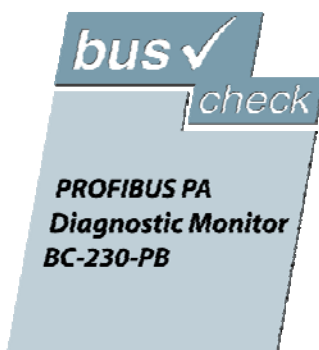


Manual

PROFIBUS PA Diagnostic Monitor BC-230-PB



Revision 1.2
8/10/2011

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1 Introduction

The BC-230-PB PROFIBUS PA Diagnostic Monitor (hereinafter referred to also as PA Monitor) is an efficient tool to test bus physics and signals of PROFIBUS PA segments. It allows both engineering and service technicians to determine the health of fieldbus segments. The PA monitor supports troubleshooting without interfering with segment operation.

Summary of Features

The BC-230-PB includes the following features:

- Tests the segment automatically and gives an OK/BAD indication without operator intervention
- Measures segment DC voltage
- Detects short circuits between the segment cable's wires and shield
- Indicates number of detected retransmissions to devices
- Measures noise in three bands: below, at and above fieldbus frequencies
- Shows when a device is added to or dropped from the segment during operation
- Supports firmware updates via a USB port
- Displays the number of devices on the segment
- Indicates the address of the device with the lowest detected signal level
- Displays device addresses (in decimal and hexadecimal) signal levels and whether each device is a master or slave
- Supports the transfer of data collected to a PC via a USB port
- Creates printable reports indicating segment condition
- Usable in hazardous areas

2 Software Installation

2.1 Before Starting

Assistant software included with the PA Monitor supports the USB features of the PA Monitor.

The Assistant software is on the **FBT-6 Software and Documents** CD included with the PA Monitor shipment.

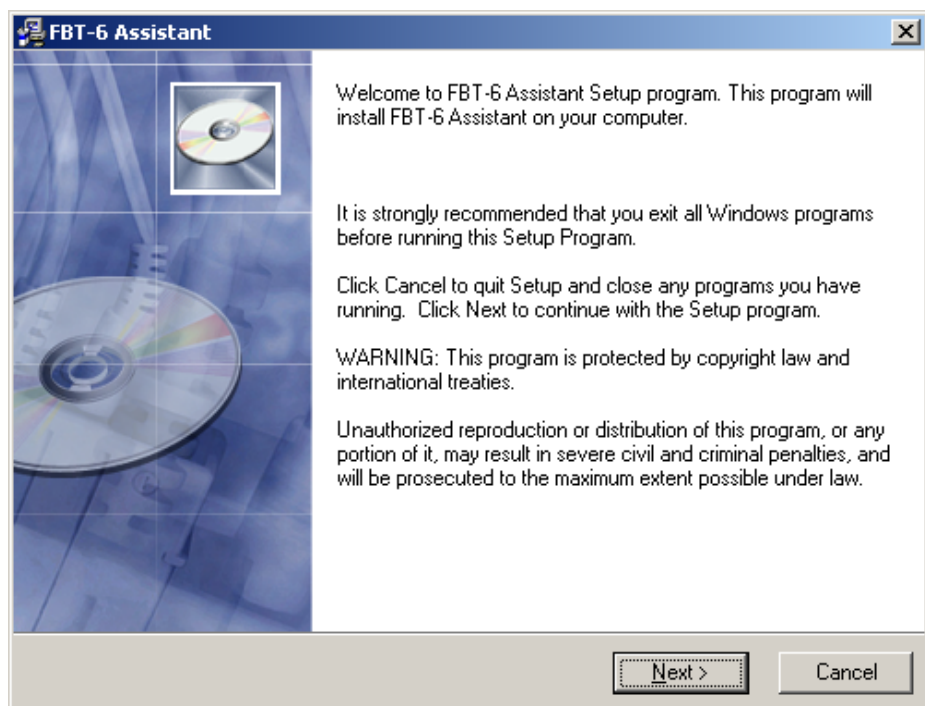
You must be logged in as an administrator to install the software and driver. **Install the Assistant Software before attaching the PA Monitor to the computer.** The Assistant application should be installed first, followed by the USB driver.

Operating System	Page for driver installation instructions
Windows 7 (32- and 64-bit)	10
Windows Vista (64-bit)	10
Windows Vista (32-bit)	11
Windows XP	13

2.2 Assistant Installation

The PA Monitor should not be attached yet. Close all Windows programs. You must be logged in as an administrator to install the software and driver.

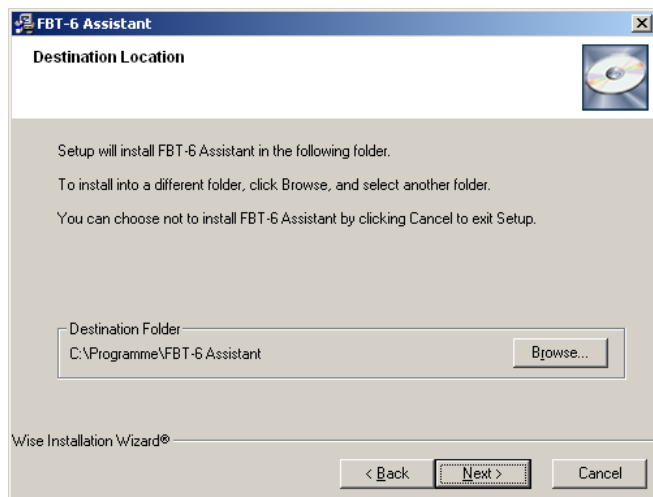
Insert the **FBT-6 Software and Documents** CD and the setup program will run automatically. The following screen will be displayed:



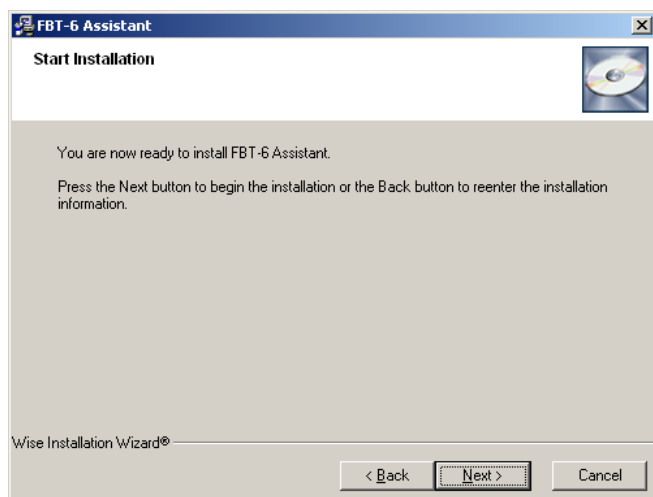
Press the **Next** button to continue.



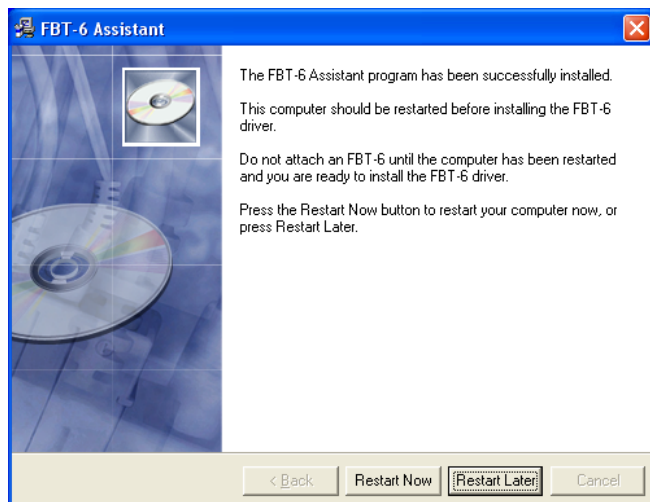
Microsoft Excel is required to use the Transfer Reports function. Press the **Next** button to continue.



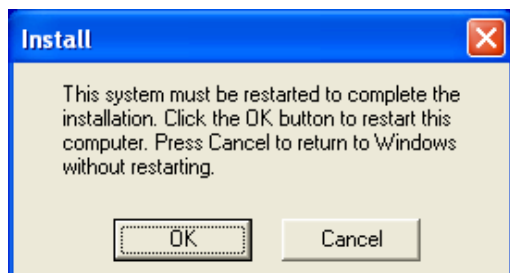
Choose an installation location or use the default location displayed and press the **Next** button to continue.



Press the **Next** button to continue.



Press **Restart Now**.



Press **OK**. Your computer will restart.

Turn to the driver installation instructions appropriate for your PC as listed below:

- Windows 7 (32- and 64-bit) & 64-bit Vista Driver Installation on page [10](#)
- Windows VISTA (32-bit) driver installation instructions on page [11](#)
- Windows XP driver installation instructions on page [13](#)

2.3 Windows 7 (32- and 64-bit) & 64-bit Vista Driver Installation

After installing the FBT-6 Assistant application, the USB driver needs to be installed. Attach the Monitor to a USB port on the PC with the provided cable.

Note: Connect the Monitor directly to a USB port on the PC. The Monitor does not work with all USB hubs and laptop docking stations.

The “Installing device driver software” text bubble appears followed by the “FBT-6 Device driver software installed successfully” text bubble.



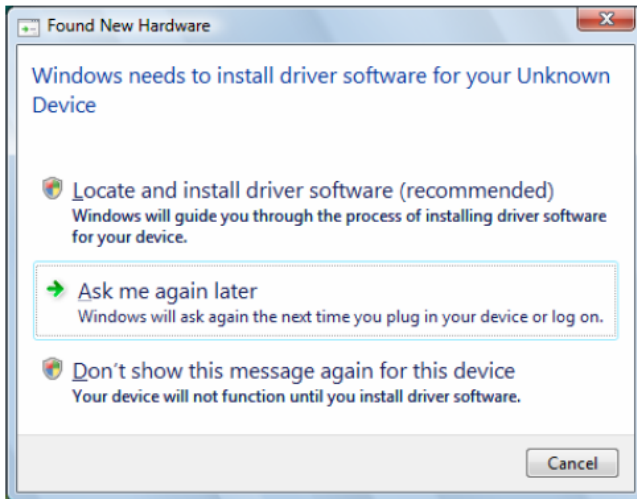
The driver installation is now complete and the FBT-6 Assistant program is ready for use.

2.4 Windows Vista (32-bit) Driver Installation

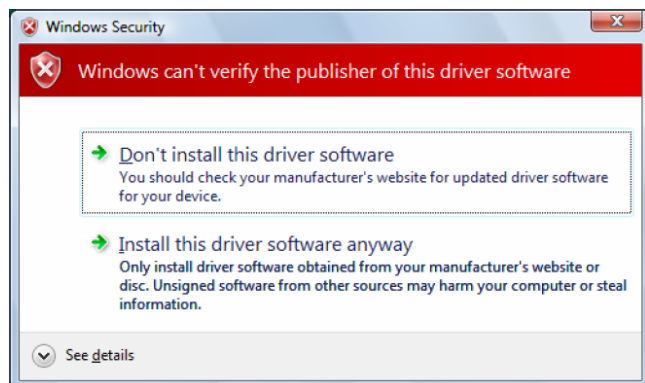
After installing the Assistant application, the USB driver needs to be installed. Attach the PA Monitor to a USB port on the PC with the provided cable.

Note: Connect the PA Monitor directly to a USB port on the PC. The PA Monitor does not work with all USB hubs and laptop docking stations.

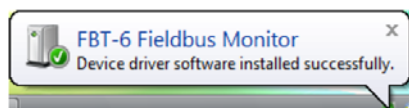
The **Found New Hardware** window appears:



Select **Locate and install driver software**.



Press **Install this driver software anyway**.



This text bubble shows that the driver is successfully installed.

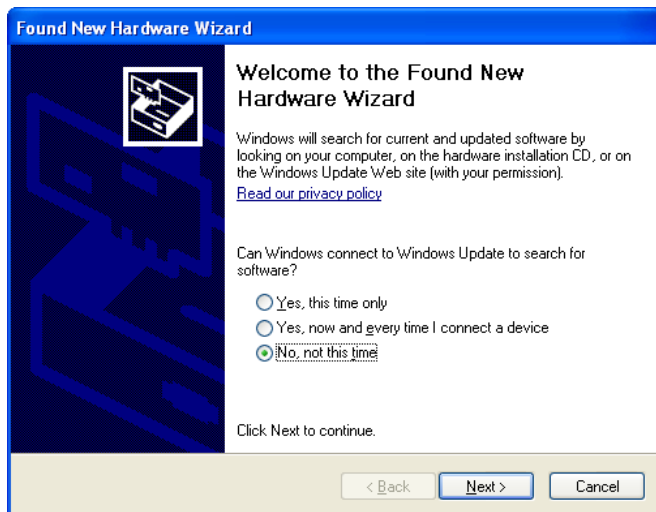
The Windows VISTA driver installation is now complete and the FBT-6 Assistant program is ready for use.

2.5 Windows XP Driver Installation

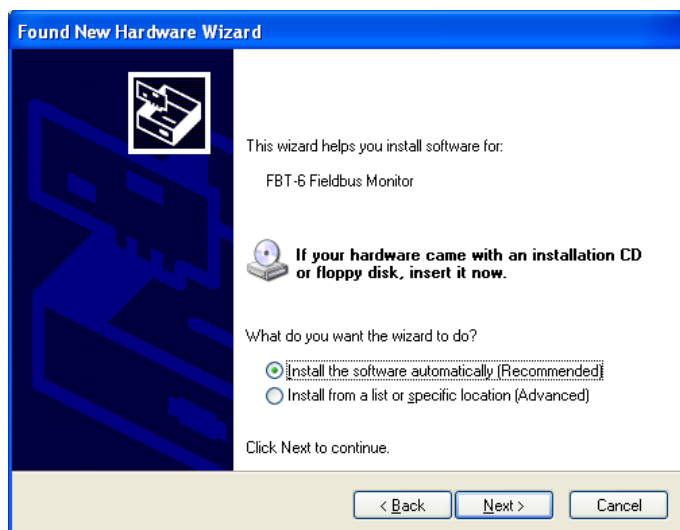
After installing the Assistant application, the USB driver needs to be installed. Attach the PA Monitor to a USB port on the PC with the provided cable.

Note: Connect the PA Monitor directly to a USB port on the PC. The PA Monitor does not work with all USB hubs and laptop docking stations.

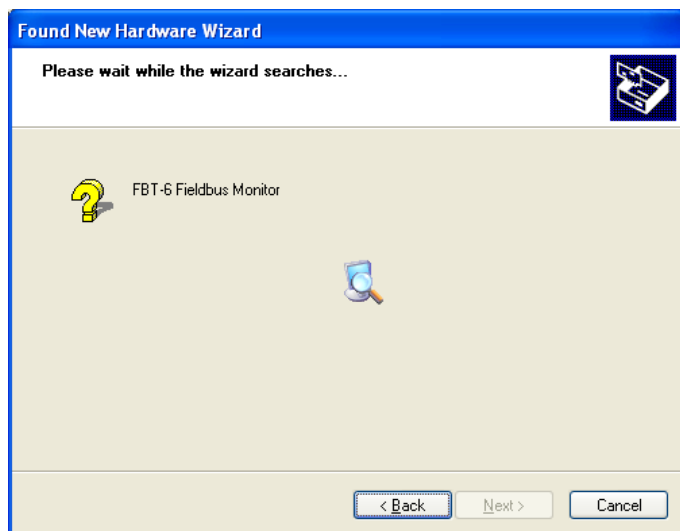
The **Found New Hardware Wizard** window appears:



Select **No, not this time** and press the **Next** button to continue.



Select the first option, **Install the software automatically (Recommended)**, and press the **Next** button to continue.



The computer searches for the driver.



Press **Continue Anyway**.



This dialog shows that the driver has been installed. Press the **Finish** button to exit. The Windows XP driver installation is now complete and the Assistant program is ready for use.

Important note: The driver must be installed on each USB port that the PA Monitor will be connected to on the PC. The Found New Hardware Wizard will run for each new port that the PA Monitor is plugged into. Follow these driver installation instructions again for each additional USB port.

2.6 Uninstalling the Assistant

To uninstall the Assistant software use the Windows **Add or Remove Programs** feature in the Control Panel. In Vista use the **Uninstall a program** feature in the Control Panel.

After the uninstall is complete, restart the computer.

3 Operation



WARNING: Do not connect the PA Monitor to a fieldbus and a PC at the same time. This could damage the fieldbus segment and the PA Monitor.



Use the USB port only in safe (non-hazardous) areas.



The PA Monitor draws 10mA of current from the fieldbus it is connected to. Verify adequate current is available before connecting the PA Monitor or bus communications may be impacted.

Install the Assistant software by following the section **Software Installation** on page [5](#) before attempting to connect the PA Monitor to the USB port.

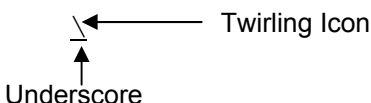
Note: Connect the PA Monitor directly to a USB port on the PC. The PA Monitor does not work with all USB hubs and laptop docking stations.

The PA Monitor is powered by the segment it is connected to and turns on automatically. The firmware version in the PA Monitor is displayed for 4 seconds upon powering up:

```
RELCOM FBT-6-PA  
FW VER XX.XX
```

The PA Monitor begins measuring segment parameters automatically then. A bar (icon) twirls on the right side of the display's second line while segment signals are present. If a bad frame is detected since the last display update then an underscore is displayed beneath the twirling icon.

VOLTAGE
22.5V OK



The diagram shows a display with the text "VOLTAGE" and "22.5V OK" on the left. To the right, there is a small icon consisting of a horizontal line with a diagonal line crossing it from the bottom-left to the top-right, resembling a stylized 'V' or a twirling bar. An arrow points from the text "Twirling Icon" to this icon. Another arrow points from the text "Underscore" to a small horizontal line segment located directly beneath the twirling icon.

Two buttons on the front of the PA Monitor control its operation. The buttons are labeled FUNC (for FUNCTION) and SEL (for SELECT). Press the FUNCTION button to cycle through the available PA Monitor functions.

Some functions have multiple sub-screens of data available for display. Sub-screens available for each function are cycled through by pressing the SELECT button.

Most functions are reset by holding down the SELECT button for 2 seconds. After holding down the SELECT button for 2 seconds, the data collected for that function is erased giving that function a "fresh start".

Holding down the SELECT and FUNCTION buttons at the same time for 2 seconds causes the PA Monitor to reset. The data collected by all PA Monitor functions is erased (unless saved using the SAVE REPORT feature). The reset is the same as if the PA Monitor was disconnected then re-connected to the segment.

Short button presses (less than 2 seconds) are acted upon when the button is released, not when depressed.

A block diagram of how to navigate through the PA Monitor functions can be found on page [50](#).

3.1 Segment Check Mode

When first attached to a segment, the PA Monitor enters the automatic Segment Check Mode and shows:

```
SEGMENT CHECK  
IN PROGRESS
```

The PA Monitor proceeds to automatically collect data and evaluates it to determine the health of the segment. Press either button to exit this mode and enter the Manual Mode at any time.

In Segment Check Mode, the PA Monitor collects the same data that it collects in Manual Mode. As the data is collected, the PA Monitor evaluates the data to determine if it is out of specification. When the PA Monitor has collected enough data to determine that all of the measured parameters are in specification, the display shows:

```
ALL MEASUREMENTS  
OK
```

In this state the PA Monitor continues taking measurements and displays the OK message.

If at any point in time the PA Monitor finds a parameter out of specification, it will jump into the Manual Mode and display the screen for the function associated with the first detected out of specification parameter. For example, if a (+) to Shield Short condition is detected, the PA Monitor enters the Shield Short function in Manual Mode and displays:

```
(+) TO SHIELD  
SHORT
```

The PA Monitor then operates in Manual Mode as described below from that point on.

Parameters are evaluated against limits as OK or BAD.

The limits can be set using the Set Alert Limits feature of the Assistant software. See the section **Set Alert Limits function** on page [39](#) for details.

Table 1 lists the parameters checked in Segment Check Mode and the default limit values.

Voltage is $\geq 9\text{VDC}$
Peak noise is $\leq 75\text{mV}$ in the fieldbus band
Peak noise is $\leq 150\text{mV}$ in the low and high frequency bands
Average noise is $\leq 75\text{mV}$ in the fieldbus band
Average noise is $\leq 150\text{mV}$ in the low and high frequency bands
No shield short exists
No retransmits
No device drops or adds
At least one device is detected on the segment
The lowest device signal level is $\geq 150\text{mV}$
The lowest device signal level is $\leq 1200\text{mV}$

Table 1: Parameters Checked in Segment Check Mode (Default Limit Values Shown)

3.2 Manual Mode Functions

Manual Mode is entered when the PA Monitor detects the first out of specification parameter or either button is pushed. The functions available are described below in the order in which they appear.

3.2.1 Voltage

The DC voltage of the segment is displayed.

```
VOLTAGE  
22.5V OK
```

If the DC voltage is less than the allowed limit (9V by default), BAD is displayed instead of OK.

```
VOLTAGE  
8.5V BAD
```

The DC voltage limit is configurable using the Set Alert Limits function in the Assistant software. See **Set Alert Limits function** on page [39](#) for details.

3.2.2 Peak Noise

Peak noise is measured in three bands: frequencies in the fieldbus signaling band (Fieldbus Frequency, FF), frequencies below fieldbus signaling band (Low Frequency, LF), and frequencies above fieldbus signaling band (High Frequency, HF). The value displayed is the highest noise level measured since the last reset. The particular frequency band displayed is selected by pushing the SELECT button. The FF band is shown first followed by the LF then HF bands.

```
PK FF NOISE
  64 mV OK
```

If the FF band noise level is above the allowed limit (75mV by default), the display will say BAD where it normally says OK.

```
PK FF NOISE
  99 mV BAD
```

If the LF or HF band noise level is above the allowed limit (150mV by default), the display will say BAD where it normally says OK.

```
PK LF NOISE
 199 mV BAD
```

The FF, LF, and HF noise level limits are configurable using the Set Alert Limits function in the Assistant software. See **Set Alert Limits function** on page [39](#) for details.

Holding down the SELECT button for 2 seconds resets the selected peak noise value.

The approximate frequency bands monitored are listed below:

Low Frequency Band	50 Hz to 4 kHz
Fieldbus Frequency Band	9 kHz to 40 kHz
High Frequency Band	90 kHz to 350 kHz

3.2.3 Average Noise

Average noise is measured in three bands: frequencies in the fieldbus signaling band (Fieldbus Frequency, FF), frequencies below fieldbus signaling band (Low Frequency, LF), and frequencies above fieldbus signaling band (High Frequency, HF). The value displayed is the average of the last 100 noise measurements. The particular frequency band displayed is selected by pushing the SELECT button. The FF band is shown first followed by the LF then HF bands.

```
AVG FF NOISE
68mV OK
```

If the FF band noise level is above the allowed limit (75mV by default), the display will say BAD where it normally says OK.

```
AVG FF NOISE
1000mV BAD
```

If the LF or HF band noise level is above the allowed limit (150mV by default), the display will say BAD where it normally says OK.

```
AVG HF NOISE
200mV BAD
```

The FF, LF, and HF noise level limits are configurable using the Set Alert Limits function in the Assistant software. See **Set Alert Limits function** on page [39](#) for details.

Holding down the SELECT button for 2 seconds resets the selected average noise value.

The approximate frequency bands monitored are listed below.

Low Frequency Band	50 Hz to 4 kHz
Fieldbus Frequency Band	9 kHz to 40 kHz
High Frequency Band	90 kHz to 350 kHz

3.2.4 Shield Short

If the segment wiring is good, the PA Monitor shows

WIRING OK

If one of the wires is shorted to the cable shield, the PA Monitor indicates a (+) or (-) to shield short as applicable.

(+) TO SHIELD
SHORT BAD

The PA Monitor will always detect shorts of 4 K Ω or less. The amount of resistance the PA Monitor reports as a short varies with temperature and DC bus voltage and could be as high as 36 K Ω .

Shorts come and go in some cases, such as with the presence of moisture or vibration. If the PA Monitor detected a short in the past then the short went away it indicates the short is intermittent.

(+) TO SHIELD
INTERMITTENT

Holding the SELECT button down for 2 seconds resets the Shield Short function. Resetting the Shield Short function clears intermittent short indications.

3.2.5 Retransmit

If a device does not respond to a request or token frame, or if the Master does not hear the device's response, the Master will query the device again. The PA Monitor displays the address of the device most recently requiring such a retransmission.

```
RETRANSMIT  
NONE OK
```

Or

```
RETRANSMITS=3  
DEVICE 19(13H)
```

Press the SELECT button to cycle through a display for each device. The number of retransmissions (up to 250) detected since the PA Monitor was connected is displayed. If more than 250 retransmissions are detected for a device, 250+ is displayed.

```
RETRANSMITS=250+  
DEVICE 19(13H)
```

Holding down the SELECT button for 2 seconds resets the number of retransmits for all devices to 0.

3.2.6 Add-Drop

If a new device is added to the segment, the PA Monitor detects it transmitting frames and will display its address and signal level. A device is considered dropped if a frame is retransmitted to the device. A Master device that is sent an FDL Status Request frame is also considered dropped. When a device is dropped by the PA Monitor and it will display the address and last known signal level of the dropped device.

ADD or DROP
NONE

If a device drops from the segment the PA Monitor shows

DROP 17 (11H)
690mV

If a device is added to the segment, the PA Monitor shows

ADD 19 (13H)
700mV

Holding down the SELECT button for 2 seconds resets the Add-Drop function. Resetting the Add-Drop function also resets the Device and Device Count functions.

3.2.7 Device

For each device, the address (decimal and hexadecimal), signal level, and whether or not it is a Master or Slave is displayed in turn by pushing the SELECT button. If the signal level is at or above the minimum limit OK is displayed. The first device shown is a Master. "M" is displayed after the signal level to indicate that the device shown is a Master. "S" is shown for slaves.

```
DEVICE    16  (10H)
1000mV    M   OK
```

If the device was added after connecting the PA Monitor , a + symbol displays after the signal level. If the device was removed after connecting the PA Monitor, a - symbol is displayed after the last known signal level.

```
DEVICE    41  (29H)
854mV    + S   OK
```

The PA Monitor is more sensitive to device add and drop activity than control systems. The PA Monitor may momentarily indicate a device dropped from the fieldbus then quickly added back on while the control system shows no change.

If the displayed device is dropped, has a signal level less than the allowed limit (150mV by default) or has a signal level more than the allowed limit (1200mV) the display will say BAD where it normally says OK.

```
DEVICE    41  (29H)
140mV     S    BAD
```

The minimum allowed signal level limit is configurable using the Set Alert Limits function in the Assistant software. See **Set Alert Limits function** on page [39](#) or details.

Holding down the SELECT button for 2 seconds will clear the “added” status of any devices added after connecting the PA Monitor (or since the last reset). Holding down the SELECT button for 2 seconds also deletes dropped devices from the PA Monitor’s internal device list. Resetting the Device function also resets the Add-Drop and Device Count functions.

3.2.8 Low

The PA Monitor displays the lowest (weakest) detected device signal level since the PA Monitor was connected and the address (decimal and hex) of the associated device. If the lowest signal level is at or above the minimum limit OK is displayed.

```
LOW= 580mV OK  
ADDR= 41 (29H)
```

If the lowest signal level is less than the allowed limit (150mV by default) or the lowest signal level is greater than the allowed limit (1200mV by default) the display will say BAD where OK is normally displayed.

```
LOW= 149mV BAD  
ADDR= 41 (29H)
```

The minimum and maximum allowed signal levels limits are configurable using the Set Alert Limits function in the Assistant software. See **Set Alert Limits function** on page [39](#) for details.

Holding down the SELECT button for 2 seconds resets the low signal level value.

3.2.9 Device Count

The PA Monitor displays the number of active devices on the segment. It also displays the number of devices present when the PA Monitor was first attached as the Initial Count.

```
DEVICE COUNT 12  
INITIAL CNT 12
```

If a device does not respond to a frame the PA Monitor considers the device to be dropped (no longer active). The count is reduced by one. If a new device is added, the device count is increased by one.

```
DEVICE COUNT 11  
INITIAL CNT 12
```

The PA Monitor is more sensitive to device add and drop activity than control systems. The PA Monitor may momentarily indicate a device dropped from the fieldbus then quickly added back on while the control system showed no change.

To make it easier to detect the adding or dropping of a device, the starting device count can be reset by holding down the SELECT button for 2 seconds. Resetting the Device Count function also resets the Add-Drop and Device functions.

3.2.10 Save Report

The PA Monitor can save the data it collected as a report in one of eight numbered report locations (internal memory blocks).

The display repeatedly cycles through three screens with each screen displayed for about three seconds. The first screen indicates the currently selected report name, report location number and the status of the report location: used or empty. The second and third screens describe how the SELECT button is used to save a report.

```
Report 1  
LOCATION 1 EMPTY
```

```
HOLD DOWN SEL TO  
SAVE REPORT
```

```
PUSH SEL TO PICK  
NEXT LOCATION
```

The first screen displays LOCATION # EMPTY (# is the memory location number, 1 to 8) if no report is saved in the selected report location. The screen displays LOCATION # USED if a report is already saved in the selected report location.

To save a report, first choose one of the eight report locations to store the report in. The PA Monitor starts at the first empty location. Momentarily pressing the SELECT button advances to the next report location. In the example below, Report 8 is the name of the report stored in location 8.

```
Report 8  
LOCATION 8 USED
```

When the last report location, location 8, is displayed and the SELECT button is pressed, the display rolls back to the first report location, location 1.

To save a report in the selected report location, hold down the SELECT button for 2 seconds. The display shows, SAVING REPORT, while the report is saving .

```
Report 5  
SAVING REPORT
```

When the report is saved, the display shows REPORT SAVED.

```
Report 5  
REPORT SAVED
```

The next time this report location screen is displayed, the report status will indicate USED.

```
Report 5  
LOCATION 5 USED
```

When a USED report location is chosen and the SELECT button is held down for 2 seconds the report is overwritten with a new report.

Use the Set Report Names feature in the Assistant to change the report names. See the section **Set Report Names function** on page [37](#) for details.

3.3 USB Port and Associated Features

The USB port on the PA Monitor can be connected to a PC. Using the Assistant program installed on a PC, reports collected on the PA Monitor can be transferred to an Excel file on the PC and the firmware in the PA Monitor can be updated.

Install the Assistant software by following the instructions **Software Installation** on page 5 before attempting to connect the PA Monitor to the USB port.

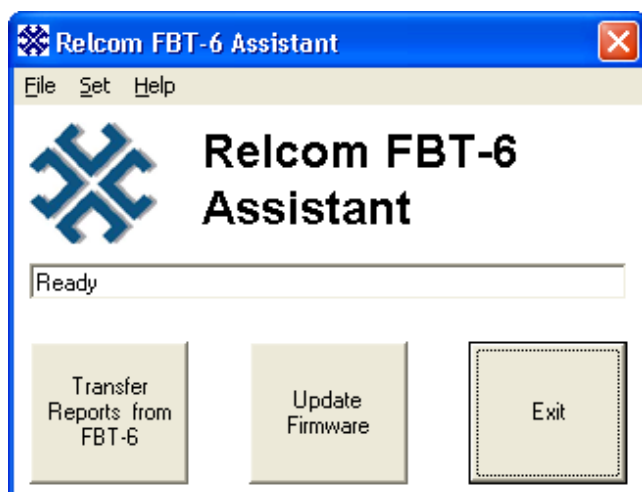
Connect the PA Monitor directly to a USB port on the PC. The PA Monitor does not work with all USB hubs and laptop docking stations.



WARNING: Do not connect the PA Monitor to a fieldbus and a PC at the same time. This could damage the fieldbus segment and the PA Monitor. Only use the USB port in safe (non-hazardous) locations.

3.3.1 Starting the Assistant Software

Connect the PA Monitor to the USB port using the supplied USB cable. Connect only one PA Monitor at a time. Open the Assistant program by double clicking on the Assistant desktop icon or selecting **Start → All Programs → FBT-6 Assistant → FBT-6 Assistant**. Pushbuttons to perform USB related functions are displayed on the screen below.

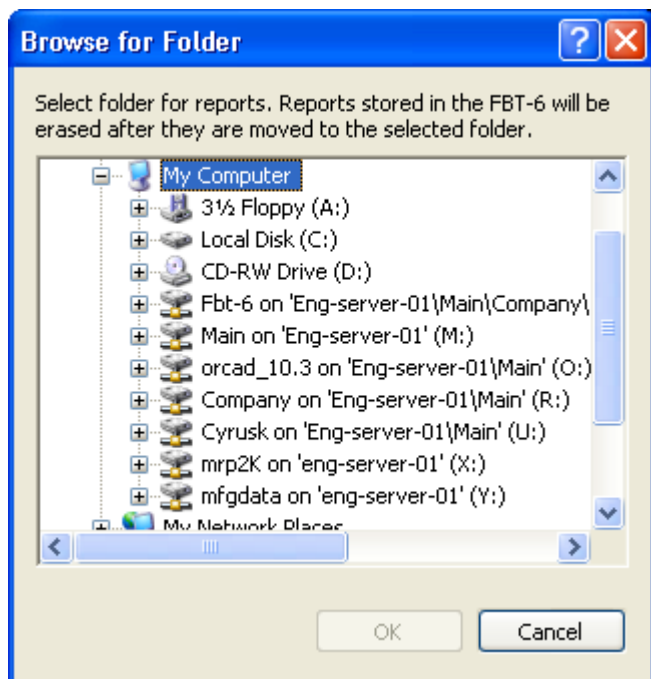


3.3.2 Transfer Reports function

Click the **Transfer Reports from FBT-6** button to transfer the reports saved in all eight PA Monitor report locations to a PC via the USB port.

NOTE: Excel must be installed and the PC must be ready to generate full-featured Excel spreadsheet reports. Otherwise, text file reports will be generated.

The Assistant displays a screen like the one below allowing selection of the folder to save the reports in.

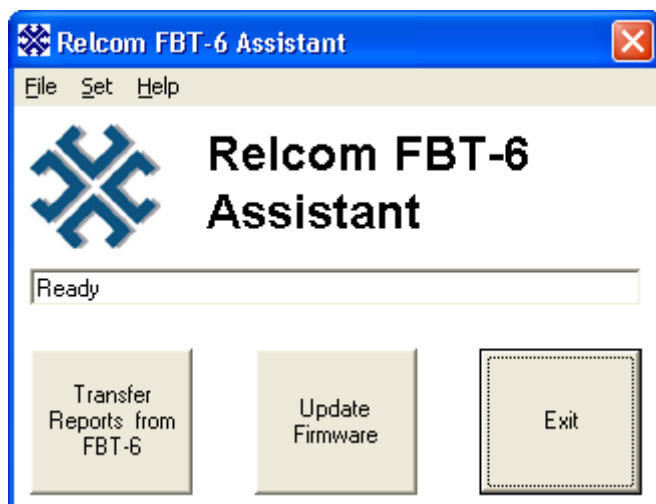


Browse to the folder to save the reports in and click the **OK** button. File names for each report are automatically generated in the following format:

<Report name> <Date report file saved on the PC (MM-DD-YYYY)>
<Time report saved on the PC (HH-MM-SS AM or PM)>.xls

For example: "Report 1 02-14-2007 3-59-37 PM.xls"

When all files have been saved, the main menu is displayed.



The reports are saved in a formatted Excel spreadsheet file. The contents of the file and how it will look when opened in Excel are shown in Table 2.

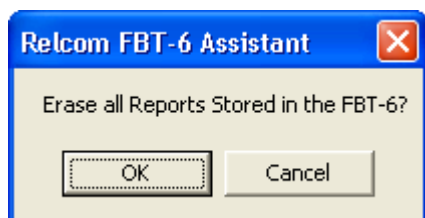
Report 1			
Segment Measurements	Data	Acceptable Values	OK/BAD
Voltage	21.8V	9.0V Minimum	OK
Lowest Device Signal	725mV	150mV Minimum	OK
Lowest Device Signal Address	16 (10H)		
Avg Fieldbus Frequency Noise	0mV	75mV Maximum	OK
Peak Fieldbus Frequency Noise	4mV	75mV Maximum	OK
Avg Low Frequency Noise	5mV	150mV Maximum	OK
Peak Low Frequency Noise	5mV	150mV Maximum	OK
Avg High Frequency Noise	1mV	150mV Maximum	OK
Peak High Frequency Noise	32mV	150mV Maximum	OK
Shield Short	No Shorts	No Shorts	OK
LAS Address	16 (10H)		
Most Recent Add/Drop Address	No Devices Added/Dropped		
Device Add or Drop	None Added/Dropped	None Added/Dropped	OK
Date/Time of Device Add/Drop	Not Available		
Number of Active Devices	1		
Device Measurements	Data	Acceptable Values	OK/BAD
Device Address	16 (10H)		
Signal Level	729mV	150mV Minimum	OK
Added/Dropped	Not Added/Dropped	Not Added/Dropped	OK
Retransmits	0	0	OK
Measurement Summary: All Measurements are OK			
Data collected by _____			
Report approved by _____			

Table 2: Example Report File

3.3.3 Erase Reports function

After all reports are successfully transferred to a PC, the PA Monitor will erase the reports in its memory the next time it is connected to a fieldbus. This allows transfer of reports to multiple PCs or to more than one location on a single PC and conveniently prepares the PA Monitor for a “fresh” start the next time it is taken into the field.

The reports in a PA Monitor may also be erased without first downloading them. From the **File** pull-down menu in the upper left corner of the main screen click **Erase Reports in FBT-6**. A window appears asking for confirmation to erase all of the reports stored in the PA Monitor.



Click **OK** to erase all of the reports in the PA Monitor. The reports will be erased the next time the PA Monitor is connected to a fieldbus.

3.3.4 Set Report Names function

The PA Monitor can save the data it collects as a report in one of eight report locations (memory blocks) using the SAVE REPORT function (see page [30](#)). Each report has a name that can be changed. The report names are changed using the Set Report Names function in the Assistant.

Report names automatically generate file names and titles for reports transferred to a PC using the Transfer Reports From FBT-6 feature (see page [33](#)). Report names help to keep track of where the reports were collected (which segment, location on a segment, etc.).

To display and edit report names in the PA Monitor click the **Set** pull-down menu and select **Report Names**. The Display/Edit Report Names window appears showing the current report names:

Display/Edit Report Names

The FBT-6 has eight locations available to store reports. Report names should be from 1 to 15 characters that can be letters or numbers, etc., but should not be \/:?*'"<>|.

Report Name	
Location 1	Report 1
Location 2	Report 2
Location 3	Report 3
Location 4	Report 4
Location 5	Report 5
Location 6	Report 6
Location 7	Report 7
Location 8	Report 8

Show Default Names

Read Current Names from FBT-6

Save Report Names to FBT-6

Cancel

Type in the desired report names and click **Save Report Names to FBT-6**. This writes the report names to the PA Monitor. The report names must be 1-15 characters long and cannot contain the following characters: \ / : * ? < > |

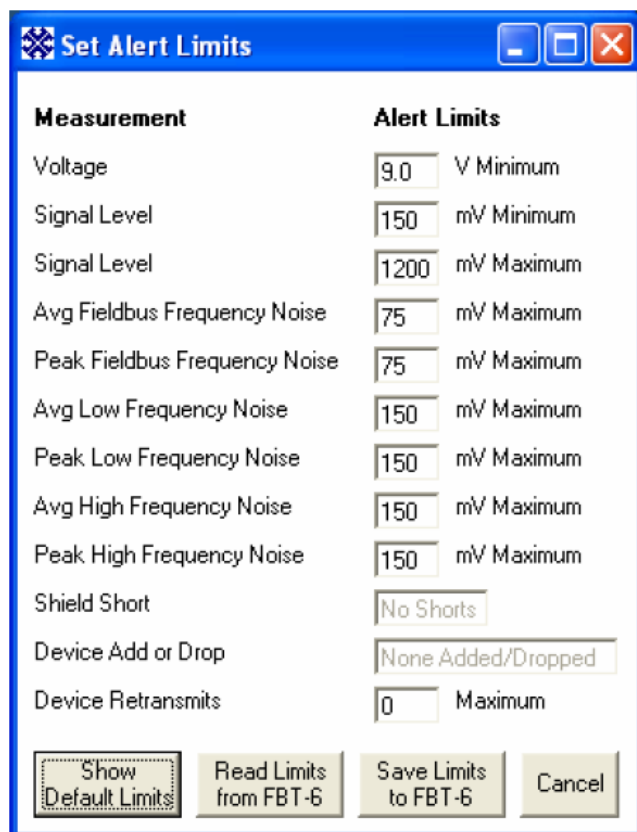
Click **Show Default Names** to show the default report names. To save the default names in the PA Monitor, Click **Save Report Names to FBT-6**.

Click **Read Current Report Names from FBT-6** to display the report names stored in the PA Monitor.

Click **Cancel** to leave the Display/Edit Report Names window without changing the report names stored in the PA Monitor.

3.3.5 Set Alert Limits function

The PA Monitor evaluates some of the parameters it monitors as OK or BAD based upon user configurable limits. To display and edit these limits click the **Set** pull-down menu and select **Alert Limits**.



The dialog box titled "Set Alert Limits" contains a table with two columns: "Measurement" and "Alert Limits". The table lists various parameters and their corresponding limit values. At the bottom of the dialog, there are four buttons: "Show Default Limits", "Read Limits from FBT-6", "Save Limits to FBT-6", and "Cancel".

Measurement	Alert Limits
Voltage	9.0 V Minimum
Signal Level	150 mV Minimum
Signal Level	1200 mV Maximum
Avg Fieldbus Frequency Noise	75 mV Maximum
Peak Fieldbus Frequency Noise	75 mV Maximum
Avg Low Frequency Noise	150 mV Maximum
Peak Low Frequency Noise	150 mV Maximum
Avg High Frequency Noise	150 mV Maximum
Peak High Frequency Noise	150 mV Maximum
Shield Short	No Shorts
Device Add or Drop	None Added/Dropped
Device Retransmits	0 Maximum

Buttons: Show Default Limits, Read Limits from FBT-6, Save Limits to FBT-6, Cancel

Type in the desired limits for each parameter and click **Save Limits to FBT-6** to write the limits to the PA Monitor.

Click **Show Default Limits** to show the factory default limit values. To save the default limits in the PA Monitor, Click **Save Limits to FBT-6**. The default limits are based upon the Foundation Fieldbus physical layer standard (IEC 61158) where possible.

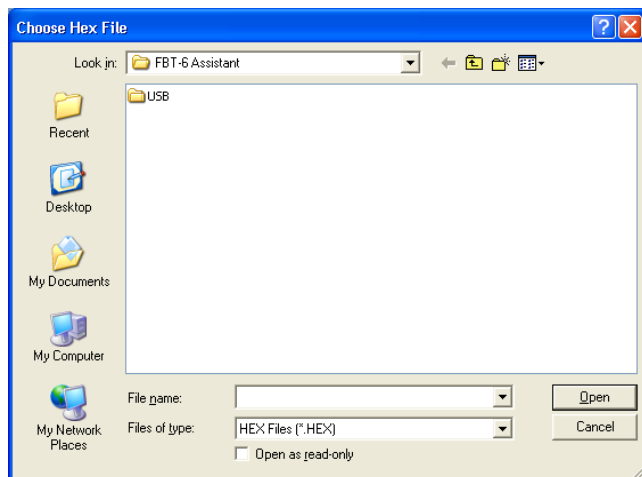
Click **Read Limits from FBT-6** to display the limit values stored in the PA Monitor.

Click **Cancel** to leave the Set Alert Limits window without changing the limits stored in the PA Monitor.

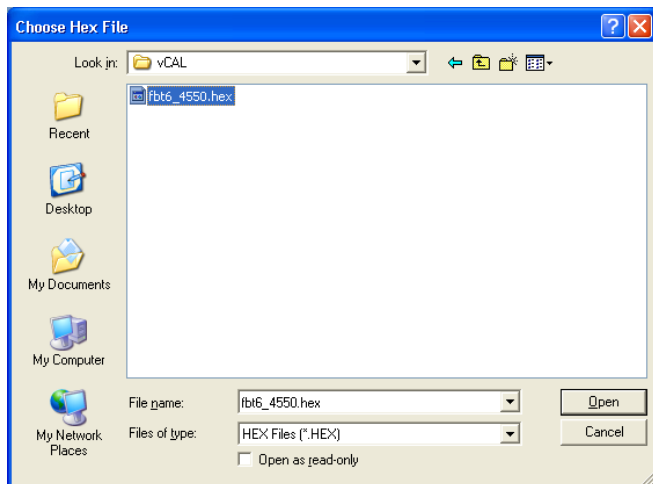
3.3.6 Update Firmware Function

New features for the PA Monitor may be released occasionally. These features may be added to PA Monitor units already in the field by updating the PA Monitor firmware. The Update Firmware function allows the existing firmware in the PA Monitor to be replaced with new firmware.

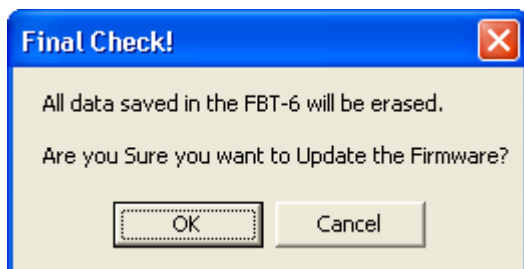
If available download the new PA Monitor firmware file from www.softing.com and save it on the PC. Start the Assistant and click the **Update Firmware** button to begin the update process. The Choose Hex File window opens.



Specify the new firmware file by browsing to the folder containing the firmware file, selecting the file, then clicking the **Open** button.



The Final Check! window opens as shown below.



Attention: Updating the firmware erases any reports saved in the PA Monitor.

Click **OK** to proceed with the update. Click **Cancel** to stop the update and return to the main Assistant screen.

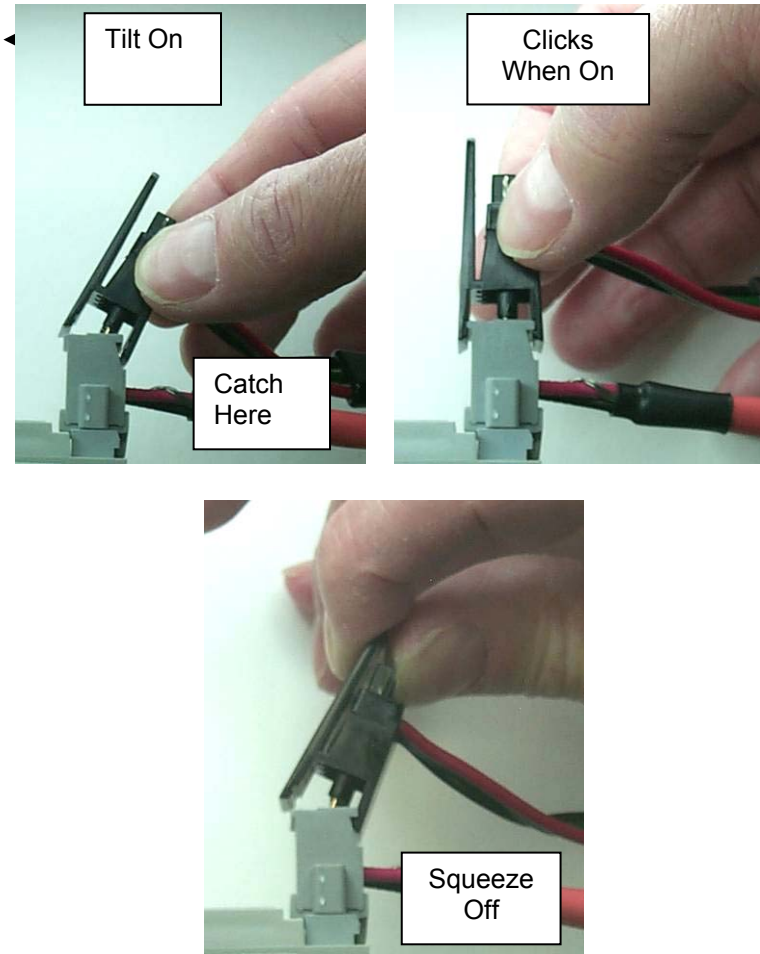
After clicking **OK**, the following screen appears:



Once the firmware update is complete, the Assistant status line in the middle of the Assistant main menu will change from, "Firmware update will take a few moments. Please wait..." to "FBT-6 firmware loaded. Ready...". Close the Assistant program by clicking the **Exit** button and begin using the PA Monitor.

4 Using the Clip-on Probe Cable

Each PA Monitor ships with two cables to attach the PA Monitor to a fieldbus. One cable has standard mini-hook connectors for attaching to the fieldbus. The second cable has a clip-on probe for easy attachment to Phoenix Contact style screw terminal connectors such as those on the Relcom Megablock wiring blocks. The pictures below show the best methods for attaching and removing the clip-on probe.



5 Operation in Special Cases

The PA Monitor operates differently under certain special circumstances. This section describes the behavior of the PA Monitor in these special cases.

Limitations

The PA Monitor will transfer report data to the PC on a total of up to 32 devices per segment including the Master (each device has a separate address). The Not Added/Dropped devices are transferred first, followed by Added devices, and finally Dropped devices. A theoretically possible extension with repeaters to more than 32 logical devices is not supported by the PA Monitor.

Silent Segment Behavior

The fieldbus segment that the PA Monitor is connected to may contain no frame traffic for long periods of time. This Silent Segment condition may be present when the PA Monitor is initially connected to the segment or may occur after the segment has been transmitting frames for some period of time. The PA Monitor will continue to record and display data, even when the segment is silent. When the segment is in a silent condition the PA Monitor will collect a set of non-device related data (DC Volts, Noise, etc.). In addition, if the segment remains silent for about 2 seconds, the PA Monitor will mark all devices as dropped and set the (active) device count to 0.

Excess Noise Mode

High levels of noise on the fieldbus can make fieldbus signals undetectable. In addition, the noise may be interpreted as constantly transmitted corrupted fieldbus data. In this case, the PA Monitor becomes unresponsive because it is spending so much time trying to identify good fieldbus frames. When this situation occurs, the PA Monitor recognizes that it is spending too much time trying to identify good fieldbus frames and will enter Excess Noise Mode. Upon entering Excess Noise Mode, the PA Monitor quits looking for fieldbus transmissions and the following display appears:

```
EXCESS NOISE, NO  
FIELDBUS MEAS. *
```

Pressing either the FUNCTION or SELECT button returns to the Voltage screen and the screens can be navigated normally. However, only fieldbus physical layer information (voltage, noise, and shield shorts) is displayed. Information contained in fieldbus data (device addresses, signal level, number of devices, etc.) is not available and the data portion of the screens normally displaying fieldbus data is blank. The twirling icon is also replaced by “*”.

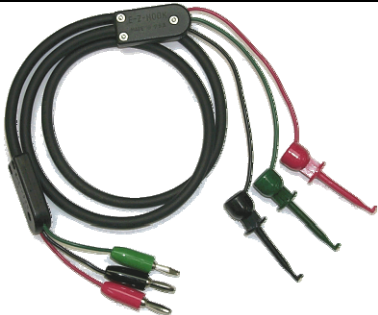


To exit the Excess Noise Mode, remove the source of the noise from the bus then reset the PA Monitor by holding down both buttons for 2 seconds or disconnecting and reconnecting the PA Monitor. If the high noise level is still present, the PA Monitor will again enter Excess Noise Mode.

Note that in Excess Noise Mode, the PA Monitor cannot differentiate between fieldbus signals and noise. As a result, the PA Monitor measures noise plus signal when it displays noise values. The noise level measurements displayed will be very high.

Unavailable Data

The data for some or all displays will be unavailable during Initial Discovery, Excess Noise Mode, after a function is reset, or because the segment is silent. When the PA Monitor is collecting and processing segment data, information may not be ready for display. In this case, only the selected PA Monitor function name is displayed. The FUNCTION and SELECT buttons still navigate through the menus as they normally would.

6 Accessories

Description	Picture
Fieldbus Cable with Mini-Hook Probes	 A black fieldbus cable with a coiled section. It features a black connector with two screws at one end. The other end has three separate wires: red, green, and black. Each wire is terminated with a different colored mini-hook probe: red, green, and black respectively.
USB Cable	 A black USB cable with a standard USB-A connector on one end and a custom black connector on the other. The cable is coiled.
Fieldbus Cable with Clip-on Probe	 A black fieldbus cable with a coiled section. It features a black connector with two screws at one end. The other end has three separate wires: red, green, and black. Each wire is terminated with a different colored clip-on probe: red, green, and black respectively.

7 Service

The PA Monitor does not contain any user serviceable parts. All adjustments and/or repairs have to be performed at the factory.

8 Specifications

Input Voltage:	Fieldbus Mode: 8 to 32 VDC USB Mode: 4.1 to 5.5 VDC
Max. Input Current:	Fieldbus Mode: 10 mA * USB Mode: 30mA
Power Dissipation:	Fieldbus Mode: 320 mW max (@ 32 VDC) USB Mode: 165 mW max (@ 5.5 VDC)
Operating Temperature:	-20 to +50°C **
Dimensions:	146 x 88 x 28 mm (5.7 x 3.5 x 1.1in.)
Weight:	378g (0.83lb.)
Case material:	ABS
DC Voltage Measurement Range:	8 to 32 VDC +/- 0.5 VDC
Signal Level Measurement Range:	0.12 to 2 Vpp $\pm 10\%$ $\pm 0.025\text{Vpp}$ ***
LF Noise Measurement Range:	50 Hz to 4 kHz 0 to 1000 mVpp $\pm 15\%$ $\pm 25\text{mVpp}$ ***
FF Noise Measurement Range:	9 kHz to 40 kHz 0 to 1000 mVpp $\pm 10\%$ $\pm 25\text{mVpp}$ ***
HF Noise Measurement Range:	90 kHz to 350 kHz 0 to 250 mVpp $\pm 20\%$ $\pm 25\text{mVpp}$ ***

* In fieldbus mode the BC-230-PB is powered by the fieldbus and draws approximately 9.4 mA of current from the segment (depending on bus voltage and ambient temperature).

** Display update speed is impaired below -10° C.

*** Vpp = Volts peak-to-peak; excessive noise adjacent to the fieldbus frequency (FF) band will prevent the BC-230-PB from reading the fieldbus data and thus reduce functionality.

Specifications subject to change without notice.

9 Certifications

CE

The BC-230-PB meets the European Union requirements for electromagnetic radiation by complying with the EMC Directive 89/336/EEC.

FCC

The BC-230-PB is a Class A digital device and complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Hazardous Area/Location Approvals

FM US and Canada:

Class I Division 2 Groups A,B,C, and D T4

Class I Zone 2 Group IIC T4

Class I Division 1 Groups A,B,C, and D T4

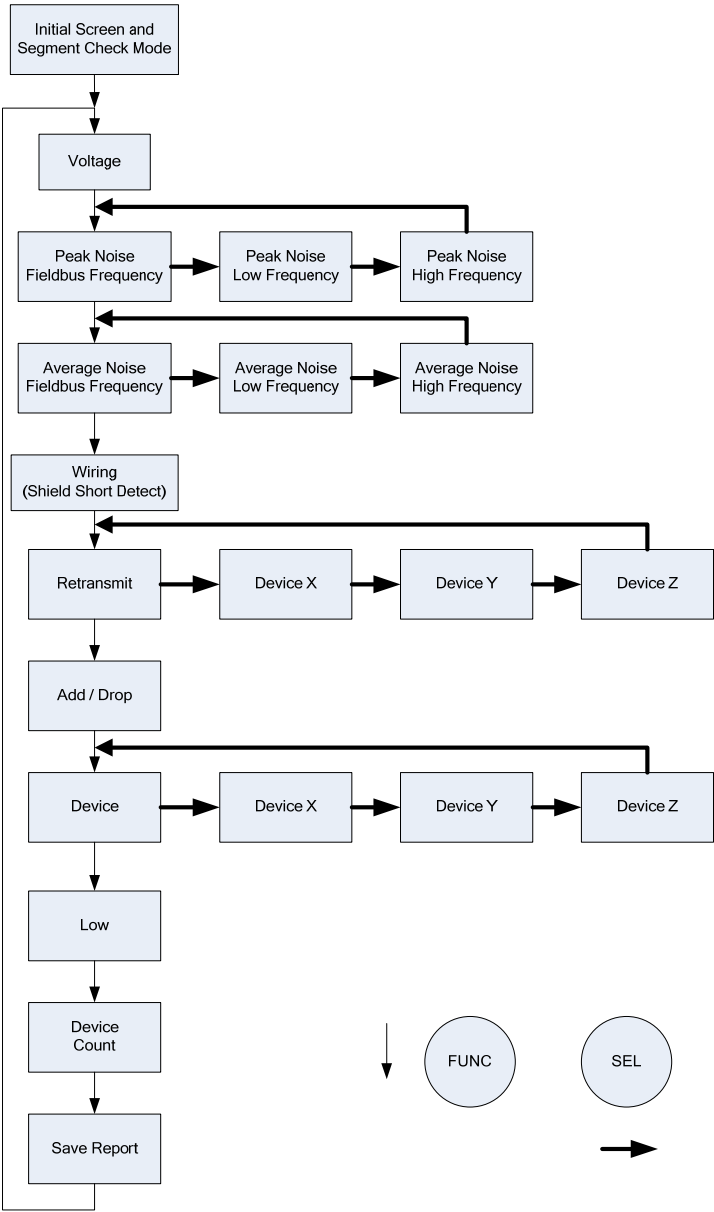
Class I Zone 0 and 1 Ex/AEx ia IIC T4

ATEX Ex ia IIC T4

ATEX Ex nL IIC T4

ATEX Ex ic IIC T4

10 Navigation with the two function buttons



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