F809F-Plus
Fieldbus diagnostic module

- Monitors health of 8 fieldbus segments
- Provides early indication of possible network failure
- Communicates over FOUNDATION™ fieldbus H1 segment
- Easily integrates into any fieldbus control system
- Registered to Fieldbus Foundation ITK 6.0, including support for Resource Block diagnostic bits
- Network status and parameters displayed in instrument management software
- Updated EDDL and FDT/DTM user interfaces, with Namur NE107 compatible alarm categories

The F809F-Plus Fieldbus Diagnostic Module continuously monitors the performance of eight fieldbus segments, providing information on the health of the network physical layer. It mounts on a range of MTL 918x, F9xx or F6x8 power supply carriers, and collects diagnostic information without interruption to normal fieldbus communications.

As a Foundation Fieldbus™ device the F809F-Plus easily integrates with the chosen host control system via a fieldbus segment, allowing the network status and measured parameters to be displayed in the control system’s instrument management software.

The F809F-Plus builds on the success of the F809F, the industry’s first fieldbus-connected diagnostic module. New features of the Plus version include superior immunity to noise on the ‘communicating’ segment, enhanced short-to-shield detection, and extended power supply voltage measurement range for compatibility with new MTL power supply types. It may be used as a direct replacement for F809F in existing installations; when installed using appropriate DD files the full feature set of F809F-Plus become available with immediate effect.

The F809F-Plus is launched with fully updated versions of eEDDL and FDT/DTM user interfaces that are free to download from the MTL website. Improvements include faster operation and clearer screen layouts, leading to an enhanced user experience. The user interfaces comply with NAMUR specification NE107 ‘Self-Monitoring and Diagnosis of Field Devices’, providing clear standardised diagnostic alerts using three of the four categories; maintenance required, out of specification, and failure.

The parameters measured include bulk power supply input voltages, module temperature, segment voltages, retransmissions and signal levels of all devices. Average and peak noise are measured in each of three frequency bands. Additionally the monitor checks for short-circuits between the fieldbus signal wires and cable shields. General parameters are presented in the System Transducer Block, and those specific to the segments are presented in each of eight Segment Transducer Blocks. An alarm is set if any parameter is outside the normal range, and corrective action is recommended using the device description help screen.

The measured physical layer parameters are used to predict the corrective action required. This allows problems to be rectified before poor network health results in devices being removed from the ‘live list’, which could affect the operation of the plant. Measurements may alternatively be captured and sent to off-site experts for interpretation.

The F809F-Plus device description file enables all the fieldbus physical layer diagnostic data and alarms to be easily integrated into the chosen fieldbus control system. The default alert limits for the F809F-Plus are based on the fieldbus specification. The basic DD, enhanced EDDL and DTM all provide an alarm optimisation wizard which sets pre-alert limits close to the actual value. The pre-alerts are categorised as maintenance required and alerts are categorised as out of specification. This ensures that an instrument technician who knows is familiar with diagnostic data from a conventional fieldbus device can enjoy the full benefits of fieldbus physical layer diagnostics without additional training.

When monitoring a fieldbus segment the F809F-Plus draws less than 1mA current from the segment. As it only monitors the communication on the segments, its effect does not need to be considered in the segment design. Segment scanning is configurable to scan any combination of the eight segments. The default is to scan all eight segments.

The segment used for fieldbus communication is easily configured using the plug-in connector supplied. The options are: communicating on segment 1 or 8 on the power supply carrier or on a separate fieldbus segment. The F809F-Plus requires a voltage in the range 9–32V and draws a current of 15mA on the communicating fieldbus segment.

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The given data is only intended as a product description and should not be regarded as a legal warranty of properties or guarantee. In the interest of further technical developments, we reserve the right to make design changes.
The Fieldbus Diagnostic Module is designed to place a minimal communication load on the communicating segment. In most applications, the control system is configured to monitor the BLOCK_ERR parameter in the nine transducer blocks (one power supply transducer block and eight segment blocks) in each F809F-Plus. If any transducer block parameter is in alarm the Needs Maintenance Soon bit is set that sets an alarm in the instrument management system. The instrument technician then opens the transducer block and can immediately see which alarm parameter is set and the current values of the monitored parameters. Help screens built into the fieldbus Device Description recommend corrective action for the parameter in alarm. This approach has no effect on the segment cyclic communication macrocycle loading.

Alternatively the control system can be configured to monitor the F809F-Plus discrete input block each macrocycle and if any transducer block parameter is in alarm the DI block is set which then sets an alarm in the instrument management system. This approach has a minimal effect on the segment cyclic communication macrocycle loading as the DI block communication takes only a few milliseconds.

### Power Supply Transducer Block Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Feed A voltage</td>
<td>Low/high</td>
</tr>
<tr>
<td>Power Feed B voltage</td>
<td>Low/high</td>
</tr>
<tr>
<td>Module Temperature</td>
<td>High</td>
</tr>
</tbody>
</table>

### Segment Transducer Block Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment Tag, 32 character text string*</td>
<td>Low/high</td>
</tr>
<tr>
<td>LAS Tag</td>
<td>Low/high</td>
</tr>
<tr>
<td>LAS Address (Hex)</td>
<td>Low/high</td>
</tr>
<tr>
<td>LAS Signal Level</td>
<td>Low/high</td>
</tr>
<tr>
<td>Lowest Signal Level Device’s Tag</td>
<td>Low/high</td>
</tr>
<tr>
<td>Lowest Signal Level Device’s Address (Hex)</td>
<td>Low/high</td>
</tr>
<tr>
<td>Lowest Device’s Signal Level (mV)</td>
<td>Low/high</td>
</tr>
<tr>
<td>Total Retransmissions On Segment</td>
<td>Low/high</td>
</tr>
<tr>
<td>Retransmission Rate on Segment</td>
<td>Low/high</td>
</tr>
<tr>
<td>Segment voltage</td>
<td>Low/high</td>
</tr>
<tr>
<td>Short to shield</td>
<td>+/- to shield</td>
</tr>
<tr>
<td>Average low frequency noise</td>
<td>High</td>
</tr>
<tr>
<td>Average in-band frequency noise</td>
<td>High</td>
</tr>
<tr>
<td>Average high frequency noise</td>
<td>High</td>
</tr>
<tr>
<td>Peak low frequency noise</td>
<td>High</td>
</tr>
<tr>
<td>Peak in-band frequency noise</td>
<td>High</td>
</tr>
<tr>
<td>Peak high frequency noise</td>
<td>High</td>
</tr>
<tr>
<td>Live device count</td>
<td>Low/high</td>
</tr>
</tbody>
</table>
F809F-Plus
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32 Sets of Device Data
The Fieldbus Diagnostic Module supports a maximum of 32 devices within each Segment Transducer Block. For typical fieldbus applications, two fieldbus I/O cards and up to 12 fieldbus devices are connected to each segment, so only 14 device data sets will be used.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device address</td>
<td>Low/High</td>
</tr>
<tr>
<td>Device Tag, 32 character text string*</td>
<td></td>
</tr>
<tr>
<td>Device signal levels</td>
<td>High</td>
</tr>
<tr>
<td>Retransmissions</td>
<td>High</td>
</tr>
<tr>
<td>Retransmission rate = Re-transmissions/Total pass token requests from LAS</td>
<td></td>
</tr>
<tr>
<td>Inverted signal</td>
<td></td>
</tr>
</tbody>
</table>

SPECIFICATION

Location of equipment
Safe area, Zone 2 or Division 2 hazardous area

ELECTRICAL

Monitored segments
- Monitored segment voltage 9 to 32V DC
- Monitored segment current draw <1mA

Isolation
- Segment to segment: Functional 250Vac withstand
- Power input to fieldbus communication port: Functional 250Vac withstand
- Power input to monitored segments: Functional 250Vac withstand

EMC compliance
To EN61326:2006 Electrical equipment for measurement, control and laboratory use - EMC requirements

INPUT

Redundant power feeds from carrier
- Input voltage 19.2 - 30.0V DC
- Current consumption 80mA @ 24 V DC input (max.)

Fieldbus communication segment
- Input voltage 9.0 to 32.0V DC
- Current consumption 15mA maximum
- Power dissipation 2.4W max

LED indicators
- Power status (green)
  - On power on
  - Off power fail
- Segment status (yellow)
  - On segment monitored
  - Off segment not monitored
  - Flashing active segment alarm

ENVIRONMENTAL

Operating temperature
- Optimum orientation † -40°C to +70°C
- Non-optimum orientation -40°C to +50°C
- Storage -40°C to +85°C

† optimum orientation is when mounted in a vertical position as defined on carrier datasheets

Ingress protection
IP20 to BS EN 60529 (Additional protection by means of enclosure)

Corrosive atmospheres
Designed to meet ten year service in Class G3 corrosive environment, as defined by ISA Standard SP71.04.

MECHANICAL

Mountable on the following carriers:
- F918x power supply carriers
- F8xx power supply carriers
- F8x8D power supply carriers
- F8x8 diagnostic module carriers

Fieldbus communication segment used
The following options are selectable using the top connector:
- Segment 1 of monitored segments
- Segment 8 of monitored segments
- A separate fieldbus segment

Dimensions (including top cover)
162(l) x 20(w) x 148(height from circuit board)

Weight
400g approx.

USER INTERFACE

Fieldbus device description
Fieldbus enhanced EDDL
Fieldbus FDT/DTM

PHYSICAL NETWORKS

IEC61158-2
FOUNDATION™ fieldbus H1

APPROVALS - for the latest certification information visit www.mtl-inst.com/certificates

<table>
<thead>
<tr>
<th>Region (Authority)</th>
<th>Standards</th>
<th>Certificate</th>
<th>Approved for</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU (Eaton ATEX Category 3)</td>
<td>EN 60079-0</td>
<td>MTL13ATEX809FPLUSX</td>
<td></td>
</tr>
<tr>
<td>EU (IECEx)</td>
<td>IEC 60079-0</td>
<td>IECEx BAS 11.0110U</td>
<td></td>
</tr>
<tr>
<td>US (FM)</td>
<td>3600, 3611, 3810 ANSI/ISA 60079-15</td>
<td>Pending</td>
<td></td>
</tr>
<tr>
<td>Canada (cFM)</td>
<td>CSA C22.2 No. 213</td>
<td>Pending</td>
<td></td>
</tr>
<tr>
<td>US (FM)</td>
<td>3600, 3611, 3810 ANSI/ISA 60079-15</td>
<td>Pending</td>
<td></td>
</tr>
<tr>
<td>Canada (cFM)</td>
<td>CSA C22.2 No. 213</td>
<td>Pending</td>
<td></td>
</tr>
</tbody>
</table>

Parameter Alarms
- Device address: Low/High
- Device Tag, 32 character text string*: Low/High
- Device signal levels: High
- Retransmissions: High
- Retransmission rate = Re-transmissions/Total pass token requests from LAS: High
- Inverted signal: High

* the segment tag and device tag data need to be entered into the F809F-Plus device description after the system has assigned addresses to the FF devices and downloaded to the F809F.
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Fieldbus diagnostic module
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SCREEN IMAGES

eEDDL Homepage

System Data

DTM Segment View

DTM Graphical View

Trending of Segment Noise

ORDERING INFORMATION

Part No      Configuration
F809F-Plus   Fieldbus diagnostics module

The given data is only intended as a product description and should not be regarded as a legal warranty of properties or guarantee. In the interest of further technical developments, we reserve the right to make design changes.
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.

Typical connection details

- 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

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.
• 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:

<table>
<thead>
<tr>
<th>LAS Signal (mV)</th>
<th>Wire Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 or more</td>
<td>Excellent</td>
</tr>
<tr>
<td>200–350</td>
<td>Good</td>
</tr>
<tr>
<td>150–200</td>
<td>Marginal</td>
</tr>
<tr>
<td>150 or less</td>
<td>Not Good</td>
</tr>
</tbody>
</table>

• Push the Monitor’s Mode button three times to get the NOISE Average reading. It should say “OK” and display the average noise level:

<table>
<thead>
<tr>
<th>Noise Level (mV)</th>
<th>Wire Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 or less</td>
<td>Excellent</td>
</tr>
<tr>
<td>25-50</td>
<td>Good</td>
</tr>
<tr>
<td>50-75</td>
<td>Marginal</td>
</tr>
<tr>
<td>75 or more</td>
<td>Not Good</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Terminators</th>
<th>LAS Signal (mV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>999</td>
</tr>
<tr>
<td>1</td>
<td>961</td>
</tr>
<tr>
<td>2</td>
<td>(correct number) 760</td>
</tr>
<tr>
<td>3</td>
<td>637</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Acceptable Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>9 to 10V</td>
</tr>
<tr>
<td>LAS Signal</td>
<td>700 to 800mV</td>
</tr>
<tr>
<td>Noise Average</td>
<td>less than 25mV</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Operating temperature range</th>
<th>0 to 50°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>12.9 x 7.0 x 3.1cm (5.1 x 2.8 x 1.2”)</td>
</tr>
<tr>
<td>Weight</td>
<td>600g</td>
</tr>
</tbody>
</table>

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fieldbus Wiring Validator</td>
<td>FBT-5</td>
</tr>
<tr>
<td>Fieldbus Monitor</td>
<td>FBT-6</td>
</tr>
</tbody>
</table>
MTL 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 network’s 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.
FBT-6 fieldbus diagnostic monitor

September 2016

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).
### APPROVALS

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<th>Ratings</th>
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</table>
| 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/IIB,IIA (mA) | 32  
1500  
1500 | NIFW  
FNICO |
| US (FM)    | 3600, 3610, 3611, 3810 | 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) | 24  
250  
250 | Entity IS  
FISCO |
| 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)  
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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) | 24  
250  
1500 | Entity IS  
FISCO |
| EU (LCIE)  | EN60079-0:2009*  
EN60079-11:2007*  
EN60079-27:2008* | LCIE06ATEX6111X | g I I 1 G  
Ex ia IIC T4 | U_i (V)  
I_i (mA)  
P_i (W) | 24  
250  
1.2 | FISCO |
| EU (Relcom)| EN60079-0:2009  
EN60079-11:2007  
EN60079-15:2010 | RELC07ATEX1003X | E II 3 G  
Ex ic IIC T4 Gc | Vmax = 32V, Imax = 1.5A |
| IECEx      | IEC60079-0:2004  
IEC60079-11:2008  
IEC60079-27-2005-04 | IECEx FME 08.0003X | Ex ic IIC T4  
Ex ic IIC T4 | U_i (V)  
I_i (mA)  
P_i (W) | 32  
1500  
NA | Entity IS  
FISCO |

* 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.

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<td>FBT-6</td>
<td>Foundation fieldbus™ H1 Diagnostic Monitor supplied in carrying case with FBT-A61, -A62, and -A63 cables, software and instruction manual.</td>
<td><img src="image" alt="FBT-6" /></td>
</tr>
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<td>FBT-A61</td>
<td>FBT-6 Fieldbus Cable with Mini-Hook Probes</td>
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<td>Clip-on Probe</td>
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<tr>
<td>501-338</td>
<td>FBT-6 User Manual</td>
<td><img src="image" alt="501-338" /></td>
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</table>
FBT-6-PA
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
- Uploads 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.
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 FBT6-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 greater than 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 FBT6-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 FBT6-PA has removed the device from its internal list of active devices. Devices having communication difficulties may show up on the FBT6-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 FBT6-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 FBT6-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.
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.

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 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)
‡ 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).
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