



## FBT-6

fieldbus diagnostic monitor

- 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 network health
- connects to intrinsically safe fieldbus in Zone 1 and Division 1 hazardous areas
- connects to non-incendive fieldbus in Zone 2 and Division 2 hazardous areas
- uploads 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 network without interfering with its operation. The Monitor is intended for maintenance personnel to verify network operation or to troubleshoot an errant network.

The **FBT-6 checks for retransmissions** from each device on the segment, providing a key performance indicator of the networks health. 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 network. 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

and recording the results allows a baseline of the fieldbus physical layer to be established. The FBT-6 collects this data, and allows up to eight file sets of data to be saved for uploading to a PC via a USB port. The data is uploaded as a tab-delimited text file and may then be used to create comprehensive commissioning and operations reports. Considerable savings can be achieved by reducing commissioning time and verifying the accuracy of the data on the segment.

**Data collected from periodic network 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 commonly available software such as Microsoft® Excel.

**Hand-held for portability**, the FBT-6 is powered by the fieldbus so that no batteries or external power source is required. It includes colour-coded test leads and an LCD display.

## Operation

The FBT-6 is connected to the network 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 an Overall Network Check to give the user a quick indication of network health.

The "FUNCTION" and "SELECT" buttons are used to select from network 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 network 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.

Here follows a more detailed explanation 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 the measured data is within an acceptable range, the Monitor displays "ALL MEASUREMENTS OK".

### Voltage

The DC voltage on the network is shown. Measurements over 9 volts are OK. The maximum input voltage is 32.0 volts.

### Device Count

If there are fieldbus devices active on the network, the Monitor counts them. If the count has remained the same since the initial network check was performed, the display shows "OK".

Note: on FOUNDATION™ fieldbus networks, 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 network, the display shows "-"; if a new device is added it shows "+".

### 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. Measurements greater than 150mV are OK.

### Device

The address (in decimal and hexadecimal) and signal level of each device on the network is displayed in turn by pushing the "SELECT" button. On Foundation fieldbus™ networks, the first device shown will be the LAS. Measurements greater than 150mV are OK.

## Average Noise

Displays the average noise based on the average of the last 100 noise measurements. Noise levels are measured and displayed in 3 frequency bands: frequencies in the fieldbus signalling band (Fieldbus Frequency, FF), frequencies below the fieldbus signalling band (Low Frequency, LF) and frequencies above the fieldbus signalling band (High Frequency, HF). The particular frequency band displayed is selected by pushing the "SELECT" button. Measurements of less than 75mV are OK.

## 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. Measurements of less than 75mV are OK.

## Retransmit

The FBT-6 checks for any device not responding to a LAS pass token and indicates the address (decimal and hexadecimal) of the last device that failed to respond to the LAS pass token, together with the number of missed pass tokens since the function was reset. If more than 250 re-transmissions are detected, the display will read "250+". Pressing and holding the "SELECT" key for 2 seconds will reset the re-transmit count for all devices to zero. Pressing the "SELECT" button for less than 2 seconds displays the number of detected, missed pass tokens for each device.

## Add-Drop

If a new device is added to the network, 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.

## 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 (-).

## Save Report

Saves the data collected by the Monitor as a report. Up to 8 reports may be saved from multiple 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.

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## SPECIFICATION

### Input voltage

8 to 32V DC

### Input current

Fieldbus mode: 10mA max.‡

USB mode: 30mA max.

### Power dissipation

Fieldbus mode: 320mW max. (@ 32V DC)

USB mode: 165mW max. (@ 5.5V DC)

### 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

### Case Specifications

Provides IP54 protection

### DC Voltage measurement range

8 to 32 ± 0.5 V DC

### Noise measurement ranges

LF (50Hz to 4kHz): 0 to 1000 mVpp ±15% ± 25mVpp

FF (9kHz to 40kHz): 0 to 1000 mVpp ±10% ± 25mVpp †

HF (90kHz to 350kHz): 0 to 250 mVpp ±20% ± 25mVpp

### Signal level measurement range

0.12 to 2Vpp ± 25mVpp

### Software utility and drivers

Operating systems: Windows XP, Windows Vista and Windows 7

USB versions: 1.1 & 2.0

*Windows is a registered trademark of Microsoft Corporation*

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

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

† *Excessive noise adjacent to the fieldbus frequency (FF) 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 network (depending on bus voltage and ambient temperature).*

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EUROPE (EMEA): +44 (0)1582 723633  
enquiry@mtl-inst.com

THE AMERICAS: +1 800 835 7075  
csinfo@mtl-inst.com

ASIA-PACIFIC: +65 6645 9888  
sales@mtlsing.com.sg





EPS FBT6 RevF 040613

## APPROVALS

Region (Authority)	Standard	Certificate	Approved For	Ratings			
US (FM)	3600, 3610, 3611, 3810 ANSI/ISA 60079-0:2009 ANSI/ISA 60079-11:2009	3023564	Class I, Div 2, ABCD, T4 Class I, Zone 2, IIC T4	Vmax(V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIB,IIA (mA)	NIFW 32 1500 1500	FNICO 17.5 274 570	
US (FM)	3600, 3610, 3611, 3810 ANSI/ISA 60079-0:2009 ANSI/ISA 60079-11:2009	3023564	Class I, Div 1, ABCD, T4 Class I, Zone 0 and 1, AEx ia IIC T4	Vmax(V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIB,IIA (mA) P <sub>i</sub> (W)	Entity IS 24 250 250 1.2	FISCO 17.5 183 380 5.32	
Canada (FM)	C22.2 No. 213, C22.2 No. 157 CAN/CSA-E79-0-95, CAN/CSA-E79-11-95	3028840	Class I, Div 2, ABCD, T4 Class I, Zone 2, IIC T4	Vmax(V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIB,IIA (mA)	NIFW 32 1500 1500	FNICO 17.5 274 570	
Canada (FM)	C22.2 No. 213, C22.2 No. 157 CAN/CSA-E79-0-95, CAN/CSA-E79-11-95	3028840	Class I, Div 1, ABCD, T4 Class I, Zone 0 and 1, Ex ia IIC T4	Vmax(V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIB,IIA (mA) P <sub>i</sub> (W)	Entity IS 24 250 250 1.2	FISCO 17.5 183 380 5.32	
EU (LCIE)	EN60079-0:2009* EN60079-11:2007* EN60079-27:2008*	LCIE06ATEX6111X	⊕ II 1 G Ex ia IIC T4	U <sub>i</sub> (V) I <sub>i</sub> (mA) P <sub>i</sub> (W)	Entity IS 24 250 1.2	FISCO 17.5 380 5.32	
EU (Relcom)	EN60079-0:2009 EN60079-11:2007 EN60079-15:2010	RELC07ATEX1003X	⊕ II 3 G Ex ic IIC T4 Gc	Vmax = 32V, Imax = 1.5A			
IECEX	IEC60079-0:2004 IEC60079-11:2006 IEC60079-27:2005-04	IECEX FME 08.0003X	Ex ia IIC T4 Ex ic IIC T4	U <sub>i</sub> (V) I <sub>i</sub> (mA) P <sub>i</sub> (W)	Ex ic 32 1500 NA	Entity IS 24 250 1.2	FISCO 17.5 380 5.32

\* the original LCIE Certificate used earlier standards. We have determined that there are no technical differences (affecting the products) between those standards and the currently harmonized EN standards listed above.

## ORDERING INFORMATION

Part Number	Description	Picture
FBT-6	Foundation fieldbus™ H1 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	

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