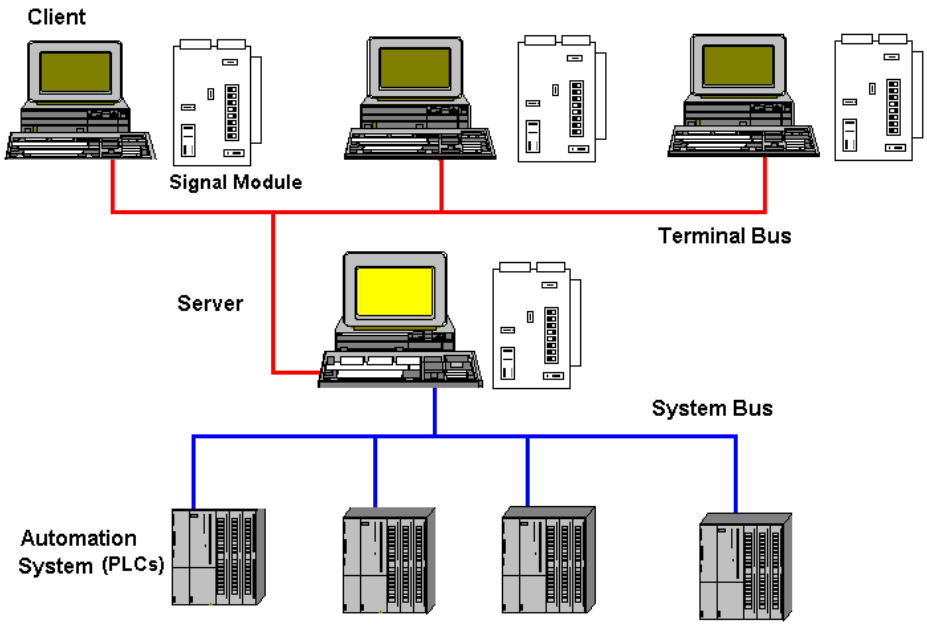
12 Hardware Options

12.1 Signal Module

12.1.1 General Information about the Signal Module

The signal module is used to control up to three different signaling devices (such as horns, buzzers, lights, etc.) and can be connected to a hardware acknowledgment button. It also includes a hardware timer (watchdog), which is retriggered cyclically by WinCC Runtime via a driver API call. An alarm will be initiated, if the triggering ceases due to an error (software protection, computer failure). The module also possesses 3 additional Binary inputs. The signal module is a PC module especially developed for the application in operator stations. It comes with an 8-Bit ISA bus interface (order number: 6DS 1916-8AA) or a 32-Bit PCI bus interface (order number: 6DS 1916-8RR).

The signal module is a hardware option to the WinCC system that is offered as an option package. The following figure shows the general structure of a system as well as the installation possibilities for the signal module within a system.



If the server operator station is to have multiple terminals (client operator stations), each terminal can be equipped with a signal module.

Installation in other PCs

According to our experiences, there are no limitations for the installation of the two cards.

Startup of the Signal Module

The signal module is started up in two steps:

- Installation of the signal module
- Testing of the signal module

12.1.2 Function Characteristics of the Signal Module

The signal module performs the following functions:

- Control of three acoustic or optical signaling devices
- Watchdog
- 3 Binary inputs
- Acknowledgment/resetting of the audible signals through software control or external wiring

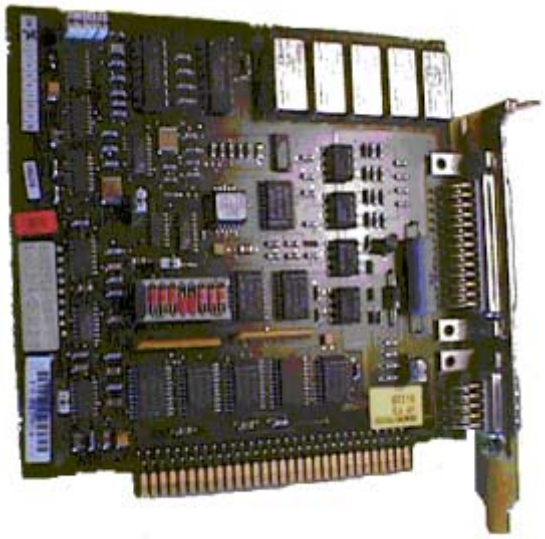
A 25-pin and a 9-pin Sub-D-plug are located at the front of the module. The watchdog and signaling device functions are carried through the 25-pin Sub-D-plug. The 9-pin plug is not used.

Via the Basic Process Control option package, the group signal or the group audible indicator is controlled by a logical OR.
When controlling through the software, the three signal outputs and the group alarm are reset. When acknowledging externally, e.g. via a button, only the group audible indicator is reset. The software forwards this state to all audible indicators - thus all audible signals will be reset as well when acknowledging externally.

All signals sent through the two plugs are isolated and implemented as relay contacts or optical couplers. The 24 V DC supply voltage, which is provided externally by the relay contacts or optical couplers of the signal module, must be 1 A protected by the customer.

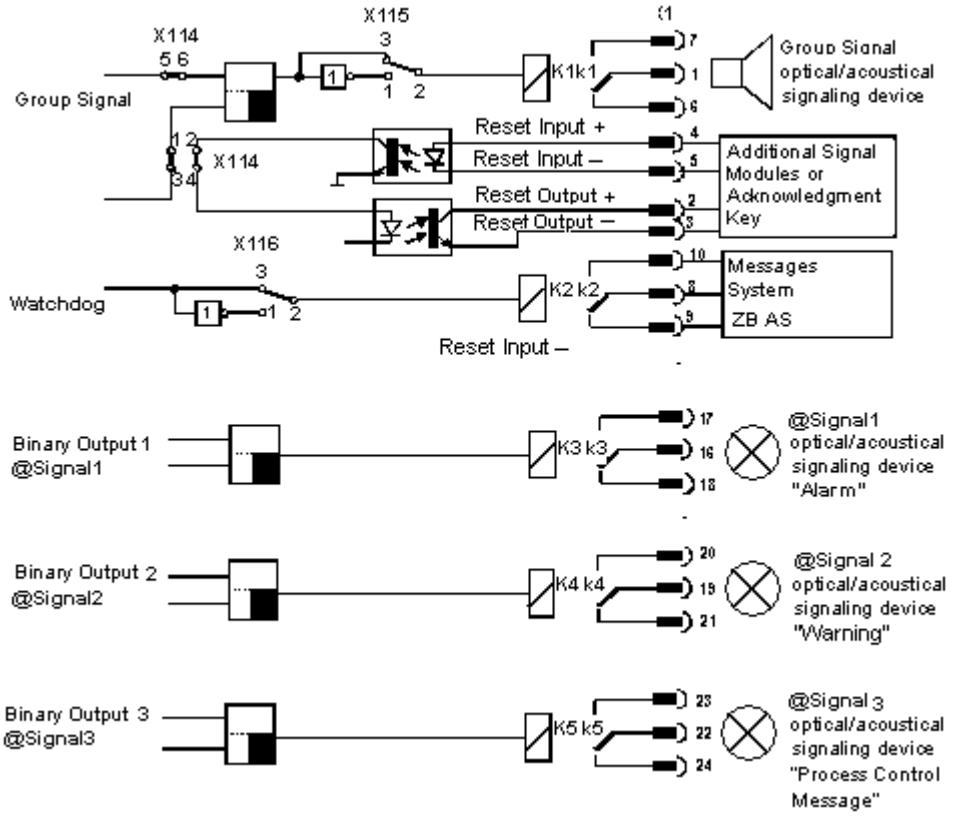
12.1.3 ISA Bus Signal Module

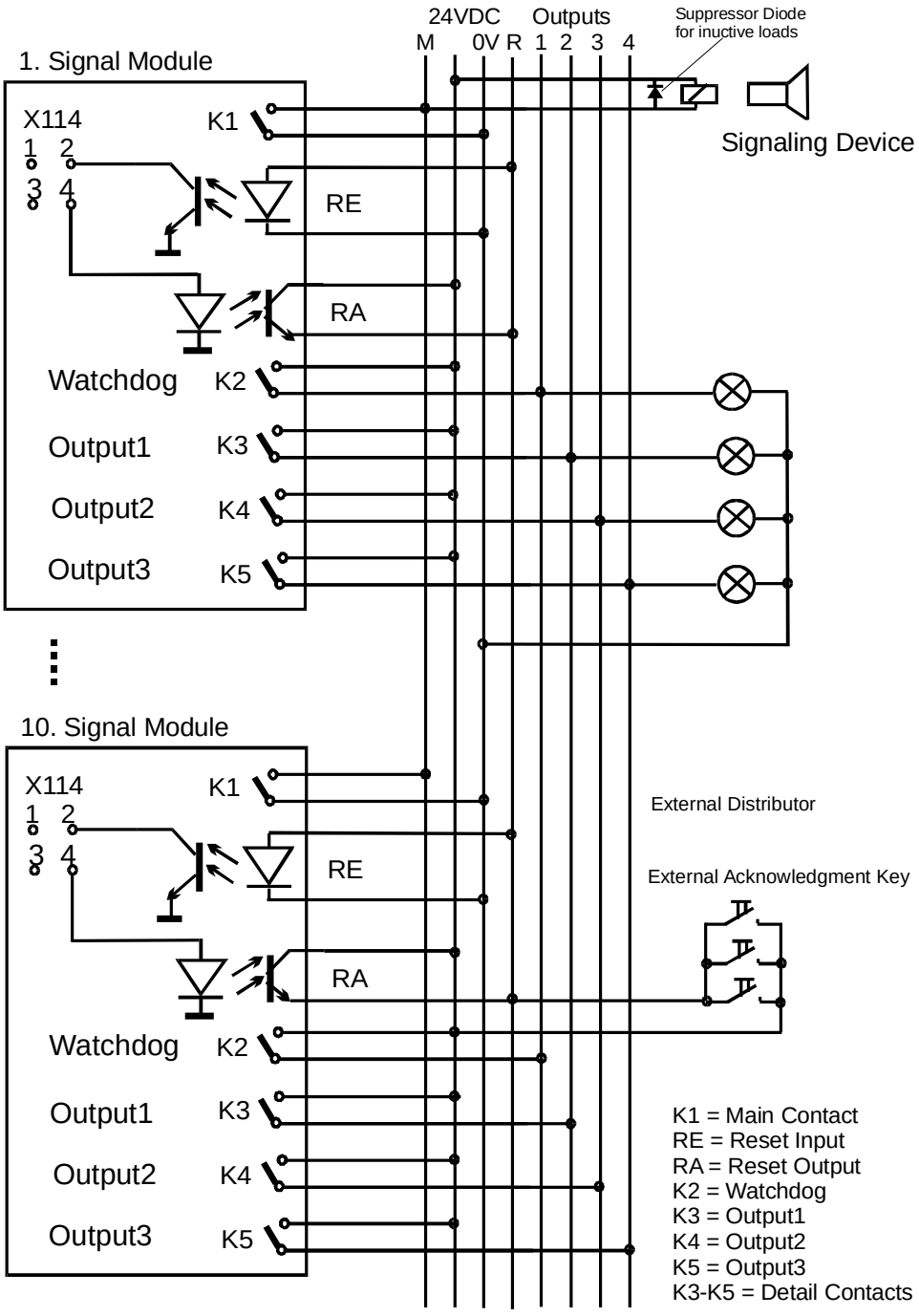
The signal module is an ISA bus card for PCs. It is used for controlling up to 3 external signaling devices and possesses 3 Binary inputs.



The signal module is plugged into the motherboard of the operator terminal PC. Check, whether an ISA slot is available. Note the addressing of the module to avoid address conflicts with other PC expansion cards. By default, the I/O address 180H is occupied by the signal module. For additional information, refer to the chapter "Addressing the ISA Bus Signal Module".

Example: 8-Bit ISA Bus Interface Circuit




24VDC
Outputs
M
0V
R
1
2
3
4
Suppressor Diode
for inuctive loads
Signaling Device
1. Signal Module
X114
1
2
3
4
K1
RE
RA
Watchdog
K2
Output1
K3
Output2
K4
Output3
K5
10. Signal Module
External Distributor
External Acknowledgment Key
K1 = Main Contact
RE = Reset Input
RA = Reset Output
K2 = Watchdog
K3 = Output1
K4 = Output2
K5 = Output3
K3-K5 = Detail Contacts

Function Characteristics of the Signaling Device Output

The make contact of the signaling device output is open, if the operator terminal is turned off. The relay contact will remain open after the operator station is turned on. The contact will be closed, if a classified event occurs during the process run. Other events will only result in the closing of the signaling device output, if an acknowledgment was made prior. This acknowledgment can be performed either internally through WinCC or by means of an external acknowledgment button. It is possible to invert the function of the signaling device via the break contact.

Acknowledgment of the Signaling Device
The following acknowledgments are possible:

- With the mouse, when the signaling device is controlled only from one operator terminal:
  Jumper X114: 1-3 and 2-4 closed (state on delivery).
- With the mouse or externally with the acknowledgment button when several operator terminals are connected, as shown in the figure above.
  Jumper X114: 1-2 and 3-4 closed.
  The acknowledgment signal is, in this case, looped through several signal modules.

The signaling device function can be switched off by removing jumper X114: 5-6 (see figure on previous page).

Watchdog

The watchdog function is used for monitoring the proper operating status of the OS (operator station).

After switching on the OS power supply, a monoflop is set cyclically on the signal module. This monoflop is retriggered just in time so as not to drop out.

If the process control of the operator terminal malfunctions, the monoflop on the signal module ceases 3.5 seconds after the last trigger impulse. Depending on how jumper X116 is set, the watchdog function can be inverted. When delivered, jumper X116: 2-3 is closed (Watchdog normal operation).

If an external signaling device (e.g. audible signal) is to be connected, a miniature contactor can be connected to the contact. This miniature contactor switches the signaling device. (Install an anti-surge diode for inductive loads!)

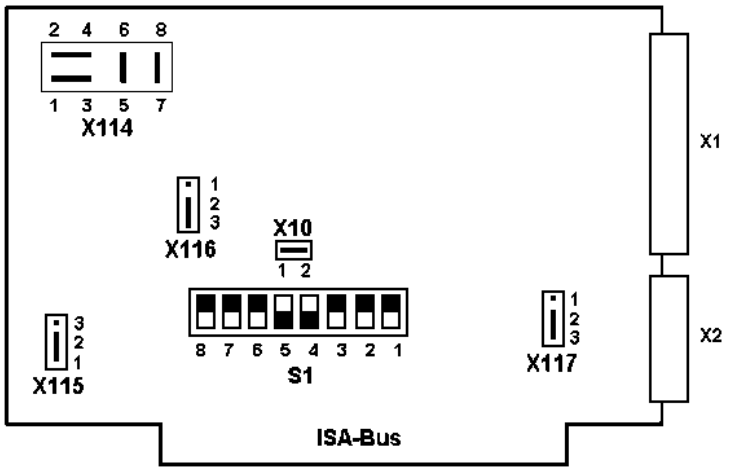
Binary Inputs

The signal module provides three binary inputs, isolated by optical couplers, for querying external binary signals.
They are intended for individual expansions and can be user-configured via the tags @SignalInput1... @SignalInput3.

12.1.3.1 Structure of the Switches and Jumpers with the ISA Bus

Overview

The following simplified representation of the signal module with 8-Bit ISA bus interface shows the physical arrangement and the pin numbering of the switches and jumpers (seen from the component side). Their use is explained below.



The factory settings of the jumpers and preset switch positions are shown in the figure. These default settings are indicated by "*)" in the following table.

Structure/Description of the Jumpers/Switches/Interfaces

The desired functions of the signaling device, watchdog, plug control and addressing are set via plug-in jumpers.

Slot	Jumper	Description
X114	1-3*) 2-4*) 1-2 3-4	Acknowledge signaling device via bus interface Acknowledge signaling device via external signal
	5-6*)	Signaling device function on
	7-8*)	Watchdog function on
X115	1-2*) 2-3	Signaling device relay picks up on event Signaling device relay drops out on event
X116	2-3*)	Watchdog function normal
	1-2	Watchdog function inverted
X10	Closed*) Open	Addressing in the I/O area Addressing in memory area
X1		25-Pin watchdog and signaling device interface
X2		9-Pin hardcopy interface
S1		DIP-switch for addressing the signal module in the I/O or memory area of the PC

The jumper settings marked with *) are the default settings. The plug connections X117 (1-2-3) are not used by WinCC.

12.1.3.2 Addressing the ISA Bus Signal Module

Overview

The signal module can be addressed in either the I/O area or the memory area of the PC. The base address for both addressing types is set using DIP-switch S1. It occupies 16 Bytes in the 0000H-03FFH I/O area and 1 KB in the C0000H-FFFFFH area. The kernel driver uses the I/O addressing only.

Slot	Jumper	Description
X10	Closed	Addressing in the I/O area
	Open	Addressing in the memory area

Signal Module Address Lines

The signal module manages 12 address lines in the I/O addressing mode, of which the four lowest (A0 - A3) are used for switching the 16 required individual addresses. **These four address lines thus can not be set with DIP-switches.** This results in the following assignment of switch to address line (as described above in general form).

Possible Address Line Settings												
Switch	8	7	6	5	4	3	2	1				
Lines A	11	10	9	8	7	6	5	4	3	2	1	0

Setting the I/O Address

The I/O address can now to be set as follow using the available switches:

- Selection of the I/O address (e.g. 180h); the address must not be in use on the respective PC, otherwise an I/O address conflict will result.
- Conversion to Binary notation (0001 1000 0000); the conversion is simplified by considering each HEX digit as a 4-Bit block.
- Setting and deletion of the individual address Bits (**WARNING:** The 4 lowest-value Bits are not covered by the DIP-switches).

The given example (180h) thus has the following switch positions (**default setting**):

Default Settings (Address 180H)								
Switch Pin	8	7	6	5	4	3	2	1
Address Pin	11	10	9	8	7	6	5	4
Position	OFF	OFF	OFF	**ON**	**ON**	OFF	OFF	OFF

Example for the Address 100H (0001 0000 0000)								
Switch Pin	8	7	6	5	4	3	2	1
Address Pin	11	10	9	8	7	6	5	4
Position	OFF	OFF	OFF	**ON**	OFF	OFF	OFF	OFF

12.1.4 PCI Bus Signal Module

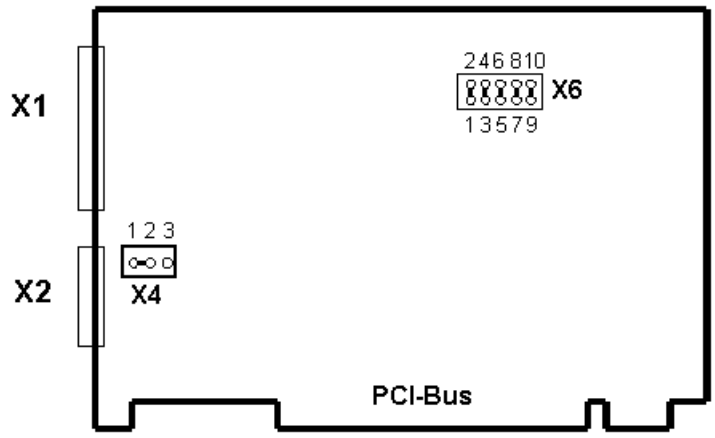
The signal module is a PCI bus card for PCs. It is used for controlling up to 3 external signaling devices and possesses 3 Binary inputs.

The signal module is plugged into the motherboard of the operator terminal PC. Check, whether a PCI slot is available.

12.1.4.1 Structure of the Switches and Jumpers with the PCI Bus

Overview

The following simplified representation of the signal module with 32-Bit PCI bus interface shows the physical arrangement and the pin numbering of the switches and jumpers. Their use is explained below.



The factory settings of the jumpers and preset switch positions are shown in the figure.

Structure/Description of the Jumpers/Switches/Interfaces

The desired functions of the signaling device, watchdog, plug control and addressing are set via plug-in jumpers.

Slot	Jumper	Description
X6	1-2 closed	Signaling device function on
	3-4 open	Acknowledge signaling device via bus interface
	3-4 closed	Acknowledge signaling device via external signal
	5-6 open	Watchdog function normal
	5-6 closed	Watchdog function inverted
	7-8 open	Signaling device relay drops out on event
	7-8 closed	Signaling device relay picks up on event
	9-10 open	Watchdog function off
	9-10 closed	Watchdog function on
X4	1-2 closed	Plug-in check via jumper 6-8 active on connector
	2-3 closed	Plug-in check via +5V active from printer
X1		25-Pin watchdog and signaling device interface
X2		9-Pin hardcopy interface

The X6 jumpers are all closed upon delivery. The X4 jumper "1-2" is closed upon delivery.

12.1.5 Installation of the Signal Module

Procedure

The installation is broken down into multiple steps. Proceed as follows:

1. Hardware Installation:
   The signal module hardware (plug-in card) is plugged into the base unit (motherboard) of the operator station. The card requires a free ISA or PCI slot in the OS. If the OS - as a server OS - possesses multiple terminals (client operator stations), each terminal may also be equipped with an additional signal module.

   Before installing the ISA card, check whether the addresses used by the card (default settings) are still available on your PC. If the default settings are in use, the card must be reset via the DIP-switches. The preset address assignment of the signal module is 180H to 18FH in the I/O area. See the chapter "Addressing the ISA Bus Signal Module", if a different address area must be set in order to avoid address conflicts with other PC expansion cards.

   It is not necessary to set the address for the PCI card.

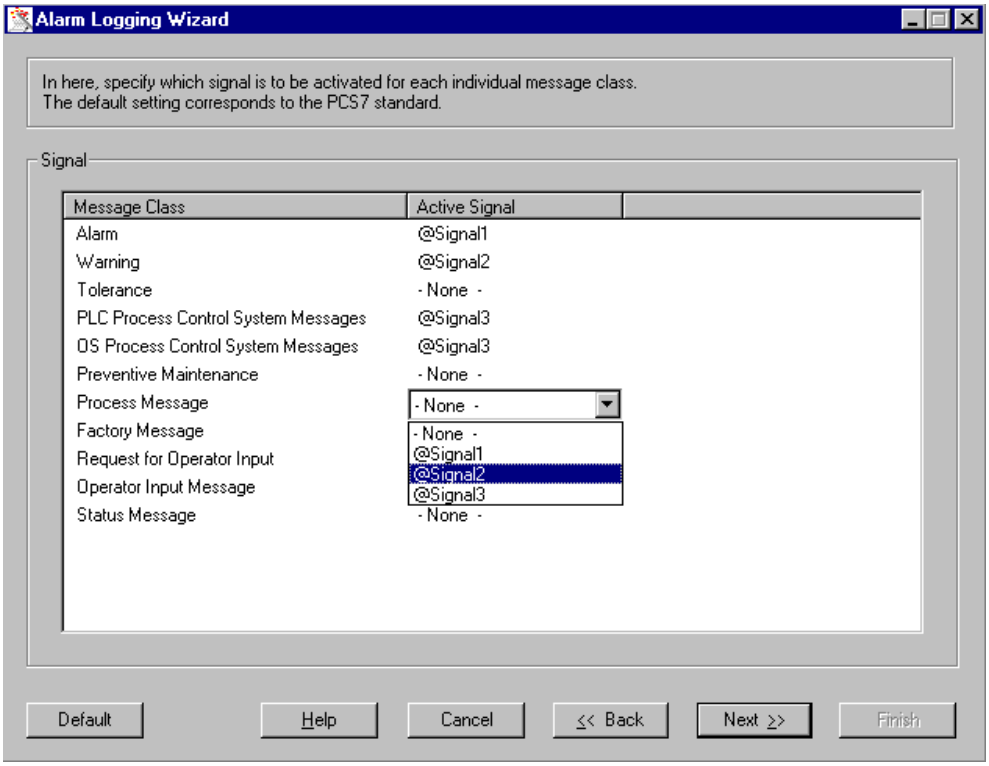
2. Hardware Setup:
   After installing the signal module plug-in card, the functionality of the card can be tested via the "Control Panel" of Windows NT. To do so, double-click on its icon in the "Control Panel" - this opens the "Signal Module Hardware Setup" dialog. The hardware setup of the signal module card can be performed this dialog.
3. Configuration via the "Alarm Logging Wizard":
   The "Alarm Logging Wizard" generates the internal tags "@Signal1"..."@Signal3" for controlling external signaling devices and "@SignalInput1"..."@SignalInput3" as images of the Binary inputs of the signal module. The Wizard adds the runtime module of the signal module (HMRT.EXE) to the startup list of the computer.

- In the project navigation window, double-click on the "Base Data" editor. This will list all installed components.
- Right-click on the "Alarm Logging Wizard" entry.

  Select the "Open" command from the displayed pop-up menu.

  On page 1, the "Signal Module Connection" check-box must be activated.

On page 3, the internal tags can be assigned to the message classes.



- Right-click on the appropriate message class in the "Active Signal" column. From list-box, select the desired tag.

12.1.6 Pin Assignment of the External Interface

Interface (X1) Pin Assignment

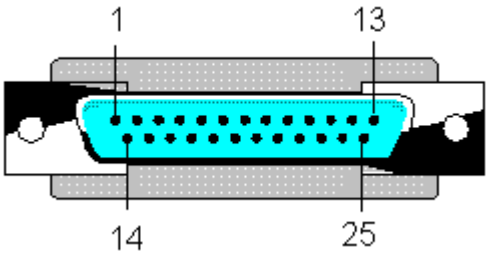
The external wiring of the signaling device output and the channel outputs is carried out directly, i.e. each contact controls a messaging device. In the event of an error message, the main contact and the assigned detail contact are set. An acknowledgment results in the control software resetting the main contact and all detail contacts. The acknowledgment may occur externally by means of an acknowledgment input or may be triggered by the software.

The following table shows the wiring of a 25-pin Sub-D plug, which is used for connecting external devices (lights, buzzers, bells, buttons, etc.).

Pin	Signal	Description	Connection
*H	*S		
1	Signaling device M	Relay, center contact	
2	+	Reset output	Optical coupler
3	-	Reset output	Optical coupler
4	+	Reset input	Optical coupler
5	-	Reset input	Optical coupler
6	Signaling device R	Relay, break contact	
7	Signaling device A	Relay, make contact	
8	Watchdog M	Relay, center contact	
9	Watchdog R	Relay, break contact	
10	Watchdog A	Relay, make contact	
11	+	BI 1 *BI	
12	-	BI 1 *BI	
13	+	BI 2 *BI	Optical coupler
14	+	BI 3 *BI	
15	-	BI 3 *BI	
16	Output 1 M	Relay, center contact	
17	Output 1 A	Relay, make contact	
18	Output 1 R	Relay, break contact	
19	Output 2 M	Relay, center contact	
20	Output 2 A	Relay, make contact	
21	Output 2 R	Relay, break contact	
22	Output 3 M	Relay, center contact	
23	Output 3 A	Relay, make contact	
24	Output 3 R	Relay, break contact	
25	-	BI 2 *BI	

*H = Housing
*S = Shield
*BI = Binary Inputs

25-pin subminiature plug connector (pin connector with screw locking)



Comments

- The primary signaling device, i.e. the horn, signal lamp or similar, is to be connected to the main contact of the signal module. The primary signaling device responds every time a detail contact is set, i.e. each time an alarm reports via the signal module.
- The detail contacts can be connected to any messaging devices (lights, buzzers or similar).
- One device can be connected to the watchdog alarm output which responds when the respective signal module no longer triggers. This occurs when the respective operator station fails.
- By default, the signal module can only be reset by either the control software (driver) or an external acknowledgment button.
  For both variants to be employed simultaneously, you must:
  - close the jumper X114 pins 1-2 and 3-4 on the ISA card (refer to description "Structure of the Switches and Jumpers with the ISA Bus"), which enables the acknowledgment via an external button

or

  - close the jumper X6 pins 3-4 on the PCI card (refer to description "Structure of the Switches and Jumpers with the PCI Bus"), which enables the acknowledgment via an external button

  The external button is then to be connected to the reset input and, parallel to this button, the reset output switched through corresponding wiring.

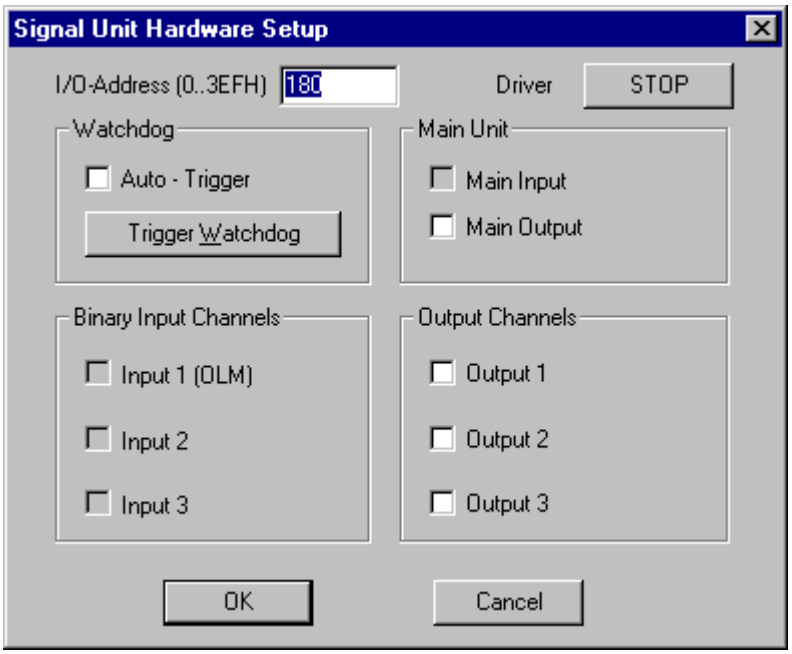
12.1.7 Testing the Signal Module

Procedure

In order to test the installed signal module plug-in card, proceed as follows:

- Access the Windows "Control Panel".
  It can be accessed via the Windows "Start" menu, "Settings" and then "Control Panel".

- Double-click on the icon to open the "Signal Module Hardware Setup" dialog.
- In the "Signal Module Hardware Setup" dialog, the signal module configuration can be tested.
- Structure of the "Signal Unit Hardware Setup" dialog for the ISA bus card.



- By activating the check-boxes "Output 1" to "Output 3" in the "Output Channels" field, the functions of the signal module and connected signaling devices can be tested immediately.

Dialog

The individual dialog fields are described in the following table.

Field	Description
I/O Address (=..3EFH)	For the ISA card, the I/O address must be specified (in the area from 0..3FFH). This address must correspond to the setting for S1 on the module. The signal module uses 16 successive I/O addresses beginning with the set base address. The address is always specified in the hexadecimal format. An address change will be entered in the registry after exiting the dialog via the "OK" button. The **default address** is **180 hexadecimal** . For the PCI card, this setting is not required.
Driver	This button starts or stops the driver. **Stop:** The driver is already running and can be stopped by pressing the button. **Start:** The driver is stopped. If the button status remains unchanged after pressing the button, a hardware conflict may be present.
Watchdog Auto - Trigger	If this check box is activated, the driver will retrigger the watchdog every second until WinCC starts the signal module channel-DLL in runtime mode. When the channel-DLL is started, the automatic triggering function of the driver is deactivated and the channel-DLL takes over control of the watchdog triggering. When WinCC is ended, the watchdog is no longer triggered and the automatic triggering is reactivated.
Trigger Watchdog	Press this button to trigger the watchdog once. (Test)
Main Unit	In the "Main Unit (Group Message)" field, on;y the "Main Output" check-box can be activated.
Main Output	When activating this check-box, the connected signaling device is activated at the output of the group signal.
Binary Input Channels	The status of the Binary inputs 1, 2 and 3 are shown here.
Output Channels	If an output is selected, the corresponding relay is controlled. While the system is running, the outputs are controlled by the permanently assigned tags.
OK	Use this button to exit the setup dialog. The I/O address and the automatic triggering settings will be entered in the registry.
Cancel	Use this button to exit the setup dialog. No changes will be made to the registry.