 0	Bit	15.6 Master Assignment	On Good,non specific
I dual balancing type 1	Bit	15.7 Master Assignment	Off Good,non specific
I dual balancing mode	Bit	16.0 Master Assignment	Off Good,non specific
O Output	8-bit unsigned integer (byte)	2 Master Assignment	0 VT_UI1 Good,non specific
O fpi	Bit	2.0 Master Assignment	Off Good,non specific
O clear error	Bit	2.1 Master Assignment	Off Good,non specific
O start bal	Bit	2.2 Master Assignment	Off Good,non specific
O stop bal	Bit	2.3 Master Assignment	Off Good,non specific
O set single mode	Bit	2.4 Master Assignment	Off Good,non specific
O set dual mode	Bit	2.5 Master Assignment	Off Good,non specific

A complete table all SB-5500 Profibus Parameters, Outputs, Inputs, and Diagnosis (errors) follow. Mechanical/ Non-Contact balancers have identical Profibus interfaces and are grouped together in the table. The octet position shown is the position offset for each individual module, starting with the first octet for that module in position 0. For example the Input from SB-5500 shown for Mechanical/ Non-Contact balancers show a total of eight octets (+0 to +7) with the first two octets for that module describing the Vibration Amplitude, the next two octets describing the Vibration Phase, etc.

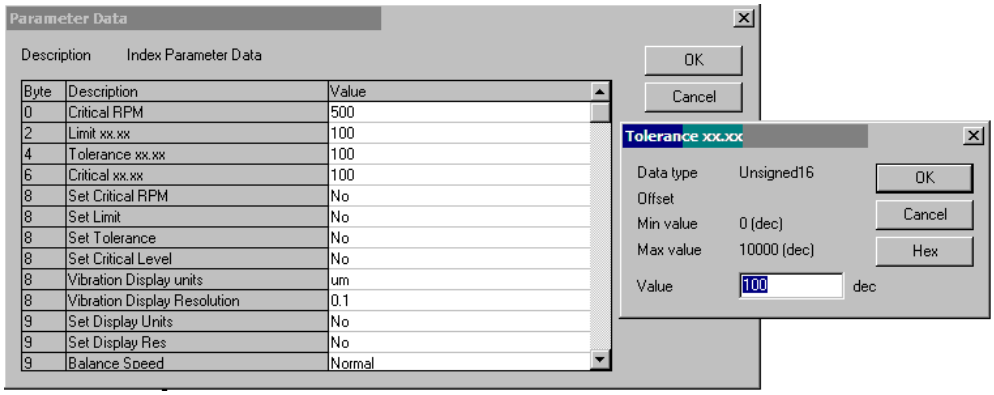
Set Parameters

The setup parameters are supplied by the GSD file. The desired settings must be entered. Again, this varies from Profibus master to master. The master used here presents a list from the GSD file of all the possible parameters for the current SB-5500 controller / device card combination. Once a specific parameter is select, a list of possible responses is presented and then a selection is made. The parameters are sent to the SB-5500 whenever an SB-5500 is connected, reconnected or a parameter is changed. This will override any setting made from the MAIN MENU available on the SB-5500 front panel / display unit. To prevent this, each parameter that can be changed from the Profibus master also has an 'enable change' selection associated with parameter. This 'enable change' must be set to 'yes' for the change in the parameter to have any effect in the SB-5500. The GSD file has these 'enable change' set to 'no' by default.

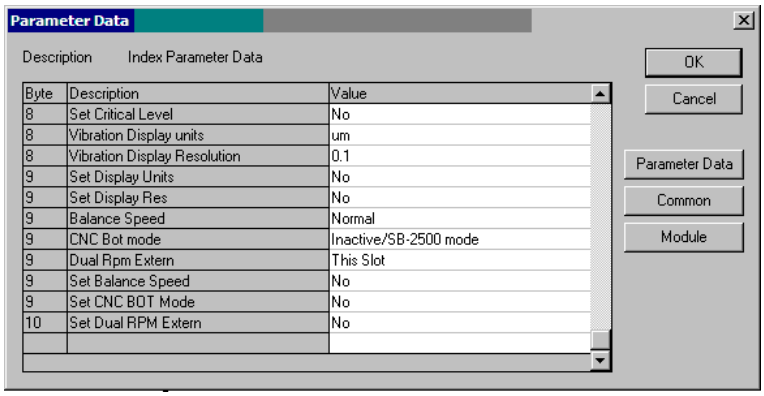
This screen shows setting the language selection.



This screen shows setting the tolerance for balancing.



This screen shows the rest of parameters that are available for balancing. The list box is not large enough to show all parameters at once.



SBS Error Reporting:

The SBS card module reported errors use letter codes ‘A’ through ‘L’. Refer to the operation manual for the device card for more details of each error code.

‘Internal Voltage Error’ (no letter code) is an error which originates from the Main module and indicates there is an internal power form failure in the control. This error will always be reported to the diagnosis field.

By default all errors codes that the SB-5500 generates use the Profibus diagnosis protocol to inform the Profibus master.

Error Reporting selectable (diagnosis field or data field)

Starting with GSD file revision 3.0, each card module will by default continue to place the various errors into the diagnosis field in the same way as with previous GSD files. However card module error reporting is now user configurable and can be set so that errors will be placed into the regular data field instead.

The list of all available modules during Profibus configuration will now show two possible error output choices for each card module.

1. The first choice will list each card module with the same name as in prior revisions of the GSD file. This selection will place the errors for that card into the diagnosis field.
2. The second choice for each device will have the same module name but with the text “wo diag” added at the end. This selection will place the errors into the data field.

Manual configuration:

When manually configuring the Profibus master, if a device card's firmware is not current enough to support the second selection (wo diag), then this configuration will fail when the Profibus master attempts to verify the configuration selections with the SB-5500. Update the card firmware to resolve.

Network scan configuration:

With the SB-5500 control in factory default condition, the Profibus master's "network" scan function will report that the SB-5500 has card modules that support only error reporting in the diagnosis field, even if the card supports both error reporting formats. This condition is required to maintain backward compatibility. This setting can be optionally changed via the Pre GSD3.0 SPRT setup menu option.

Pre-GSD3.0 SPRT Setup menu option:

Changing this setting to "NO" will cause the "network" scan to report the card modules as supporting data field error reporting (shows the "wo diag" version of the module), if the card has the capability. If the card firmware doesn't support the "wo diag" option then it will still be listed only once with the first option. Changing this setting will disable backward compatibility. The default factory value is "YES" to maintain the required backward compatibility.

"Report Errors" Setup menu option:

The 'REPORT ERRORS" setting under the Profibus setup screen can be used to prevent any SB-5500 errors via diagnosis messages from being sent from power on until the first profibus "output" packet from the profibus master is sent. A setting of "YES" will allow all errors to be sent from power on, a setting of "NO" prevent errors from being sent immediately after power on. After the first "output" packet is sent, then the "Slot x Error Disable" control bits (see table above) take over control of whether or not any errors are sent via diagnosis messages.

Profibus Parameters List

Module	Parameter		Outputs to SB-5500	# bits	position octet*	position bit	Inputs from SB-5500		# bits	position octet*	position bit	diagnosis
Main	Language		Front Panel Inhibit	1	0	0	Front Panel Inhibited		1	0	0	
	Set Language (Y/N)	a.	Not used	3	0	1-3	Front Panel Installed		1	0	1	
							Not Used		2	0	2-3	
			Slot 1 Error Disable	b. 1	0	4	Slot 1 Error Disabled	b.	1	0	4	
			Slot 2 Error Disable	b. 1	0	5	Slot 2 Error Disabled	b.	1	0	5	
			Slot 3 Error Disable	b. 1	0	6	Slot 3 Error Disabled	b.	1	0	6	
			Slot 4 Error Disable	b. 1	0	7	Slot 4 Error Disabled	b.	1	0	7	
Mech Balancer (SB-5512) card Non-Contact Balancer (SB-5532)	Critical RPM		Front Panel Inhibit	1	+0	0	Vibration Amplitude (0.01 microns)		16	+0,1	0-7	A-P
	Limit xx.xx		Clear the error	1	+0	1	Vibration phase (0.1 deg)		16	+2,3	0-7	
	Tolerance xx.xx		Start Balance	1	+0	2	RPM		16	+4,5	0-7	
	Critical xx.xx		Stop Balance	1	+0	3	Balance Out of Tolerance		1	+6	0	
	Set Critical RPM (Y/N)	a.	Set Single Mode	1	+0	4	Balance Out of Tolerance 2		1	+6	1	
	Set Limit (Y/N)	a.	Set Dual Mode	1	+0	5	Error Needs to be cleared		1	+6	2	
	Set Tolerance (Y/N)	a.	Move Weights to Home Pos.	1	+0	6	Front Panel Inhibit		1	+6	3	
	Set Critical Level (Y/N)	a.	Force Idle Mode	1	+0	7	Balance In Progress		1	+6	4	
	Vib Display Units						Failed Balance/System Inoperative		1	+6	5	
	Vib Display Resolution						Dual Balancing Type		2	+6	6,7	
	Set Display Units (Y/N)	a.					Dual Balancing Mode		1	+7	0	
	Set Display Res (Y/N)	a.					Weights at Home Pos.		1	+7	1	
	Balance Speed (1-3)						Not Idle Mode		1	+7	2	
	CNC BOT Mode						Errors A-H	c.	8	+8	0-7	
	Dual RPM Extern						Errors I-P	c.	8	+9	0-7	
	Set Balance Speed (Y/N)	a.					Errors Q-X	c.	8	+10	0-7	
	Set CNC BOT Mode (Y/N)	a.										
	Set Dual RPM Extern											

Module	Parameter		Outputs to SB-5500	# bits	position octet*	bit	Inputs from SB-5500	# bits	position octet*	bit	diagnosis
Hydro Balancer (SB-5518)	Critical RPM		Front Panel Inhibit	1	+0	0	Vibration Amplitude (0.01 microns)	16	+0,1	0-7	A-P
	Limit xx.xx		Clear the error	1	+0	1	Vibration phase (0.1 deg)	16	+2,3	0-7	
	Tolerance xx.xx		Start Balance	1	+0	2	RPM	16	+4,5	0-7	
	Critical xx.xx		Stop Balance	1	+0	3	Balance Out of Tolerance	1	+6	0	
	Set Critical RPM (Y/N)	a.	Set Single Mode	1	+0	4	Balance Out of Tolerance 2	1	+6	1	
	Set Limit (Y/N)	a.	Set Dual Mode	1	+0	5	Error Needs to be cleared	1	+6	2	
	Set Tolerance (Y/N)	a.	Balance Direction	2	+0	6,7	Front Panel Inhibit	1	+6	3	
	Set Critical Level (Y/N)	a.	Set Balance Direction	a.	1	+1	0	Balance In Progress	1	+6	4
	Vib Display Units		Force Idle Mode	1	+1	1	Failed Balance/System Inoperative	1	+6	5	
	Vib Display Resolution						Dual Balancing Type	2	+6	6,7	
	Set Display Units (Y/N)	a.					Dual Balancing Mode	1	+7	0	
	Set Display Res (Y/N)	a.					Balancing Direction	2	+7	1,2	
	Balance Speed (1-3)						Not Idle Mode	1	+7	3	
	CNC BOT Mode						Errors A-H	c.	8	+8	0-7
	Dual RPM Extern						Errors I-P	c.	8	+9	0-7
	Set Balance Speed (Y/N)	a.					Errors Q-X	c.	8	+10	0-7
	Set CNC BOT Mode (Y/N)	a.									
	Set Dual RPM Extern										
Manual Balancer (SB-5543)	Critical RPM		Front Panel Inhibit	1	+0	0	Vibration Amplitude (0.01 microns)	16	+0,1	0-7	A-P
	Limit xx.xx		Clear the error	1	+0	1	Vibration phase (0.1 deg)	16	+2,3	0-7	
	Tolerance xx.xx		Force Idle Mode	1	+0	2	RPM	16	+4,5	0-7	
	Critical xx.xx						Balance Out of Tolerance	1	+6	0	
	Set Critical RPM (Y/N)	a.					Balance Out of Tolerance 2	1	+6	1	
	Set Limit (Y/N)						Error Needs to be cleared	1	+6	2	
	Set Tolerance (Y/N)	a.					Front Panel Inhibit	1	+6	3	
	Set Critical Level (Y/N)	a.					Balance In Progress	1	+6	4	
	Vib Display Units						Failed Balance/System Inoperative	1	+6	5	
	Vib Display Resolution						Not Idle Mode	1	+6	6	
	Set Display Units (Y/N)	a.					Errors A-H	c.	8	+7	0-7
	Set Display Res (Y/N)	a.					Errors I-P	c.	8	+8	0-7
							Errors Q-X	c.	8	+9	0-7
AEMS (SB-5522)			Job #	8	+0	0-7	Pressure Level xxx.xx	16	+0,1	0-7	A-G
			Front Panel Inhibit	1	+1	0	Job #	8	+2	0-7	
			Clear the error	1	+1	1	Sensor #	3	+3	0-2	
			Reset Crash Latch	1	+1	2	Error Needs to be cleared	1	+3	3	
			M1	1	+1	3	M1	1	+3	4	
			M2	1	+1	4	M2	1	+3	5	
			Start Continuous	1	+1	5	Gap	1	+3	6	
			Stop	1	+1	6	Limit 1	1	+3	7	
			reserved	1	+1	7	Limit 2	1	+4	0	
			reserved	1	+2	0	Crash	1	+4	1	
			Force Idle Mode	1	+2	1	Cycle Running	1	+4	2	
							Front Panel Inhibit	1	+4	3	
							Not Idle Mode	1	+4	4	
							Errors A-H	c.	8	+5	0-7
							Errors I-P	c.	8	+6	0-7

Module	Parameter	Outputs to SB-5500	# bits	position octet*	bit	Inputs from SB-5500	# bits	position octet*	bit	diagnosis
ExactDress (SB-5523)		Dataset Select	8	+0	0-7	Pressure Level xxx.xx	16	+0,1	0-7	A-I
		Front Panel Inhibit	1	+1	0	Dataset #	8	+2	0-7	
		Clear the error	1	+1	1	Sensor #	3	+3	0-2	
		Reset Crash Latch	1	+1	2	Error Needs to be cleared	1	+3	3	
		<unused>	1	+1	3	Process Running	1	+3	4	
		Data Teach	1	+1	4	Data Teach	1	+3	5	
		Start Continuous	1	+1	5	Gap	1	+3	6	
		Stop	1	+1	6	Min	1	+3	7	
		Start/Stop Process	1	+1	7	Max	1	+4	0	
						Crash	1	+4	1	
						Cycle Running	1	+4	2	
						Front Panel Inhibit	1	+4	3	
						Errors A-H c.	8	+5	0-7	
						Errors I-P c.	8	+6	0-7	
ExactControl (SB-5560)		Channel 1 – Job Select	8	+0	0-7	Channel 1 - Digital Outputs 1-8	1x8	+0	0-7	
		Channel 1 - Start/Stop	1	+1	0	Channel 1 – Digital Outputs 9-14	1x7	+1	1-6	
		Channel 1 - Teach	1	+1	1	Channel 1 – Infeed Enable	1	+1	7	
		Channel 2 – Job Select	8	+2	0-7	Channel 2 - Digital Outputs 1-8	1x8	+2	0-7	
		Channel 2 - Start/Stop	1	+3	0	Channel 2 – Digital Outputs 9-14	1x7	+3	1-6	
		Channel 2 - Teach	1	+3	1	Channel 2 – Infeed Enable	1	+3	7	
		Channel 3 – Job Select	8	+4	0-7	Channel 3 - Digital Outputs 1-8	1x8	+4	0-7	
		Channel 3 - Start/Stop	1	+5	0	Channel 3 – Digital Outputs 9-14	1x7	+5	1-6	
		Channel 3 - Teach	1	+5	1	Channel 3 – Infeed Enable	1	+5	7	
		Channel 4 – Job Select	8	+6	0-7	Channel 4 - Digital Outputs 1-8	1x8	+6	0-7	
		Channel 4 - Start/Stop	1	+7	0	Channel 4 – Digital Outputs 9-14	1x7	+7	1-6	
		Channel 4 - Teach	1	+7	1	Channel 4 – Infeed Enable	1	+7	7	
						Errors A-H	8	+8	0-7	
						Errors I-P	8	+9	0-7	

a. These Set Parameters control update of each corresponding parameter value.
Set parameter=1 will force the corresponding parameter to be updated.
Set parameter=0 will leave the corresponding value unchanged from its current stored value.
b. Available in 5510 firmware rev. 0.49 and higher
c. When the "wo diag" module version is in use, SB-5500 errors are not reported in the diagnosis field. Instead the data packet is expanded and SBS errors are reported using these additional data fields (see SBS Error Reporting). Errors codes Q-X are reserved for future use
* The octet position is this value added to the total number of octets used by the Main card plus all installed cards up to this card's slot number in the SB5500.

ExactControl

The SB-5560 Profibus Interface provides no parameter bytes, 8 output bytes, and 10 input bytes.

ExactControl Job Selection Encoding

The Job is encoded on the Job Select digital input. The numeric value for Job Select bits is as follows:

Job Select bit	1	2	3	4	5	6	7	8
Value	1	2	4	8	16	32	64	128

The Job number that will be selected on a channel is the sum of the values of the active Job Select bits. e.g. Activate Job Select bits 2 and 3 to start Job 6 (2+4) and activate Job Select bits 1 and 4 to start Job 9 (1+8). A Job Select bit combination that adds to more than the maximum job number will be ignored and the Job will not start. Selecting Job 0 will select the last Job selected in the IVIS Parameter Settings screen (the same Job started by the Manual channel).

Definitions of the Parameters

Outputs To SB-5500:

Main Front Panel Inhibit	1 = Inhibit front panel activity on all slots. 0 = Front panel activity is not inhibited from this source. Any active Front Panel Inhibit source for a slot may inhibit front panel activity. All Front Panel Inhibit sources for a slot must be inactive to allow activity on the panel. This signal is only one of four Front Panel Inhibit sources for any slot.
Balance Card Front Panel Inhibit	1 = Inhibit front panel activity for this slot. 0 = Front panel activity for this slot is not inhibited from this source. Any active Front Panel Inhibit source for a slot will inhibit front panel activity. All Front Panel Inhibit sources for a slot must be inactive to allow activity on the panel. This signal is only one of four Front Panel Inhibit sources for any slot.
Slot x Error Disable (x=1,2,3 or 4)	1 = Prevent any error(s) from the specified slot from being passed to the bus master. Will send a 'diagnosis clear' to the bus master to clear any errors currently registered within the bus master for the specified slot. Any error condition(s) will continue to function as normal within the controller/slot card. 0 = Allows all errors from the specified slot card to be passed to the bus master. Any error(s) generated within the slot card while this disable bit was set will not be passed on to the bus master. Only new errors will be passed on to the bus master.
Clear the Error	1 = Clear the current error in slot. The 0 – 1 transition causes the actual clearing. 0 = NOP.
Start Balance	1 = Start a balance cycle. The 0 – 1 transition causes the actual balance cycle. 0 = NOP
Stop Balance	1 = Abort a balance cycle in progress. The 0 – 1 transition causes the actual abort. 0 = NOP.
Set Single Mode	1 = Change slot operation to single balance head operation. The 0 – 1 transition causes the actual change. 0 = NOP
Set Dual Mode	1 = Change slot operation to dual balance head operation. The 0 – 1 transition causes the actual change. 0 = NOP
Set Balance Direction Command (Hydrokompenser):	0,0 = automatic always 0,1 = automatic once 1,0 = same 1,1 = opposite
Activate Balance Direction	1 = Turn on balance direction as set above. The 0 – 1 transition causes the actual direction change. 0 = Turn off balance direction.
Job #	Values of 0 thru 16 will immediately set the job: 0 represents OFF and 1 thru 16 represent job numbers.
Reset Crash Latch	1 = Clear the "crash" latch. The 0 – 1 transition causes the actual reset. 0 = NOP
M1	1 = Change to "M1" mode. The 0 – 1 transition causes the actual change. 0 = NOP
M2	1 = Change to "M2" mode. The 0 – 1 transition causes the actual change. 0 = NOP
Start Continuous	1 = Start continuous plotting and transmission of acoustical data. The 0 – 1 transition causes the actual start. 0 = NOP
Stop	1 = Stop plotting and transmission of acoustical data. The 0 – 1 transition causes the actual stop. 0 = NOP
Dataset Select	1 = dataset 1 2 = dataset 2
Data Teach	1 = Teach mode active 0 = Process monitoring mode active
Start/Stop Process	1 = Start process monitoring or data teach acquisition, per status of data teach. The 0 – 1 transition causes the actual start. 0 = Stop process monitoring or data teach acquisition. The 1 – 0 transition causes the actual stop.

Inputs From SB-5500:

Main Front Panel Inhibited	1 = front panel is inhibited for all slots 0 = front panel active for all slots (note: individual slot front panel inhibits may still be active)
Front Panel Installed	1 = front panel assembly (real or virtual) is connected to SB5500 controller. 0 = no front panel assembly connected
Slot x Error Disable (x=1,2,3 or 4)	1 = Prevent any error(s) from the specified slot from being passed to the bus master. Will send a 'diagnosis clear' to the bus master to clear any errors currently registered within the bus master for the specified slot. Any error condition(s) will continue to function as normal within the controller/slot card. 0 = Allows all errors from the specified slot card to be passed to the bus master. Any error(s) generated within the slot card while this disable bit was set will not be passed on to the bus master. Only new errors will be passed on to the bus master.
Vibration Amplitude	The actual vibration amplitude in units on 0.01 microns. The 2 bytes that make up this field are little endian.
Vibration phase	The actual vibration phase in units on 0.1 degrees. The 2 bytes that make up this field are little endian.
RPM	The actual RPM. The 2 bytes that make up this field are little endian.
Pressure Level	The actual acoustical energy level in units on 0.01 dynes. The 2 bytes that make up this field are little endian.
Job #	The current job number. 0 represents 'OFF' and 1 thru 16 represent a job number.
Sensor #	The current sensor that is being monitored.
Dual Balancing Type	0,0 = Single 0,1 = Dual Plane 1,0 = Dual Spindle (not supported)
Dual Balancing Mode	0 = Single 1 = Dual
Balance Direction (hydro only)	0,0 = automatic always 0,1 = automatic once 1,0 = same 1,1 = opposite
Balance Out of Tolerance	This bit will become a '1' when the sensed vibration level exceeds the operator defined Tolerance level. The function of this bit during an automatic balance cycle is determined by the CNC BOT MODE setting.
Balance Out of Tolerance2	The bit will become a '1' when the sensed vibration level exceeds the operator defined Critical Tolerance or when the spindle RPM exceeds the operator defined Critical RPM. The function of this bit during an automatic balance cycle is determined by the CNC BOT MODE setting.
Error Needs to be Cleared	When this bit is set, an error has occurred and needs to be serviced / cleared. It is cleared by setting the 'Clear the error' bit in under Outputs to SB-5500.
Front Panel Inhibit	This bit indicates the current setting of the CNC-interface FPI bit. When this bit is set, key operator actions at the front panel keypad are disallowed. The MENU, MAN., and the AUTO Button are disabled. Still enabled are the Power button and the Cancel button, which can be used to stop an automatic balance operation. Access to the SHOW-ALL button and System Status screen are a allowed.
Balance in Progress	When this bit is set, an automatic balance cycle is in progress.
Failed Balance/System Inoperative	This bit will set when an automatic balance cycle failed.
M1	This bit will be a '1' when the "monitoring parameter set 1" is the current set.
M2	This bit will be a '1' when the "monitoring parameter set 2" is the current set.
Gap	This bit will be a '1' when the actual acoustical energy level is above the operator defined 'gap' value for the current job.
Limit 1	This bit will be a '1' when the actual acoustical energy level is above the operator defined 'limit 1' value for the current job.
Limit 2	This bit will be a '1' when the actual acoustical energy level is above the operator defined 'limit 2' value for the current job.
Crash	This bit will be a '1' when the actual acoustical energy level is above the operator defined 'crash' value for the current job.
Dataset #	1 = dataset 1 2 = dataset 2

Process running	1 = Start process monitoring or data teach acquisition, per status of data teach. The 0 – 1 transition causes the actual start. 0 = Stop process monitoring or data teach acquisition. The 1 – 0 transition causes the actual stop.
Min	1 = Error: The results of the current dress process fall below the zone minimum limit set. Indicates that some active process zones have produced lower AE signal levels that the corresponding zone dataset master. 0 = No error
Max	1 = Error: The AE signal exceeds the level of the Process Maximum Limit setting (excessive dress pressure). 0 = No Error
Data Teach	1 = Data Teach mode is active 0 = Process monitoring mode active
Cycle Running	This bit will be a '1' when acoustical energy is actively being graphed and transmitted.

Application Notes

Profibus byte/word addressing note for the Siemen S7 and SB-5500

The SB-5500 Profibus packets contain both byte (8 bit size) and word (16 bit size) variables/data. The position and number of data elements will vary depending on what function cards are plugged in. This means that the word variables can/will be on odd memory addresses or on even memory addresses. This is completely normal and compatible with Profibus. The Profibus Master Controller/software may need to have the memory address(es) where the specific variable(s) are referenced from adjusted so they will be on an even address boundary to correctly function.

We have had one customer that had all data sequenced such that all the word sized variables always came out on odd addresses with in the Profibus master/controller. Only the very first byte at address 0 and every fourth word correctly read. After adjusting the addresses on all word size data to be even, the data could be correctly read.

Profibus and LCD interaction

Commands/parameters that are sent over Profibus that change settings in the SB-5500 will not cause the LCD screen to be changed. For the screen to reflect the change, the user has to change to another screen and then change back to the screen that is desired. After doing this, the changes that took place over Profibus will be visible. It is assumed that the user is controlling the SB-5500 over Profibus will be looking at the results from the changes via Profibus but not on the LCD also.

Profibus master reporting errors A and J while the spindle is stopped

Interpretation of SBS error codes A and J are both timing / rpm dependent. The SB-5500 reports these errors at any time the RPM signal is not present (Error J), or if the RPM signal is present but is either below 300 RPM, or above 30,000 RPM (Error A). The SB-55500 doesn't have any way of knowing if the lack of rpm is intended and valid (stopped spindle) or not, so it always reports the status of rpm using these error codes. How to interpret these errors must be handled by the Profibus master / PLC since it has the knowledge of whether or not the spindle is rotating.

When errors are sent via diagnosis messages

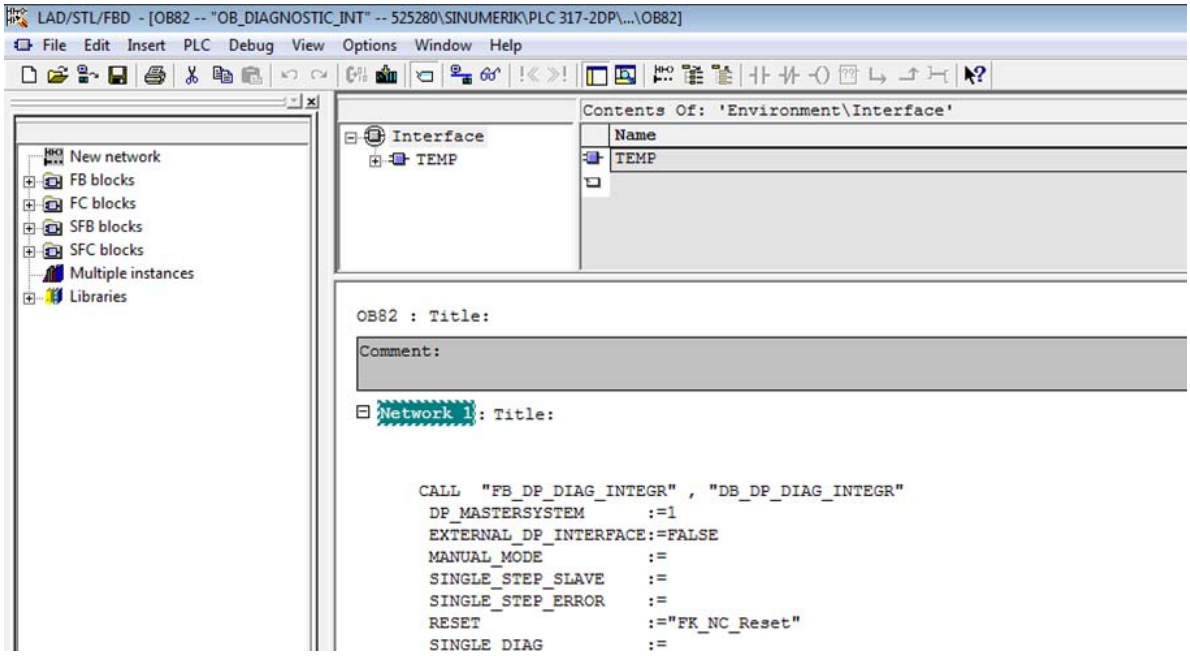
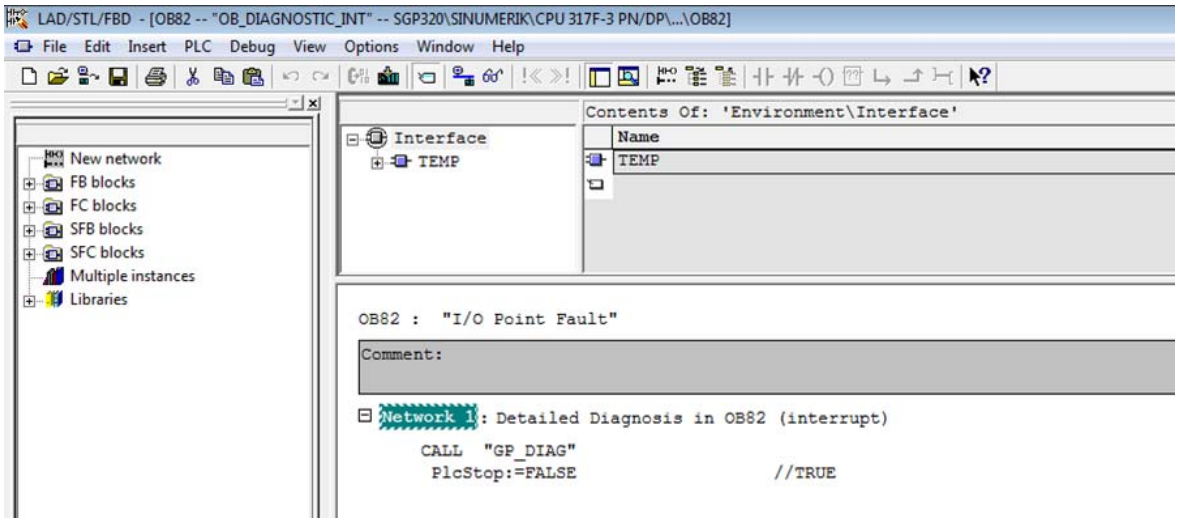
If the Sinumeric has 'Safety Integrated Features' or 'SF' running, this will cause the CNC to go into 'STOP' mode and display 'SF' when it sees SBS error signals. The feature is active by default in later versions of Siemens code.

To prevent the Siemens PLC from going into "STOP" mode and displaying 'SF' when SBS sends a diagnosis message via Profibus, three options are available:

1) Use GSD file version 3.0 or newer and select module types with the "wo diag" option that removes SBS error reporting from the diagnosis field and instead sends errors as part of the regular data packet.
2) The 'REPORT ERRORS" setting under the Profibus setup screen can be used to prevent any SB-5500 errors from being sent during the time from power on of the SBS control until the first profibus "output" packet from the profibus master is sent (see SBS Error Reporting).

3) The Sinumeric 'Safety Integrated Features' or 'SF' can be disabled, although this is not recommended. To do so the OB82 setting on the Sinumeric control has to be changed as shown following.

OB82 Version 1.0 Set EXTERNAL_DP_INTERFACE:= FALSE



OB82 Version 1.0 Set PlcStop:=FALSE