FB-HS…; FB-DP…; FB-PA/SC

PROFIBUS DP to PROFIBUS PA coupler



Data sheet
3378_en_B

© PHOENIX CONTACT 2015-07-14

1 Description

PROFIBUS coupler/link products transparently convert PROFIBUS DP to PROFIBUS PA, while providing detailed network diagnostics. Each configuration requires a head station for management, a PROFIBUS DP repeater, and a PROFIBUS PA module to interface with the PROFIBUS PA network. This modular approach allows configuration for specific applications. A preconfigured unit, the FB-HSB-DP/PA, provides a basic package suitable for most applications.

A bus inside the base of each module allows connection of ten PROFIBUS DP or PA modules that can connect up to four separate DP/PA networks. Network redundancy is also supported with the PROFIBUS DP repeater modules for the capacity of having up to ten redundant segments per head station.

By interfacing with the communication interface module, the primary element of the coupler/link, configuration and diagnostic information can be accessed via the integrated web server using an Ethernet connection.

Integrated network diagnostics can be accessed through the communication interface module and include physical layer measurements of DP/PA segments, a list of active devices, network configuration and oscilloscope functionality. There is also the ability to perform remote configuration and maintenance of connected field devices using FDT/DTM.

2 Features

- One communication interface module can drive up to ten individual PROFIBUS DP or PROFIBUS PA modules
- Powerful, embedded web server for configuration and access to network diagnostics
- PROFIBUS PA link can auto-detect any baud rate up to 12 Mbps transparently
- Built-in ProfiTrace® OE for monitoring network status
- System is completely hot swappable and expandable up to ten modules per coupler
- Manage and configure PROFIBUS field devices using FDT/DTM
- Up to ten modules of configurable network redundancy
- DIN rail mountable

Make sure you always use the latest documentation.
It can be downloaded at phoenixcontact.com/.

This data sheet is valid for all products listed on the following page:

3 Ordering data

Products

Description	Type	Order No.	Pcs./Pkt.
Coupler/link for converting PROFIBUS DP to PROFIBUS PA, diagnostic monitoring for one network, includes one FB-HSB, one FB-DP-RPTR, and one FB-PA/SC	FB-HSB-DP/PA	2316370	1
Communication interface module, without monitoring, includes base	FB-HSA	2316372	1
Communication interface module, diagnostic monitoring of up to four networks, includes base	FB-HSC	2316371	1
PROFIBUS DP repeater, single channel, includes base	FB-DP-RPTR	2316373	1
PROFIBUS DP SCOPE repeater, single channel, includes base	FB-DP-RPTR/SC	2316374	1
PROFIBUS PA coupler, single channel, includes base	FB-PA/SC	2316375	1

4 Technical data

4.1 FB-HS… (Order No. 2316371, 2316372)

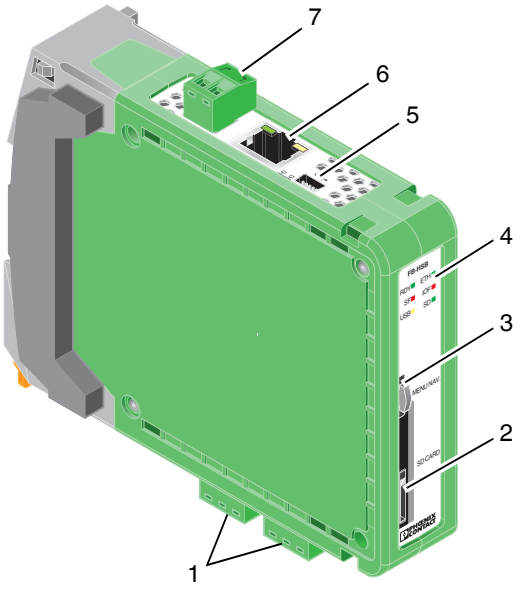
General data	
Weight	150 g
Ambient temperature range, operating	-20 … 60°C
Ambient temperature range, storage	-20 … 60°C
Dimensions (H x W x D)	105 x 30 x 130 mm

Power supply	
Supply range	10.8 … 26.4 V DC
Current consumption, typical	800 mA
Power consumption	20 W
Backplane current capacity, maximum	2.5 A
Reverse polarity protection	Yes
Redundancy	Yes
Connection (solid/stranded/AWG)	0.2 … 2.5 mm^2/0.2 … 2.5 mm^2/24 … 12 AWG

Ethernet	
Connector	RJ45
Cable length, max	100 m
Transmission speed	10/100 Mbps
Default IP address	192.168.1.254

Remote signaling	
Relay contact	300 MΩ
Voltage, maximum	24 V DC/170 V AC
Current, maximum	0.5 A

Structure



1 Power connectors
2 SD card slot
3 Menu navigation button
4 LEDs
5 USB programming port
6 RJ45 port
7 Remote alarm connector

Figure 1 FB-HSB structure

4.2 FB-DP-RPTR repeater (Order No. 2316373)

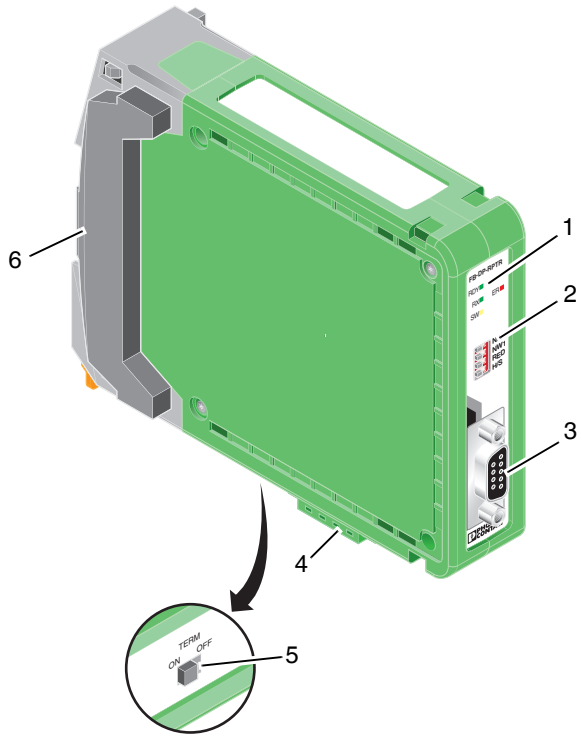
General data	
Weight	110 g
Ambient temperature range, operating	-20 … 60°C
Ambient temperature range, storage	-20 … 60°C
Dimensions (H x W x D)	105 x 30 x 130 mm

Power supply	
Source	Supplied through backplane from head station
Power consumption	6.5 W
Current consumption, nominal	160 mA
Current consumption, maximum	270 mA

Network	
Connection data (solid/stranded/AWG)	0.2 … 2.5 mm²/0.2 … 2.5 mm²/24 … 12 AWG
Number of networks per backplane	4
Number of modules per head station	10
Number of devices per channel	10
Connection type	Removable COMBICON
Transmission speed	9.6 kbps … 12 Mbps
Autobaud	Yes (<10 s detection)
Termination	Integrated and switchable (390/220/390 Ω)
Redundancy	Yes, maximum 10 cables activated by switch

PROFIBUS	
Supported protocol	DP-V0, DP-V1, DP-V2, FDL, MPI, FMS, PROFIsafe, PROFIdrive and other FDL-based protocol
Address	None
Data delay time (normal mode)	1.6 TBit @ 9.6 … 93.75 kbps 1.7 TBit @ 187.5 … 500 kbps 1.8 TBit @ 1.5 Mbps 2.0 TBit @ 3 Mbps 2.75 TBit @ 6 Mbps 3.75 TBit @ 12 Mbps
Data delay time (redundant mode)	11.6 TBit @ 9.6 … 93.75 kbps 11.7 TBit @ 187.5 … 500 kbps 11.8 TBit @ 1.5 Mbps 12.0 TBit @ 3 Mbps 12.75 TBit @ 6 Mbps 13.75 TBit @ 12 Mbps
Delay time jitter, maximum	0.25 TBit
Transmission length	1200 m @ 9.6 … 93.75 kbps 1000 m @ 187.5 kbps 400 m @ 500 kbps 200 m @ 1.5 Mbps 100 m @ 3 … 12 Mbps

Structure



1 LEDs
2 DIP switch
3 D-SUB 9 connector for PROFIBUS DP
4 4-pin connector for PROFIBUS DP
5 Termination switch
6 Backplane cover

Figure 2 FB-DP-RPTR structure

4.3 FB-DP-RPTR/SC repeater (Order No. 2316374)

General data	
Weight	120 g
Ambient temperature range, operating	-20 … 60°C
Ambient temperature range, storage	-20 … 60°C
Dimensions (H x W x D)	105 x 30 x 130 mm

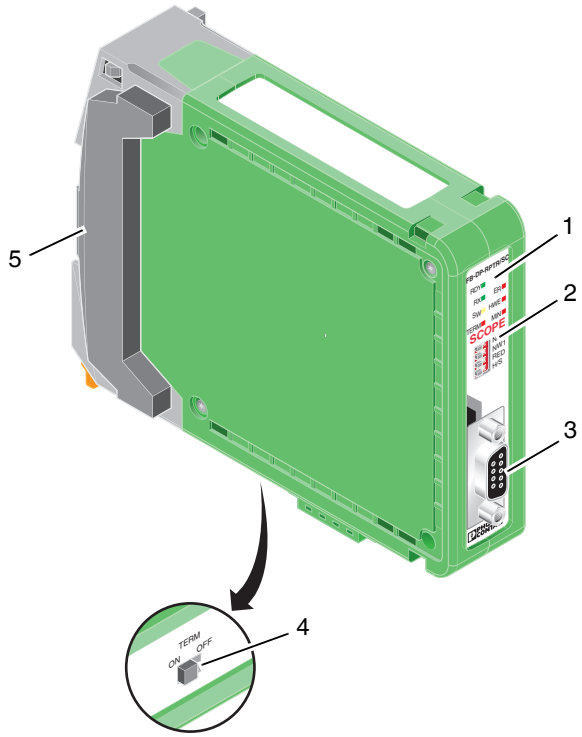
Power supply	
Power supply source	Supplied through backplane from head station
Power consumption	13.3 W
Current consumption, nominal	400 mA
Current consumption, maximum	555 mA

Network	
Connection data (solid/stranded/AWG)	0.2 … 2.5 mm²/0.2 … 2.5 mm²/24 … 12 AWG
Number of networks per backplane	4
Number of modules per head station	10
Number of devices per channel	31
Connection type	Removable COMBICON
Transmission speed	9.6 kbps … 12 Mbps
Autobaud	Yes (<10 s detection)
Termination	Integrated and switchable (390/220/390 Ω)
Redundancy	Yes, maximum 10 modules activated by switch

PROFIBUS	
Supported protocol	DP-V0, DP-V1, DP-V2, FDL, MPI, FMS, PROFIsafe, PROFIdrive and other FDL-based protocol
Address	None
Data delay time (normal mode)	1.6 TBit @ 9.6 … 93.75 kbps 1.7 TBit @ 187.5 … 500 kbps 1.8 TBit @ 1.5 Mbps 2.0 TBit @ 3 Mbps 2.75 TBit @ 6 Mbps 3.75 TBit @ 12 Mbps
Data delay time (redundant mode)	11.6 TBit @ 9.6 … 93.75 kbps 11.7 TBit @ 187.5 … 500 kbps 11.8 TBit @ 1.5 Mbps 12.0 TBit @ 3 Mbps 12.75 TBit @ 6 Mbps 13.75 TBit @ 12 Mbps
Delay time jitter, maximum	0.25 TBit
Transmission length	1200 m @ 9.6 … 93.75 kbps 1000 m @ 187.5 kbps 400 m @ 500 kbps 200 m @ 1.5 Mbps 100 m @ 3 … 12 Mbps

Oscilloscope function specifications	
AC PA voltage	4 MS/s
Resolution	7.5 mV
Range	-0.95 … +0.95 V
DC PA voltage	1 kS/s
Resolution	75 mV
Range	-38 … +38 V
DC PA current	1 kS/s
Resolution	1 mA
Range	0 … 1024 mA

Structure



1 LEDs
2 DIP switch
3 D-SUB 9 connector
4 Termination switch
5 Backplane cover

Figure 3 FB-DP-RPTR/SC structure

4.4 FB-PA/SC coupler (Order No. 2316375)

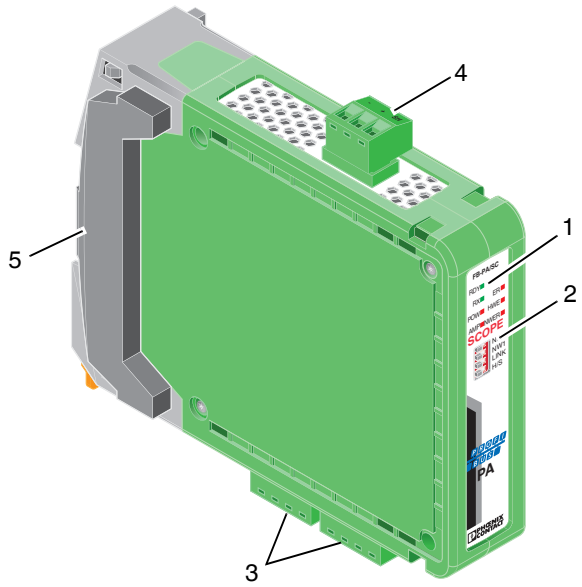
General data	
Weight	133 g
Ambient temperature range, operating	-20 … 60°C
Ambient temperature range, storage	-20 … 60°C
Dimensions (H x W x D)	105 x 30 x 130 mm

Power supply	
Supply range	Supplied through bus connector from head station
Power supply range, simplex power	10.8 … 26.4 V DC
Power consumption	13.3 W
Current consumption, typical	350 mA
Current consumption, maximum	555 mA

PROFIBUS PA network	
Trunk voltage	10…27 V
Trunk current	500 mA
Trunk current consumption	10 mA
Number of devices	32
Transmission speed	31.25 kbps
Transmission length	1900 m
Connection data (Solid/stranded/AWG)	0.2 … 2.5 mm^2/0.2 … 2.5 mm^2/24 … 12 AWG
Connection type	Removable COMBICON
Termination	Automatic (On in “Link” and “Coupler” modes)

Oscilloscope function specifications	
AC PA voltage	4 MS/s
Resolution	7.5 mV
Range	-0.95 … +0.95 V
DC PA voltage	1 kS/s
Resolution	75 mV
Range	-38 … +38 V
DC PA current	1 kS/s
Resolution	1 mA
Range	0 … 1024 mA

Structure



1 LEDs
2 DIP switch
3 PROFIBUS PA connectors
4 Simplex power connector
5 Backplane cover

Figure 4 FB-PA/SC structure

5 Installation

5.1 Mounting

A base incorporates an internal bus (backplane) that transfers power to other modules through the base and incorporates communication between the modules and head station.

The 2316370 is shipped as an assembly. If separated or the different modules are installed separately, the FB-HS… must be installed on the left side and additional modules installed on the right.

1. Remove the protective film over the backplane on the left side of any modules except the FB-HS… modules. Remove the backplane cover on the right side of all the modules except the last module on the right.

NOTE:

The backplane at each end of the module stack must be covered by a backplane cover.

2. Hook the assembly over the top edge of the DIN rail.
3. Rotate the assembly until it snaps over the lower edge of the DIN rail.

For removal, use a screwdriver to release the latch, rotate the module and lift off the DIN rail.

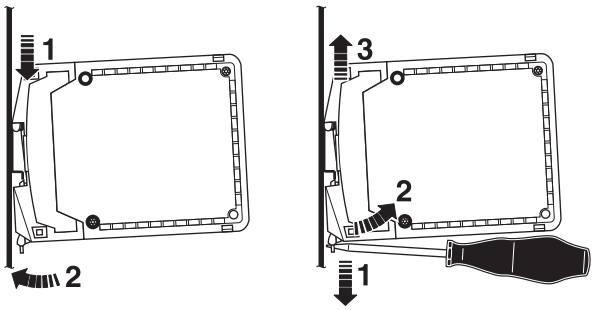


Figure 5 Base installation

4. Repeat steps 1 and 2 for any additional modules.

5. Slide the additional modules together, making sure they snap into place.

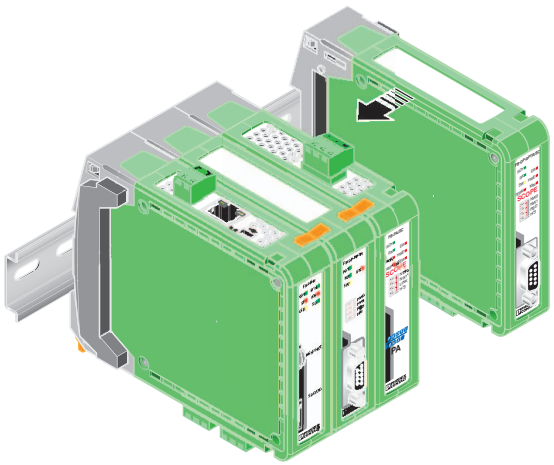


Figure 6 Additional modules

6. Snap the butterfly clips (1) into the slots, top and bottom, to lock the modules together.

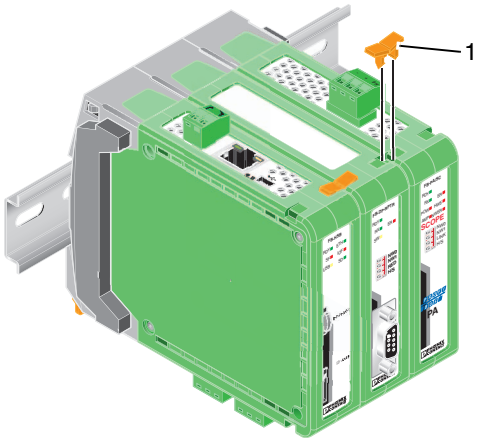


Figure 7 Butterfly clip

5.2 Power

Power is connected to the head station. It is then supplied via the bus to the installed FB-DP-RPTR/SC and FB-PA/SC modules.

+	24 V DC
-	0 V DC
SH	Wire shield

5.3 Connections

Network connections are via removable COMBICON terminals. The FB-PA/SC communicates along PROFIBUS PA networks. The FB-DP-RPTR and FB-DP-RPTR/SC communicate on PROFIBUS DP networks. Through the use of the FB-DP-RPTR, FB-DP-RPTR/SC and FB-PA/SC modules, up to a maximum of four PROFIBUS networks can be monitored. The FB-HSC can monitor up to four PROFIBUS networks.

The FB-HSA does not provide monitoring capability.

6 Configuration

Basic configuration can be accomplished using the DIP switches on the different modules. Advanced configuration is through an internal web server and requires a laptop PC connected to the FB-HS… module through the RJ45 port.

6.1 Web server access

To access the internal web server and change the default IP address:

1. Connect an Ethernet cable between the RJ45 port of the FB-HS… and a PC.
2. Set the IP address of the PC to the same subnet as the FB-HS… (192.168.1.xxx).
3. Open a web browser on the PC and enter **192.168.1.254** in the “Address” field. The web server of the FB-HS… appears.
4. Click **IP config** on the left-side menu.
5. From the resulting dialog box, click the “Save” button to save the changes. The web page reloads with the updated web address.

6.2 DIP switch settings

Web server configuration overrides DIP switch settings when the H/S DIP switch is in the on position (right).

DIP switches are referenced facing the product as either left or right.

FB-DP-RPTR and FB-DP-RPTR/SC

The FB-DP-RPTR and FB-DP-RPTR/SC each have a 4-pos. DIP switch.



Figure 8 FB-DP-RPTR and FB-DP-RPTR/SC DIP switches

The first two DIP positions select the network number of the connected network. One of four PROFIBUS networks can be connected to the FB-DP-RPTR or FB-DP-RPTR/SC.

Switch position		Network
NW0	NW1	
Left	Left	1
Right	Left	2
Left	Right	3
Right	Right	4

The third DIP position, labeled RED, configures the redundancy of the network. To enable PROFIBUS DP redundancy, position the switch to the right. To turn off PROFIBUS DP redundancy, position the switch to the left.

The fourth DIP position configures the module to use either the hardware (DIP switch) or software settings. For hardware settings, position the switch to the left. For software settings, position the switch to the right.

FB-PA/SC

The FB-PA/SC has a 4-pos. DIP switch.

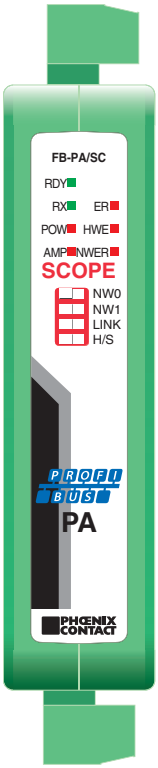


Figure 9 FB-PA/SC DIP switches

The first two DIP positions select the network number of the connected network. One of four PROFIBUS DP/PA networks can be connected to the FB-PA/SC.

Switch position		Network
NW0	**NW1**	
Left	Left	1
Right	Left	2
Left	Right	3
Right	Right	4

The third DIP position, labeled LINK, configures the module to operate as a PROFIBUS DP/PA link or PROFIBUS DP/PA coupler.

– To configure the module as a link, position the switch to the right. As a link, the DP to PA conversion automatically adjusts to any PROFIBUS DP transfer rate, from 9.6 kbps to 12 Mbps.
– To configure the module as a coupler, position the switch to the left. As a coupler, the PROFIBUS DP transfer rate must be set to 45.45 kbps for successful PROFIBUS DP to PA conversion.

When configured as a link/coupler, the power connector on top of the FB-PA/SC is enabled for accepting a simplex power source directly to the module. This allows both power and communication to occur on the PROFIBUS PA trunk output. The backplane continues to be the communication link to the head station and other modules.

The fourth DIP position configures the module to use either the hardware (DIP switch) or software settings. For hardware settings, position the switch to the left. For software settings, position the switch to the right.

7 Maintenance

7.1 LEDs

The following describes LED signaling during normal operation. Additional signaling may occur during special procedures, such as a firmware update.

FB-HS…

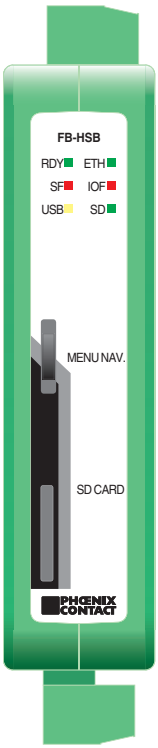


Figure 10 FB-HSB

LED	Status	Indication
RDY	Solid green	Normal operation
	Flashing green	Module is booting
	Off	No power
ETH	Solid green	Ethernet link is established
	Flashing green	DHCP configuration is pending
	Off	No Ethernet link
SF	Solid red	Internal component failure or firmware error
	Flashing slowly red	Clock-chip error
	Flashing fast red	Backplane voltage too low <5.5 V DC Backplane current draw too high >2.5 A
	Off	Normal operation
IOF	Solid red	High-speed module in slot 11-32 More than 32 modules found Module not identified
	Off	Normal operation
USB	Solid yellow	USB cable connection
	Off	No USB connection
SD	Solid green	Card installed with no activity
	Flashing yellow	Card inserted and data access occurring
	Off	No card installed

FB-DP-RPTR and FB-DP-RPTR/SC

(see Figure 8)

LED	Status	Indication
RDY	Solid green	Normal operation
	Flashing green	Module is being configured by head station module
	Off	Module has not been configured yet No power
RX	Solid green	Data is being transferred on the channel
	Flashing green	Data is being transferred on the channel
	Off	No data transfer is occurring
ER	Solid red	The channel has not determined the transfer rate There is a problem with the wiring
	Flashing red	There is a problem with the wiring
	Off	Normal operation
SW	Solid yellow	Internal termination is active
	Off	Internal termination is not active

FB-DP-RPTR/SC

(see Figure 8)

LED	Status	Indication
MIN	Solid red	PROFIBUS signal is too low <2.5 V
	Off	Normal operation
TERM	Solid red	Idle voltage is too low <1 V
	Off	Normal operation
HWE	Solid red	Internal error
	Off	Normal operation

FB-PA/SC

(see Figure 9)

LED	Status	Indication
RDY	Solid green	Normal operation
	Flashing green	Module is booting
	Off	No power
RX	Solid green	Data is being transferred on the channel
	Flashing green	Data is being transferred on the channel
	Off	No data transfer is occurring
ER	Solid red	Corrupt data packets have been received
	Off	Normal operation
POW	Solid red	Limit settings have been exceeded[1]
	Off	Normal operation
HWE	Solid red	Internal error
	Off	Normal operation
AMP	Solid red	PROFIBUS signal is too low <2.5 V
	Off	Normal operation
NWER	Solid red	Limit settings within the oscilloscope function have been exceeded[1]
	Off	Normal operation

[1] Monitored functions and limits are determined by the user within the web server.

7.2 Menu navigation

FB-HS… modules include access to a special configuration menu through the “Menu Nav” button (see Figure 1 on page 3). This allows the user to be able to perform some basic procedures that simplify setup. These actions can all be performed using the menu button on the front of the FB-HS... module without the need to connect a PC and access the web server.

Use the following sequence for module configuration:

Function		Menu button action to access mode	LED acknowledgment	To invoke mode
Normal operation			RDY LED is solid	
Special menu		Hold up for 5 seconds	All LEDs flash	
	Read settings from SD card	Tap down one time	RDY LED flashes	Hold up for 5 seconds
	Save settings from SD card	Tap down two times	ETH LED flashes	Hold up for 5 seconds
	Clear password	Tap down three times	SF LED flashes	Hold up for 5 seconds
	Reset to factory defaults	Tap down four times	IOF LED flashes	Hold up for 5 seconds
	Warm start	Tap down five times	USB LED flashes	Hold up for 5 seconds
Process completion			All LEDs cycle through	

The time to complete each function varies, based on the function. The LEDs will flash randomly while the process is running.

7.3 SD card

FB-HS… modules include an SD card slot. This slot accepts SD and SDHC cards. A configuration can be loaded on the SD card and transferred to other FB-HS… modules.

To remove the SD card, press the card in slightly and then release it. The card should pop out sufficiently to grab. Be sure to pull it straight out until clear.

To install the SD card, align the card with the slot, making sure it is oriented properly, with the contacts going in first and the notch up. Gently press it in until it clicks and is properly seated.