# FBT-6


- **fieldbus powered**
- **device add & drop indication**
- **shield short indication**
- **measures low, fieldbus and high frequency average and peak noise**
- **measures signal level for all segment devices**
- **assesses segment health**
- **upload measurement data to a PC via USB port**

**The Fieldbus Diagnostic Monitor, FBT-6,** is used to examine the operation of a live FOUNDATION Fieldbus™ H1 segment without interfering with its operation. The Monitor is intended for maintenance personnel to verify segment operation or to troubleshoot an errant segment.

**The FBT-6 Diagnostic Monitor** checks for retransmissions from each device on the segment, providing a key performance indicator of segment health. The Monitor also provides measurements of bus voltage level, device signal level, and peak and average noise level. It displays the number of devices present on the segment and indicates when devices are added or removed from the segment. It also detects the presence of a short between either of the signal wires and the cable shield.

**Modern fieldbus commissioning procedures** require various bus parameters to be measured and recorded. Key parameters include bus voltage, signal level for each device and noise level on each segment or at every device on each segment. Recording the results allows a baseline of the fieldbus physical layer to be established. The Monitor collects this data, and saves up to eight segment reports to be saved for transfer to a PC via a USB port. The reports are saved as Microsoft® Excel files as a comprehensive commissioning and operations report. Considerable savings can be achieved by reducing commissioning time and verifying the correct operation of the segment.

**Data collected from periodic segment** verification testing or during troubleshooting can be simply transferred to a file for easy comparison to the segment baseline/history measurements. Data can be displayed as tables and graphs using Microsoft® Excel.

**Hand-held for portability**, the Monitor is powered by the fieldbus so that no battery or external power source is required. It includes color- coded test leads and an LCD display.

## OPERATION

The FBT-6 is connected to the segment using the clip-on probes at the end of the cable. The red probe is connected to the fieldbus + wire, the black probe to the – wire and the green probe to the shield wire. The + and – test leads are polarity sensitive and the Monitor will not operate if they are reversed.

When first connected to a fieldbus, a version number is displayed for several seconds. The Monitor then performs a Segment Check providing a quick indication of segment health.

The “FUNCTION” and “SELECT” buttons are used to choose from segment parameters that can be examined with the Monitor. When a function is selected, the data portion of the LCD display is blank until the Monitor has collected and processed the data. After that, the measured value is shown. The indication “OK” is shown if the measured value is within the acceptable range. The indication “BAD” is shown if the measured value is outside of the acceptable range.

The rotating symbol in the lower right corner of the display indicates that there is segment activity. A horizontal bar (underscore) under the rotating symbol indicates that a frame was detected, but could not be decoded. This is not a maintained function, so if a single “bad” frame is detected, the underscore will only display for a short time. Periodic “bad” frames will cause the underscore to blink. The following are more detailed explanations of each of the Monitor’s functions.


**Segment Check**
When first connected, the FBT-6 gathers data for all of its monitoring functions. If all measured data is within acceptable range, the Monitor displays “ALL MEASUREMENTS OK”.

**Voltage**
The DC voltage on the segment is shown. By default, measurements over 9 volts are OK. The maximum input voltage is 32.0 volts.

**Device Count**
If there are fieldbus devices active on the segment, the Monitor counts them. If the count has remained the same since the initial segment check was performed, the display shows “OK”. Note, on FOUNDATION fieldbus™ segments, the Link Active Scheduler (LAS) is considered a device and, as such, is included in the count.
The FBT-6 is more sensitive to missed communications than most PC monitoring software. As a result, a device may still show up on PC monitoring software, even though the FBT-6 has removed the device from its internal list of active devices. Devices having communication difficulties may show up on the FBT-6 as repeatedly being added or dropped.
If a device leaves the segment, the display shows “-”; if a new device is added it shows “+”.


**Device**
The address (in decimal and hexadecimal) and signal level of each device on the segment is displayed in turn by pushing the “SELECT” button. On FOUNDATION fieldbus™ segments, the first device shown will be the LAS. By default, measurements greater than 150mV are OK. If a device leaves the segment, a “-” is displayed; if a device is added it shows “+”.

**Average Noise**
Displays the average of the most recent 100 noise measurements. Noise levels are measured and displayed in 3 frequency bands: frequencies in the fieldbus signaling band (Fieldbus Frequency, FF), frequencies below the fieldbus signaling band (Low Frequency, LF) and frequencies above the fieldbus signaling band (High Frequency, HF). The particular frequency band displayed is selected by pushing the “SELECT” button.

**Peak Noise**
Displays the peak noise recorded since the Monitor was connected. The value displayed is the highest noise level measured since the last reset. Peak noise levels are measured and displayed in the same three frequency bands as average noise.

**Retransmit**
If a device does not respond to an LAS Pass Token frame, the frame is retransmitted. The FBT-6 indicates the address (decimal and hexadecimal) of the last device that failed to respond to an LAS Pass Token, together with the number of missed pass tokens since the function was reset. If more than 250 retransmits are detected, the display will read “250+”. Pressing the “SELECT” button cycles through screens indicating the number of detected retransmits for each device.

**Shield Short**
If a short circuit between the + fieldbus wire and the cable shield is detected, “(+) TO SHIELD SHORT” is displayed. If the short is between the – wire and the shield, “(–) TO SHIELD SHORT” is displayed. If a detected shield short goes away the Monitor indicates an INTERMITTENT SHIELD SHORT to (+) or (-).

## OPERATION (continued)

### Add–Drop
If a new device is added to the segment, the Monitor will display its address and signal level. If a device does not respond to a Pass Token frame, the device is considered “dropped” by the FBT-6 and the Monitor will display the address and last known signal level of the dropped device.

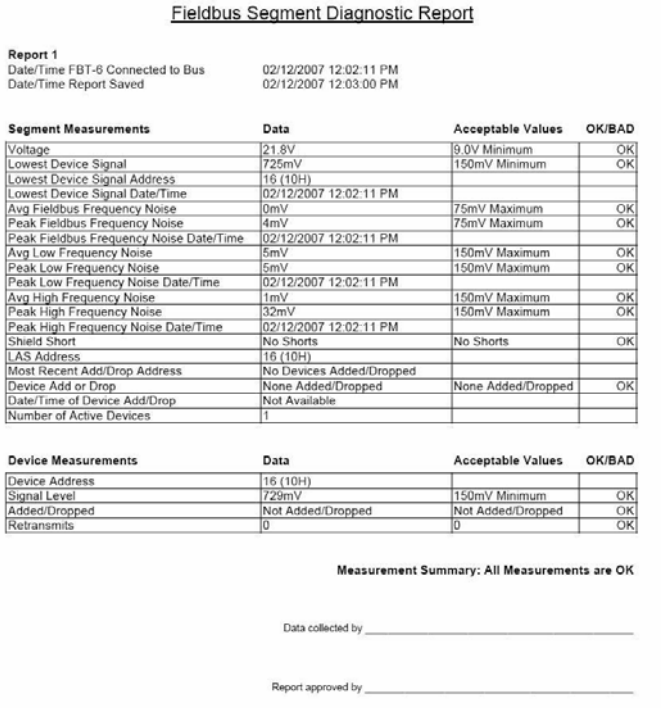
### Low
The signal level of the device with the weakest signal is shown. The device’s address (in decimal and hexadecimal) is also displayed. This will be the lowest signal level reading from a device since the Monitor was connected to the fieldbus. By default, measurements greater than 150mV are OK.

### Save Report
Saves the fieldbus data collected by the Monitor as a report. Up to 8 reports may be saved from multiple network segments and/or multiple locations on one segment.

### Transfer Report
Connect the Monitor to a PC USB port and transfer the saved reports to Excel files on the PC.

### Set Report Names
Customize the names of the reports saved in the Monitor to easily identify the report source.

### Set OK/BAD Limits
Change the limits at which Monitor measurements transition from OK to BAD to establish customized plant standards.



Fieldbus Segment Diagnostic Report

**Report 1**

| | |
|---|---|
| Date/Time FBT-6 Connected to Bus | 02/12/2007 12:02:11 PM |
| Date/Time Report Saved | 02/12/2007 12:03:00 PM |

| 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) | | |
| Lowest Device Signal Date/Time | 02/12/2007 12:02:11 PM | | |
| Avg Fieldbus Frequency Noise | 0mV | 75mV Maximum | OK |
| Peak Fieldbus Frequency Noise | 4mV | 75mV Maximum | OK |
| Peak Fieldbus Frequency Noise Date/Time | 02/12/2007 12:02:11 PM | | |
| Avg Low Frequency Noise | 5mV | 150mV Maximum | OK |
| Peak Low Frequency Noise | 5mV | 150mV Maximum | OK |
| Peak Low Frequency Noise Date/Time | 02/12/2007 12:02:11 PM | | |
| Avg High Frequency Noise | 1mV | 150mV Maximum | OK |
| Peak High Frequency Noise | 32mV | 150mV Maximum | OK |
| Peak High Frequency Noise Date/Time | 02/12/2007 12:02:11 PM | | |
| 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 _____

## SPECIFICATIONS

### Input voltage
Fieldbus Mode: 8 to 32 VDC
USB Mode: 4.1 to 5.5 VDC

### Input current
Fieldbus mode: 10mA max.‡
USB mode: 30mA max.

### Power dissipation
Fieldbus mode: 320mW max. (@ 32 VDC)
USB mode: 165mW max. (@ 5.5 VDC)

### Operating Temperature
–20 to +50°C *

### Dimensions
146 x 88 x 28 mm (5.7 x 3.5 x 1.1 inches)

### Weight
378g (0.83lb)

### Case Material
ABS

### DC Voltage measurement range
8 to 32 ± 0.5 VDC

### Signal level measurement range
0.12 to 2 Vpp ±10% ± 25mVpp

### Noise measurement ranges
LF (50Hz to 4kHz): 0 to 1000 mVpp ±15% ± 25 mVpp
FF (9kHz to 40kHz): 0 to 1000 mVpp ±10% ± 25 mVpp †
HF (90kHz to 350kHz): 0 to 250 mVpp ±20% ± 25mVpp

### Software utility and drivers
Operating system: Windows® XP, Windows® 2000
USB version: 1.1, 2.0

(Note: Vpp = Volts peak-to-peak)

* Display update speed is impaired below –10°C

† Excessive noise adjacent to the fieldbus frequency (FF) band will prevent the FBT-6 from reading the fieldbus data and thus reduce functionality.

‡ In fieldbus mode the FBT-6 is powered by the fieldbus and draws approximately 9.4mA of current from the segment (depending on bus voltage and ambient temperature).

FOUNDATION fieldbus™ is a trademark of Fieldbus Foundation™, Austin, Texas

Specifications subject to change without notice.

## APPROVALS

| Region (Authority) | Standard | Certificate | Approved For | Ratings |
|---|---|---|---|---|
| EU (Relcom) | EN61326 | | Class A, Industrial Locations | CE |
| | EN55022, EN55024 | | Class B, Information Technology Equipment | |
| US (Relcom) | EN61326 | | Class A, Industrial Locations | FCC |
| | EN55022, EN55024 | | Class B, Information Technology Equipment | |
| US (FM) | 3600, 3610, 3611, 3810 | 3023564 | Class I, Div 2, ABCD, T4<br>Class I, Zone 2, IIC T4 | NIFW / FNICO<br>Vmax (V): 32 / 17.5<br>Imax Gps A, B/IIC (mA): 1500 / 274<br>Imax Gps C, D/IIB, IIA (mA): 1500 / 570 |
| US (FM) | 3600, 3610, 3611, 3810 | 3023564 | Class I, Div 1, ABCD, T4<br>Class I, Zone 0 and 1,<br>AEx/Ex ia IIC T4 | Entity IS / FISCO<br>Ui (V): 24 / 17.5<br>Imax Gps A, B/IIC (mA): 250 / 183<br>Imax Gps C, D/IIB, IIA (mA): 250 / 380<br>Pi (W): 1.2 / 5.32 |
| Canada (FM) | C22.2 No. 213,<br>C22.2 No. 157<br>CAN/CSA-E79-0-95,<br>CAN/CSA-E79-11-95 | 3028840 | Class I, Div 2, ABCD, T4<br>Class I, Zone 2, IIC T4 | NIFW / FNICO<br>Vmax (V): 32 / 17.5<br>Imax Gps A, B/IIC (mA): 1500 / 274<br>Imax Gps C, D/IIB, IIA (mA): 1500 / 570 |
| Canada (FM) | C22.2 No. 213,<br>C22.2 No. 157<br>CAN/CSA-E79-0-95,<br>CAN/CSA-E79-11-95 | 3028840 | Class I, Div 1, ABCD, T4<br>Class I, Zone 0 and 1,<br>AEx/Ex ia IIC T4 | Entity IS / FISCO<br>Ui (V): 24 / 17.5<br>Imax Gps A, B/IIC (mA): 250 / 183<br>Imax Gps C, D/IIB, IIA (mA): 250 / 380<br>Pi (W): 1.2 / 5.32 |
| EU (LCIE) | EN60079-0 (2004),<br>Pr EN60079-11 (2005),<br>EN60079-27 (2004) | LCIE 06 ATEX 6111 X | Ex ia IIC T4 | Entity IS / FISCO<br>Ui (V): 24 / 17.5<br>Ii (mA): 250 / 380<br>Pi (W): 1.2 / 5.32 |
| EU (Relcom) | IEC 60079-0 (2004)<br>IEC 60079-15 (2006)<br>IEC 60079-11 (2005) | RELC07ATEX 1003X | Ex nL IIC T4<br>Ex ic IIC T4 | Vmax=32V, Imax=1.5A |
| IECEx (FM) | IEC 60079-0 (2004)<br>IEC 60079-11 (2006)<br>IEC 60079-27 (2005) | FME 08.0003X | Ex ia IIC T4<br>Ex ic IIC T4 | Ex ic / Entity IS / FISCO<br>Ui (V): 32 / 24 / 17.5<br>Ii (mA): 1500 / 250 / 380<br>Pi (W): NA / 1.2 / 5.32 |

| ORDERING INFORMATION | | |
|---|---|---|
| Part Number | Description | Picture |
| FBT-6 | Fieldbus Diagnostic Monitor supplied in carrying case with FBT–A61, -A62, and –A63 cables, software and instruction manual. | |
| FBT-A61 | FBT-6 Fieldbus Cable with Mini-Hook Probes |  |
| FBT-A62 | FBT-6 USB Cable |  |
| FBT-A63 | FBT-6 Fieldbus Cable with Clip-on Probe |  |
| FBT-A64 | Clip-on Probe |  |
| 501-338 | FBT-6 User Manual | |