MTL Instruments

Fieldbus Networks - Test Equipment

COOPER Crouse-Hinds

FBT-3
FBT-4
FBT-5
FBT-6
FBT-6-PA

live troubleshooting for fieldbus H1 networks

FBT-3

- **Bus-powered fieldbus monitor for monitoring:**
  - ***LAS***
  - ***Packet traffic***
  - ***Device counts***
  - ***Framing errors***

- **Monitor also measures:**
  - ***Signal levels***
  - ***Noise levels***
  - ***DC power***

The Fieldbus Monitor, FBT-3 is used to examine the operation of a live FOUNDATION fieldbus™ network without interfering with its operation. The monitor is intended for maintenance personnel to verify network operation or to troubleshoot an errant network. The Fieldbus Monitor allows the user to quickly assess the health of a fieldbus network segment by providing measurements of bus power level, minimum signal level, and peak and average noise level. It also displays the number of devices present on the segment and indicates when devices are added or removed from the network.

The Fieldbus Monitor is palm-sized for portability and is powered by the fieldbus so that no batteries or external power source is required. It includes color-coded test leads and an LCD display.

Caution:
The FBT-3 must not be used in a hazardous area without a gas clearance certificate. If connected to an IS trunk, even in a safe area, the gas clearance must cover the whole system.

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May 2004

Operation
The FBT-3 can be connected to the network using the clip leads. The 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 1 second. The MODE button is used to select from several network parameters that can be examined with the Monitor. When a function is selected, the LCD display reads "- - -" 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 (as defined by the fieldbus specification). The rotating symbol in the lower right corner of the display indicates that there is network activity. A horizontal bar under the rotating symbol indicates that a frame was detected, but could not be decoded. This is not a maintained function. I.e., if a single "bad" frame is detected, the horizontal underbar will only be on the display for a short time. Periodic "bad" frames will cause the underbar to blink. Following are more detailed explanations of each of the monitor's modes:

Power
The DC voltage on the network is shown. Measurements over 9V are OK. The maximum displayed value is 25.5V.

LAS
If there is any activity on the network, the Link Active Scheduler (LAS) should be sending out Probe Node frames. The Monitor measures the signal level of the Probe Node frame. The signal level is in millivolts.

Device
If there are fieldbus devices active on the network, the Monitor counts them. If the count has remained the same since the Device function was selected, the display shows "OK". Note that the LAS is considered a device and as such is included in the count. Devices are counted by watching their response to a Pass Token. If a device does not respond to the Pass Token, it is taken off an internal list and the count will be reduced. The device may still show up on PC monitoring software because the LAS will not take it off of the Live List until it has failed to respond to a Pass Token three times in a row. If a device leaves the network, "-" is displayed. If a new device is added, the display shows "+"

Low
The signal level of the device with the weakest signal is shown. The device's address (hexadecimal) is displayed behind the word "LOW". This will be the lowest signal level reading from a device since the tester was connected to the fieldbus. Measurements greater than 150mV are OK

Noise Av
The noise on the network is measured during the silence between frames. The value is averaged over 10 measurements. Measurements of less than 75mV are OK.

Noise Pk
The peak noise recorded since this function was started is displayed. Measurements of less than 75 mV are OK.

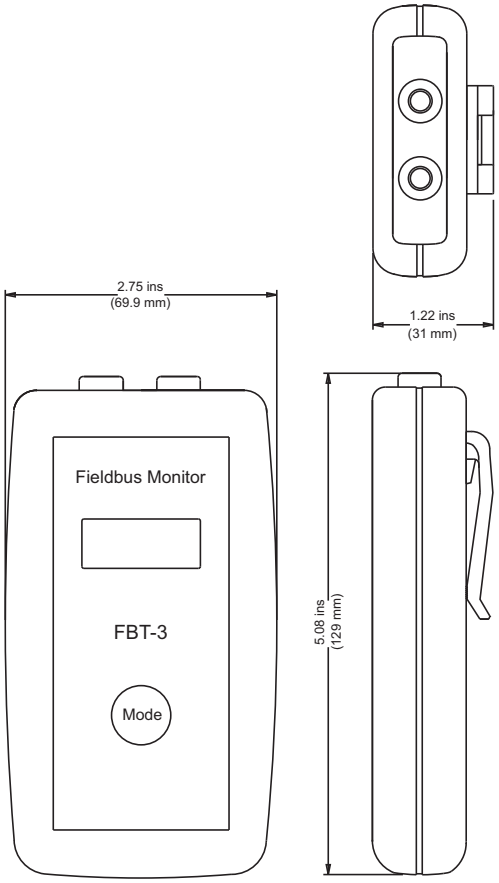
New
If a new device is to be added to the network, it must respond to the Probe Node frame sent by the LAS. The Monitor measures the signal level of the new device's response. Measurements greater than 150mV are OK. The address (in hexadecimal) of the new device is displayed also.

Specifications
The Monitor is powered by the fieldbus and draws approximately 10mA of current from the network (depending on bus voltage and ambient temperature).

Operating temperature range
0 — 50°C

Dimensions
12.9 × 7.0 × 3.1cm

Weight
150g



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monitoring of fieldbus networks

FBT-4

- **Checks for basic fieldbus operation**
- **Bus powered**
- **Monitors:**
  - ***DC power***
  - ***Polarity***
  - ***Packet traffic***

The Fieldbus Power & Signal Probe, FBT-4, is used to examine the operation of a live FOUNDATION fieldbus™ network without interfering with its operation. The Probe is intended for maintenance personnel to verify network operation or to troubleshoot an errant network. The Power and Signal Probe is designed to help instrument technicians quickly determine if bus power and signal levels are within specification at individual points on a fieldbus network segment. For example, if a fieldbus transmitter suddenly goes off-line, the FBT-4 can be used to determine if the problem resides in the transmitter itself or is due to an open or short in the network cable system. Inexpensive and portable, the FBT-4 runs on bus power and thus requires no batteries or other external source of power.

Operation

One red and two green LEDs indicate the status of the fieldbus network. They are labeled Signal, Voltage, and Reversed. A lit green LED indicates that the network is performing satisfactorily. A lit red LED signals an error condition. Following are descriptions of the three indicators:

Signal indicates that there is bus activity. It will only light if data traffic is detected with peak to peak amplitude greater than 150 mV. The validity of the data is not checked. You will notice that the LED blinks when there is bus activity. It is driven directly by the frame data and is thus not powered during the brief silence between packets.

Voltage indicates that the DC Voltage on the fieldbus is greater than the 9.0V dc minimum that is required by the fieldbus standard.

Reversed indicates that the FBT-4 probes have been connected to the network incorrectly or that the fieldbus has been wired with reversed polarity.

Connection

The pointed probe attached directly to the case of the FBT-4 is the negative input and should be connected to a negative point on the fieldbus. The red wire with the pointed probe should be connected at a positive point on the fieldbus. For hands-free operation, a red mini-hook assembly is available which can be attached to the end of the red pointed probe. A black cable with mini-hook is also available to plug onto the negative terminal of the FBT-4.

Specifications

The Monitor is powered by the fieldbus and draws 12-15mA of current, depending on bus voltage and ambient temperature.

Operating temperature range: 0 - 50°C

Weight: 300g

Size: 11.8 × 5.0 × 2.1cm

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May 2004

accurate characterisation of fieldbus wiring

FBT-5

- **Signal generator for testing fieldbus wiring**
- **Operates with wiring blocks installed**
- **Use with FBT-6 to measure signal and noise levels**
- **Test fieldbus wiring before the control system is installed**

The Fieldbus Wiring Validator, FBT-5, is used in combination with the Relcom Fieldbus Monitor, FBT-6, to test new or existing field wiring to determine its suitability for use in a FOUNDATION fieldbus™ network. The FBT-5 acts as a signal generator, supplying DC power and a simulated fieldbus signal to the wire pair being tested. The FBT-6 is then used to take power, signal, and noise measurements. Testing can be performed on existing instrumentation wiring, multi-pair cables, newly installed fieldbus cable, or a complete fieldbus wiring system with wiring blocks and terminators already installed.

Connection

Using the clip leads, connect the FBT-5 to one end of the cable. To the other end, attach the Test Terminator. Connect the FBT-6 to the Test Terminator. Be sure to attach the red clips to the positive fieldbus wires and the black clips to the negative. If the wires are reversed, the Monitor will not function.

Caution

The FBT-5 must not be used in a hazardous area without a gas clearance certificate. If connected to an IS trunk, even in a safe area, the gas clearance must cover the whole system.

Operation

The Wiring Validator has a push-button Power switch to turn it on or off. If the Wiring Validator is turned on with a single click of the Power button, it will stay on for about 5 minutes and then automatically turn itself off to conserve battery power. If the Wiring Validator needs to be powered on indefinitely, such as when wire testing is being performed by a single person, press and hold the Power button for about 3 seconds. The green Power On light shows that the Wiring Validator is on.

- If the Power On light blinks rapidly (about three times per second), the Wiring Validator or Fieldbus Monitor is not attached to the wire pair or the connection is reversed.
- If the Power On blinks slowly (about once a second), there is a good connection to the wire pair and Fieldbus Monitor, and the Wiring Validator is in battery save mode (and will automatically power down in about five minutes).
- If the Power On indicator lights continuously, all connections have been made properly and the Wiring Validator will stay on until it is manually powered off. When the Wiring Validator is turned on, the Fieldbus Monitor powers up and displays the following readings:
- Voltage should be between 9 and 10V

(continued overleaf)

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Aug 2008

- Push the Monitor's Mode button once to get the LAS function. The LAS signal level reading should say "OK" and show the signal level in millivolts:

LAS Signal (mV)	Wire Condition
350 or more	Excellent
200-350	Good
150-200	Marginal
150 or less	Not Good

- Push the Monitor's Mode button three times to get the NOISE Average reading. It should say "OK" and display the average noise level:

Noise Level (mV)	Wire Condition
25 or less	Excellent
25-50	Good
50-75	Marginal
75 or more	Not Good

Wire System Testing
A complete fieldbus wire system, with two terminators and other wiring blocks installed, can be tested before field devices are connected. This is done in the same way as the wire testing described previously except that the Test Terminator is not used.

Note: The wiring system cannot have fieldbus devices attached to it during testing. The Wiring Validator is not capable of providing power to the fieldbus devices and its signal generator will interfere with any data transmission that the fieldbus devices attempt to initiate.

If the wiring system has two terminators installed (as required for proper fieldbus operation), test results will be comparable to the results of the wire by itself. However, if too few or too many terminators have been installed, the measured signal levels will be

inaccurate. The chart below shows the relative values of LAS signal level that will be observed:

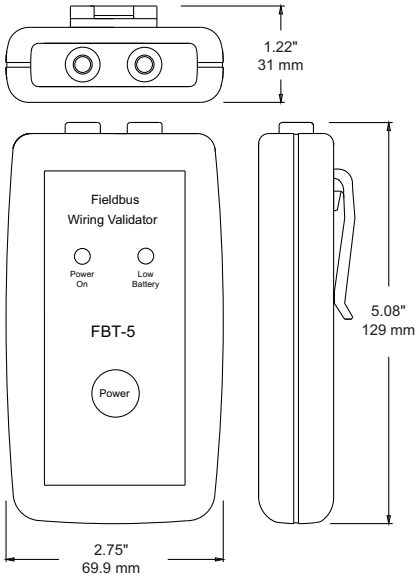
Terminators	LAS Signal (mV)
0	999
1	961
2	(correct number) 760
3	637

Error Conditions
A blinking Low Battery light indicates that the outputs of the Wiring Validator are shorted. The Low Battery light may also flash briefly as the Wiring Validator is first attached to a wire pair. A continuously lit Low Battery light indicates that the batteries need to be replaced.

Self Test
To verify that the Wiring Validator and the Fieldbus Monitor are working correctly, connect them to each other through the Test Terminator. Observe the power, signal, and noise values and verify that they are within the following ranges:

Measurement	Acceptable Range
Power	9 to 10V
LAS Signal	700 to 800mV
Noise Average	less than 25mV

If the observed values fall outside of these ranges, replace the batteries as described below. If the problem persists, contact Relcom for assistance. The unit contains no user serviceable parts.



Additional Wiring Tests
To get a complete characterization of the fieldbus wiring, measure the resistance between the individual conductors in the cable using a standard ohmmeter.

Suggested measurements include:

- The resistance between the twisted-pair wires
- The resistance between each of the twisted pair wires and the shield/drain (if present)
- The resistance between the shield/drain and instrument ground bar.

Readings of 100K ohms or higher are acceptable.

Additional System Requirements
A Relcom Fieldbus Monitor, FBT-6, is required to obtain signal and noise measurements as described in these instructions.

Batteries
The FBT-5 requires four (4) AA Alkaline batteries **which are not included**. These must be installed prior to using the FBT-5. Access to the battery compartment is obtained by unscrewing the four screws on the back of the unit and removing the battery cover.

As a guide, the batteries will last about 12 hours with continuous use.

Specifications
The FBT-5 includes soft case, Test Terminator, clip leads, and operating instructions.

Operating temperature range
0 to 50°C

Dimensions
12.9 × 7.0 × 3.1cm (5.1 × 2.8 × 1.2″)

Weight
600g

ORDERING INFORMATION

Description	Part Number
Fieldbus Wiring Validator	FBT-5
Fieldbus Monitor	FBT-6

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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 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 diagnostic monitor 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.

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Dec 2007

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.

Specification subject to change without notice

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

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Dec 2007

SPECIFICATIONS

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 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) 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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APPROVALS

Region (Authority)	Standard	Certificate	Approved For	Ratings		
US (FM)	3600, 3610, 3611, 3810	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/IIC,IIA (mA)	NIFW 32 1500 1500	FNICO 17.5 183 380
US (FM)	3600, 3610, 3611, 3810	3023564	Class I, Div 1, ABCD, T4 Class I, Zone 0 and 1, AEx/Ex ia IIC T4	Ui(V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIC,IIA (mA) Pi(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	Ui (V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIC,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, AEx/Ex ia IIC T4	Ui (V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIC,IIA (mA) Pi (W)	Entity IS 24 250 250 1.2	FISCO 17.5 183 380 5.32
EU (LCIE)	EN60079-0 (2004). Pr EN60079-11 (2005). EN60079-27 (2004)	LCIE 06 ATEX 6111 X	Ex ia IIC T4	Ui (V) Ii (mA) Pi (W)	Entity IS 24 250 1.2	FISCO 17.5 380 5.32
EU (Relcom)	IEC 60079-0 (2004) IEC 60079-15 (2006) IEC 60079-11 (2005)	501-316	Ex nL IIC T4 Ex ic IIC T4	Vmax = 32V, Imax = 1.5A		

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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Profibus-PA diagnostic monitor

FBT-6-PA

- **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**
- **upload measurement data to a PC via USB port**

The Profibus PA Diagnostic Monitor, FBT-6-PA, is used to examine the operation of a live Profibus-PA 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-PA 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 colour-coded test leads and an LCD display.

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Oct 2007

OPERATION

The FBT-6-PA 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-PA gathers data for all of its monitoring functions. If all measured data is within acceptable range, the Monitor displays "ALL MEASUREMENTS OK".

Voltage

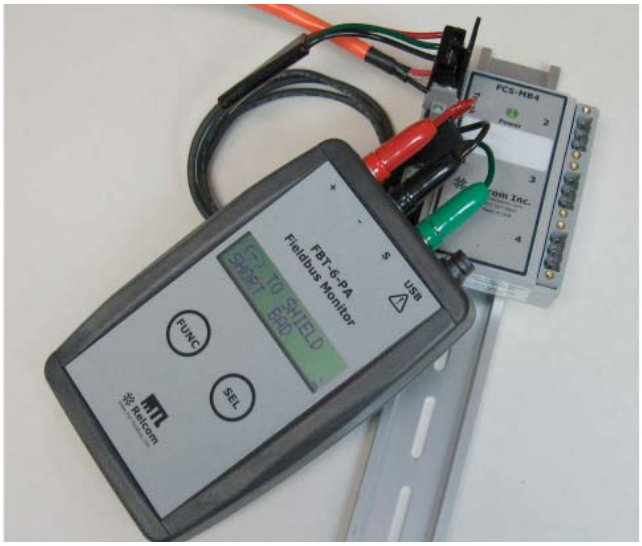
The DC voltage on the segment is shown. By default, measurements over 9 volts are OK. The maximum input voltage is 32.0 volts.

Device Count

If Profibus PA devices are 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 Profibus PA segments, the Master is considered a device and, as such, is included in the count.

The FBT-6-PA 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-PA has removed the device from its internal list of active devices. Devices having communication difficulties may show up on the FBT-6-PA 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. The first device shown will be the Master. 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 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.

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 a request frame or a token frame, the frame is retransmitted. The FBT-6-PA indicates the address (decimal and hexadecimal) of the last device that failed to respond, together with the number of retransmits 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 (-).

Add–Drop

If a new device is added to the segment, the Monitor will display its address and signal level. If a frame is retransmitted to a device, the device is considered "dropped" by the FBT-6-PA and the Monitor will display the address and last known signal level of the dropped device. A Master device that is sent an FDL Status Request frame is also considered dropped.

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.

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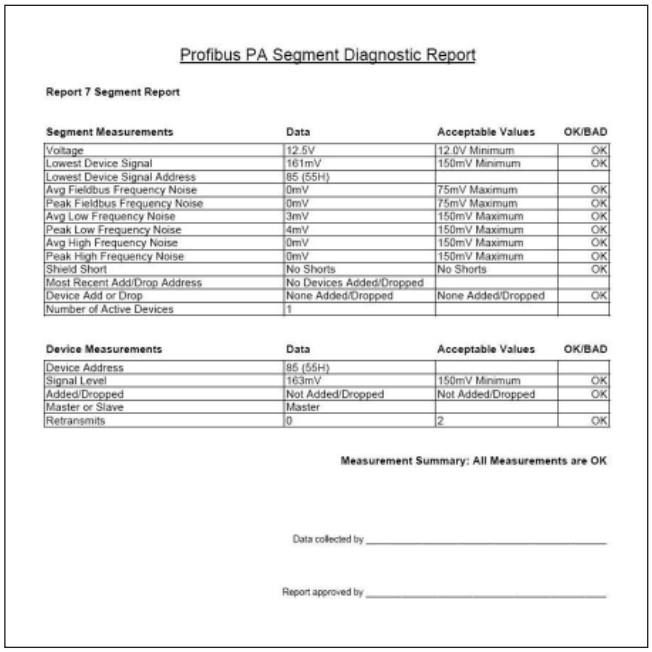
Save Report
Saves the data collected by the Monitor as a report. Up to 8 reports may be saved from multiple segments and/or multiple locations on one segment.

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.



Profibus PA Segment Diagnostic Report

Report 7 Segment Report

Segment Measurements	Data	Acceptable Values	OK/BAD
Voltage	12.5V	12.0V Minimum	OK
Lowest Device Signal	161mV	150mV Minimum	OK
Lowest Device Signal Address	85 (55H)		
Avg Fieldbus Frequency Noise	0mV	75mV Maximum	OK
Peak Fieldbus Frequency Noise	0mV	75mV Maximum	OK
Avg Low Frequency Noise	3mV	150mV Maximum	OK
Peak Low Frequency Noise	4mV	150mV Maximum	OK
Avg High Frequency Noise	0mV	150mV Maximum	OK
Peak High Frequency Noise	0mV	150mV Maximum	OK
Shield Short	No Shorts	No Shorts	OK
Most Recent Add/Drop Address	No Devices Added/Dropped		
Device Add or Drop	None Added/Dropped	None Added/Dropped	OK
Number of Active Devices	1		

Device Measurements	Data	Acceptable Values	OK/BAD
Device Address	85 (55H)		
Signal Level	163mV	150mV Minimum	OK
Added/Dropped	Not Added/Dropped	Not Added/Dropped	OK
Master or Slave	Master		
Retransmits	0	2	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)

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

* Display update speed is impaired below –10°C

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

Specifications subject to change without notice.

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APPROVALS

Region (Authority)	Standard	Certificate	Approved For	Ratings		
US (FM)	3600, 3610, 3611, 3810	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/IIC,IIA (mA)	NIFW 32 1500 1500	FNICO 17.5 183 380
US (FM)	3600, 3610, 3611, 3810	3023564	Class I, Div 1, ABCD, T4 Class I, Zone 0 and 1, AEx/Ex ia IIC T4	Ui(V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIC,IIA (mA) Pi(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	Ui (V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIC,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, AEx/Ex ia IIC T4	Ui (V) Imax Gps A, B/IIC (mA) Imax Gps C, D/IIC,IIA (mA) Pi (W)	Entity IS 24 250 250 1.2	FISCO 17.5 183 380 5.32
EU (LCIE)	EN60079-0 (2004). Pr EN60079-11 (2005). EN60079-27 (2004)	LCIE 06 ATEX 6111 X	Ex ia IIC T4	Ui (V) Ii (mA) Pi (W)	Entity IS 24 250 1.2	FISCO 17.5 380 5.32
EU (Relcom)	IEC 60079-0 (2004) IEC 60079-15 (2006) IEC 60079-11 (2005)	501-316	Ex nL IIC T4 Ex ic IIC T4	Vmax = 32V, Imax = 1.5A		

ORDERING INFORMATION

Part Number	Description	Picture
FBT-6-PA	Profibus PA Diagnostic Monitor supplied in carrying case with FBT-A61, -A62, and -A63 cables, software and instruction manual.	
FBT-A61	FBT-6-PA Fieldbus Cable with Mini-Hook Probes	
FBT-A62	FBT-6-PA USB Cable	
FBT-A63	FBT-6-PA Fieldbus Cable with Clip-on Probe	
FBT-A64	Clip-on Probe	
501-366	FBT-6-PA User Manual	

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