Fieldbus Network Monitor

FBT-3

Relcom Inc.
INDUSTRIAL LAN | WIRING COMPONENTS AND TESTERS

The Fieldbus Network Monitor, FBT-3, is used to examine the operation of a live Fieldbus network without interfering with its operation. The Monitor is intended for maintenance personnel to verify network operation or to troubleshoot an errant network.

Connection

Connect the FBT-3 using the red and black clip leads at the end of the cable assembly. The red clip should connect to the positive Fieldbus wire and the black clip to the negative Fieldbus wire. If the wires are reversed, the Monitor will not operate. The cable assembly attaches to the FBT-3 case using standard banana connectors found on most multimeters. If you prefer, you may substitute another set of probes for the ones supplied with the Monitor.

Operation

When first connected to a Fieldbus, a Version number is displayed for 1 second.

A number of network parameters can be examined with the Monitor. These are selected by pushing and releasing the MODE button. This cycles the Monitor through all of its functions (9). When a function is selected, the measurement value shown initially is "---" until the needed data is gathered by the Monitor, if it is available. As soon as data is available for the selected function, the measured value is shown. The indication "OK" is shown if the measured value is within the acceptable range.

The last character of the display (lower right corner) indicates whether there is network traffic and if the Monitor is unable to properly decode a frame of data. Each time the display is updated this character is rotated 45 degrees if the Monitor was able to decode a frame of data. Continuous receipt of data causes the character to look like a rotating line. A horizontal line under the rotating symbol indicates that a frame could not be decoded. This is not a maintained function. In other words, 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 while many "bad" frames will appear to leave the underbar on continuously.

Mode Switch: The MODE switch has a dual function. Pressing and releasing the button, cause the Monitor to move to the next function. Pressing and holding the button for about 2 second, causes the current function to be cleared. Releasing the button after the clear does not cause the Monitor to change functions. Not all functions respond to the clear request since these functions continuously update the display with data. The affect of the clear request will be discussed in each of the following modes:

Display Modes

Volts: The DC voltage on the network is shown. Measurements over 9 volts are OK. A clear request has no effect in this mode.

LAS: If there is any activity on the network, the Link Active Scheduler should be sending out Probe Node frames. The Monitor measures the signal level of the Probe Node frame. The signal level is in millivolts. Measurements over 150 mV are OK. A clear request has no effect in this mode.

Device: If there are Fieldbus devices active on the network, the Monitor counts them. If the count has remained the same since the Monitor was powered up or since the last clear request for this mode, 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 of 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 number of devices have left the network, the display shows "-X" where "X" is the number of devices which have left the network since the last clear of this mode, or since the Monitor was attached to the network. "X" is a hexidecimal number (1-9, A, B, C, D, E, F). If more than 15 devices have changed, "X" will remain an "F". If new devices have been added to the network, the display shows "+X" (again "X" defined as above). A clear request while in this mode, removes any "+X" or "-X" and displayes an "OK".

Low: The signal level and address of the device with the lowest signal level is shown. Measurements over 150 mV are OK. The device's address (hexadecimal) is shown behind the word "LOW". This will be the lowest signal level reading from a device since the tester was connected to the fieldbus or since the last clear request. A clear request causes the Monitor to re-evaluate the lowest signalling device.

Noise Av: The noise on the network is measured in the silence period between frames. The value is averaged over 10 measurements. Measurements under 75 mV are OK. The Monitor will not display noise readings over 693mv. A clear request has no effect in this mode.

Noise Pk: The peak noise recorded since connecting to the network, or since the last clear request for this function is displayed. Measurements under 75 mV are OK. A clear request for this function causes the peak noise to be re-evaluated. Peak noise over 75mv may be fine in your application as long as these peaks occur infrequently. Fieldbus is designed to recover from occasional bad frames.

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 over 150 mV are OK. The device's address (hexadecimal) is shown behind the word "LOW". The values displayed are held until another new device is added to

the network, or until a clear request is made for this function. If no new device has been added to the network, dashes will fill the device number and signal level.

Invert: This mode displays the address (hexidecimal) of a device which is transmitting an inverted Fieldbus signal. If there is more than one device on the network which is transmitting an inverted signal, the display will randomly show one of the device numbers. This may cause the display to change quickly between different device numbers. A clear request will cause the display to show dashes until the Monitor detects another device transmitting an inverted signal.

FEC: This stands for Framing Error Code. If the tester starts to decode a frame and is unable to finish, it will display a code that indicates what problem was encountered during the frame decoding. The last FEC that occurred since entering this mode is displayed. A zero means no "bad" frames have been detected since entering this mode. Issuing a clear request will zero the display until another FEC is detected.

Specifications

The Monitor is powered from the Fieldbus and uses 10 mA of current. CAUTION: Be careful when connecting to a current limited spur (Spurguard™). The added current of the monitor may exceed the rating of the Spurguard™ and shut down the spur.

Operating temperature range is 0 – 50 degrees centigrade.

Framing Error Codes

The following Framing Error Codes (FECs) may appear on the FEC display. There are many reasons that a FEC may occur. The most likely reason is noise on the network causing the Monitor to falsely detect the start of a frame. The FEC is a number that is incremented (from zero) as a frame is decoded. This means that the larger the FEC, the further the Monitor was into the decoding process before an error condition was detected.

Frame Valid Signal went Invalid

A hardware signal that indicates that a frame is currently on the bus is periodically checked to verify that the electronics still "sees" a frame. If this signal goes invalid while decoding a frame, the decoding will stop and the error code will be displayed. FECs that indicate this condition are: 2, 4, 10, and all odd numbers from 11 – 55. The most likely cause for this is noise or a very low signal level.

Preamble Errors:

During the preamble, the Monitor synchronizes with the data stream by watching for transitions. In the preamble, a transition should occur every 32 microseconds. FECs 1, 3, 5, 7, or 9 indicate that a transition did not occur soon enough.

After the Monitor synchronizes with the bitstream in the preamble, it verifies that the signal stays high and then low for a minimum time (about 24 microseconds). If the signal changes too soon, FEC 6, or 8 will occur.

Start Delimiter Errors

FEC 12: Expected an "N-"
FEC 14: Expected a "1"
FEC 16: Expected a "0"
FEC 18: Expected an "N-"
FEC 20: Expected an "N+"
FEC 22: Expected a "0"

Control Byte Errors

FEC 24, 26, 28, 30, 32, 34, 36, 38: Received an "N+" or "N-" while expecting a "1" or "0".

Address Byte Errors

FEC 40, 42, 44, 46, 48, 50, 52, 54: Received an "N+" or "N-" while expecting a "1" or "0".

WARNING

The FBT-3 may NOT be used in a Hazardous Location unless the area is known to be safe.